ABB INDUSTRIAL DRIVES

# DCS880 drives

## Firmware manual

# DCS880 Drive Manuals

All the documents available for the drive system DCS880 are listed below:

## List of manuals

| | | Language | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Publication number | E | D | I | ES | F | CN | RU |
| **General** | | | | | | | | |
| DCS880 Quick Guide | 3ADW000480 | x | | | | | | |
| Safety instructions all languages | 3ADW000481 | x | x | x | x | x | x | x |
| DCS880 Documentation pack | DCS880 CD download | x | | | | | | |
| **DCS880 Units** | | | | | | | | |
| DCS880 Flyer | 3ADW000475 | x | x | | | x | | |
| DCS880 Technical Catalog | 3ADW000465 | x | | | | | | |
| DCS880 Hardware Manual | 3ADW000462 | x | | | | | | |
| DCS880 Firmware Manual | 3ADW000474 | x | | | | | | |
| DCS880 Service Manual | 3ADW000488 | x | | | | | | |
| ACS-AP-x assistant control panels user's manual | 3AUA0000085685 | x | | | | | | |
| **Functional safety** | | | | | | | | |
| Supplement for functional safety | 3ADW000452 | x | | | | | | |
| **Functional safety for cabinet** | | | | | | | | |
| +Q957 Prevention of unexpected Start Up | 3ADW000504 | x | | | | | | |
| +Q951 Emergency stop, category 0 with MC opening | 3ADW000505 | x | | | | | | |
| +Q952 Emergency stop, category 1 with MC opening | 3ADW000506 | x | | | | | | |
| +Q963 Emergency stop, category 0 without MC opening | 3ADW000507 | x | | | | | | |
| +Q964 Emergency stop, category 1 without MC opening | 3ADW000508 | x | | | | | | |
| **Enclosed converter** | | | | | | | | |
| Installation manual | 3ADW000091 | x | x | | | | | |
| **Door mounting kits** | | | | | | | | |
| DPMP-01 mounting platform for ACS-AP control panel | 3AUA0000100140 | x | | | | | | |
| DPMP-02 mounting platform for ACS-AP control panel | 3AUA0000136205 | x | | | | | | |
| **Serial communication** | | | | | | | | |
| FCAN-01 CANopen adapter module | 3AFE68615500 | x | x | | | | | |
| FDNA-01 DeviceNet™ adapter module | 3AFE68573360 | x | | | | | | |
| FECA-01 EtherCAT adapter module | 3AUA0000068940 | x | x | | | | | |
| FENA-11/-21 Ethernet adapter module | 3AUA0000093568 | x | | | | | | |
| FEPL-02 Ethernet POWERLINK adapter module | 3AUA0000123527 | x | x | | | | | |
| FPBA-01 PROFIBUS DP adapter module | 3AFE68573271 | x | x | | | | | |
| FSCA-01 RS-485 adapter module | 3AUA0000109533 | x | | | | | | |
| FDCO-01/02 DDCS communication modules | 3AUA0000114058 | | | | | | | |
| **Tool and maintenance manuals and guides** | | | | | | | | |
| Drive composer PC tool | 3AUA0000094606 | x | | | | | | |
| Drive (IEC61131-3) application programming manual | 3AUA0000127808 | x | | | | | | |
| Adaptive programming, Application guide | 3AXD50000028574 | x | | | | | | |
| NETA-21 remote monitoring tool | 3AUA0000096939 | x | | | | | | |
| NETA-21 remote monitoring tool guide | 3AUA0000096881 | x | | | | | | |
| **Extension modules** | | | | | | | | |
| FIO-11 Analog extension module | 3AFE68784930 | x | | | | | | |
| FIO-01 Digital extension module | 3AFE68784921 | x | | | | | | |
| FAIO-01 Analog extension module | 3AUA0000124968 | x | | | | | | |
| FDIO-01 Digital extension module | 3AUA0000124966 | x | | | | | | |
| FEN-01 TTL encoder interface | 3AFE68784603 | x | | | | | | |
| FEN-31 HTL encoder interface | 3AUA0000031044 | x | | | | | | |
| FEA-03 F series extension adapter | 3AUA0000115811 | x | | | | | | |
| | | | | | | | | |

Status 02.2018 x → existing p → planned DCS880 Manuals list e f.docx

# Table of contents

# Safety instructions

## What this chapter contains

This chapter contains the safety instructions you must follow when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive, the motor or driven equipment. Read the safety instructions before you work on the unit.

## To which products this chapter applies

The information is valid for the whole range of the product DCS880, the converter modules DCS880-S0x size H1 … H8, field exciter units DCF80x, etc. like the Rebuild Kit DCS880-R00.

## Usage of warnings and notes

There are two types of safety instructions throughout this manual: warnings and notes. Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Notes draw attention to a particular condition or fact, or give information on a subject.
The warning symbols are used as follows:

**Dangerous voltage warning** warns of high voltage which can cause physical injury or death and/or damage to the equipment.

**General danger warning** warns about conditions, other than those caused by electricity, which can result in physical injury or death and/or damage to the equipment.

**Electrostatic sensitive devices warning** warns of electrostatic discharge which can damage the equipment.

## Installation and maintenance work

These warnings are intended for all who work on the drive, motor cable or motor. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

**WARNING**

- **Only qualified electricians are allowed to install and maintain the drive!**
- Never work on the drive, motor cable or motor when main power is applied.
- Always ensure by measuring with a multimeter (impedance at least 1 MΩ) that:
  - 1. Voltage between drive input phases U1, V1 and W1 and the frame is close to 0 V.
  - 2. Voltage between terminals C+ and D- and the frame is close to 0 V.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation resistance or voltage withstand tests on the drive or drive modules.
- Isolate the motor cables from the drive when testing the insulation resistance or voltage withstand of the cables or the motor.
- When reconnecting the motor cable, always check that the C+ and D- cables are connected with the proper terminal.

**Note:**

- The motor cable terminals on the drive are at a dangerously high voltage when the main power is on, regardless of whether the motor is running or not.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the relay outputs of the drive system (e.g. XRO1 … XRO3).
- DCS880 with enclosure extension: Before working on the drive, isolate the whole drive system from the supply.

## Grounding

These instructions are intended for all who are responsible for the grounding of the drive. Incorrect grounding can cause physical injury, death and/or equipment malfunction and increase electromagnetic interference.

**WARNING**

- Ground the drive, motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and pick-up.
- Make sure that grounding conductors are adequately sized and marked as required by safety regulations.
- In a multiple-drive installation, connect each drive separately to protective earth (PE ⏚).
- Minimize EMC emission and make a 360° high frequency grounding (e.g. conductive sleeves) of screened cable entries at the cabinet lead-through plate.
- Do not install a drive equipped with an EMC filter to an ungrounded power system or a high resistance-grounded (> 30 Ω) power system.

**Note:**

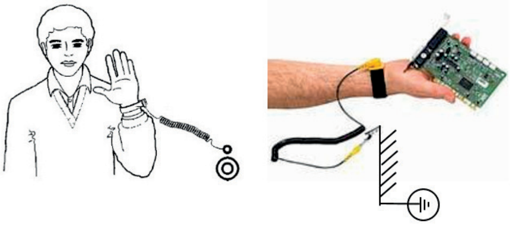
- Power cable shields are suitable as equipment grounding conductors only when adequately sized to meet safety regulations.
- As the normal leakage current of the drive is higher than 3.5 $\text{mA}_{\text{AC}}$ or 10 $\text{mA}_{\text{DC}}$ (stated by EN 50178, 5.2.11.1), a fixed protective earth connection is required.

## Printed circuit boards and fiber optic cables

These instructions are intended for all who handle the circuit boards and fiber optic cables. Ignoring the following instructions can cause damage to the equipment.

**WARNING**

- The printed circuit boards contain components sensitive to electrostatic discharge. Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily.
- Use grounding strip:



-
- ABB order no.: 3ADV050035P0001

**WARNING**

- Handle the fiber optic cables with care.
- When unplugging optic cables, always grab the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the fiber is extremely sensitive to dirt.
- The minimum allowed bend radius is 35 mm (1.38 in.).

# Mechanical installation

These notes are intended for all who install the drive. Handle the unit carefully to avoid damage and injury.

**WARNING**

- DCS880 sizes H4 ... H8: The drive is heavy. Do not lift it alone. Do not lift the unit by the front cover. Place units H4 … H6 only on its back.
- DCS880 sizes H6 ... H8: The drive is heavy. Lift the drive by the lifting lugs only. Do not tilt the unit. The unit will overturn from a tilt of about 6 degrees.
- Make sure that dust from drilling does not enter the drive when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.
- Ensure sufficient cooling.
    - Do not fasten the drive by riveting or welding.

## Operation

These warnings are intended for all who plan the operation of the drive or operate the drive. Ignoring the instructions can cause physical injury or death and/or damage to the equipment.

⚠

**WARNING**

- Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the base speed.
- Do not control the motor with the disconnecting device (disconnecting mains); instead, use the control panel keys ▽ and ◇, or commands via the I/O board of the drive.
- Mains connection:
  You can use a disconnect switch (with fuses) to disconnect the electrical components of the drive from the mains for installation and maintenance work. The type of disconnect switch used must be as per EN 60947-3, Class B, so as to comply with EU regulations, or a circuit-breaker type which switches off the load circuit by means of an auxiliary contact causing the breaker's main contacts to open. The mains disconnect must be locked in its "OPEN" position during any installation and maintenance work.
- EMERGENCY STOP buttons must be installed at each control desk and at all other control panels requiring an emergency stop function. Pressing the STOP button on the control panel of the drive will neither cause an emergency stop of the motor, nor will the drive be disconnected from any dangerous potential.
- To avoid unintentional operating states, or to shut the unit down in case of any imminent danger according to the standards in the safety instructions it is not sufficient to merely shut down the drive via signals "RUN", "drive OFF" or "Emergency Stop" respectively "control panel" or "PC tool".
- Intended use:
- The operating instructions cannot take into consideration every possible case of configuration, operation or maintenance. Thus, they mainly give such advice only, which is required by qualified personnel for normal operation of the machines and devices in industrial installations.
- If in special cases the electrical machines and devices are intended for use in non-industrial installations - which may require stricter safety regulations (e.g. protection against contact by children or similar) - these additional safety measures for the installation must be provided by the customer during assembly.

**Note:**

- When the control location is not set to Local (Local not shown in the status row of the display), the stop key on the control panel will not stop the drive. To stop the drive using the control panel, press the Loc/Rem key and then the stop key ▽.

# Introduction to this manual

## Chapter overview

This chapter describes the purpose, contents and the intended use of this manual.

## Before You Start

The purpose of this manual is to provide you with the information necessary to control and program the drive. Study carefully the *Safety instructions* at the beginning of this manual before attempting any work on or with the drive. Read through this manual before starting-up the drive. The installation and commissioning instructions given in the DCS880 Hardware Manual and DCS880 Quick Guide must also be read before proceeding.
This manual describes the **standard** DCS880 firmware.

## What this manual contains

The *Safety instructions* can be found at the beginning of this manual.

*Introduction to this manual*, the chapter you are currently reading, introduces you to this manual.

*Start-up*, this chapter describes the basic start-up procedure of the drive.

*Using the control panel*, this chapter describes the handling of the control panel.

*Firmware description*, this chapter describes how to control the drive with standard firmware. Including the I/O configuration of digital and analog inputs and outputs with different hardware possibilities.

*Macros*, this chapter contains a short description of each macro together with a connection diagram. Macros are pre-defined applications which will save the user time when configuring the drive.

*Parameters*, this chapter contains all signals and parameters.

*Fault Tracing*, this chapter describes the protections and fault tracing of the drive.

*Fieldbus control via embedded fieldbus (EFB)*, this chapter describes the communication to and from a fieldbus network using the embedded fieldbus interface of the drive.

*Fieldbus control via fieldbus adapter*, this chapter describes the communication to and from a fieldbus network using an optional fieldbus adapter module.

*Firmware structure diagram*, this chapter shows the parameter structure within the firmware.

## Related documents

A list of related manuals is shown on the inside of the front cover under *DCS880 Drive Manuals*.

## Terms and abbreviations

| Term/Abbreviation | Definition |
|---|---|
| AC 800M | Type of programmable controller manufactured by ABB. |
| ACS-AP-I | Types of control panel used with DCS880 drives. |
| ACS-AP-W | |
| AI | Analog input; interface for analog input signals. |
| AO | Analog output; interface for analog output signals. |
| D2D | Drive-to-drive; communication link between drives. |
| DCS800 | A product family of ABB drives. |
| DDCS | Distributed drives communication system; a protocol used in communication between ABB drive equipment. |
| DI | Digital input; interface for digital input signals. |
| DIO | Digital input/output; interface that can be used as a digital input or output. |
| DO | Digital output; interface for digital output signals. |
| Drive | Converter to control DC motors. |

| Term/Abbreviation | Definition |
|---|---|
| DriveBus | A communication link used by, for example, ABB controllers. DCS880 drives can be connected to the DriveBus link of the controller. |
| DriveAP | Adaptive Programming of the drive. |
| Drive composer | PC tool for commissioning and maintenance of ABB drives. |
| Drive control unit | Contains the electronics of the drive. The power unit is connected to the drive control unit. |
| EFB | *Embedded fieldbus interface*. |
| FAIO-01 | Optional analog I/O extension module. |
| FBA | Fieldbus adapter. |
| FCAN-01 | Optional CANopen adapter. |
| FCNA-01 | Optional ControlNet adapter. |
| FDCO-0x | Optional DDCS communication module. |
| FDIO-01 | Optional digital I/O extension module. |
| FDNA-01 | Optional DeviceNet adapter. |
| FEA-03 | Optional I/O extension adapter. |
| FECA-01 | Optional EtherCAT® adapter. |
| FEN-01 | Optional TTL encoder interface module. |
| FEN-11 | Optional absolute encoder interface module. |
| FEN-21 | Optional resolver interface module. |
| FEN-31 | Optional HTL encoder interface module. |
| FENA-11 | Optional Ethernet/IP, Modbus/TCP and PROFINET IO adapter. |
| FENA-21 | Optional dual-port Ethernet/IP, Modbus/TCP and PROFINET IO adapter. |
| FEPL-02 | Optional POWERLINK adapter. |
| FIO-01 | Optional digital I/O extension module. |
| FIO-11 | Optional analog I/O extension module. |
| FPBA-01 | Optional PROFIBUS DP adapter. |
| FPTC-01 | Optional thermistor protection module. |
| FPTC-02 | Optional ATEX-certified thermistor protection module for potentially explosive atmospheres. |
| FSCA-01 | Optional Modbus/RTU adapter. |
| FSO-xx | Optional safety functions module. |
| HTL | High-threshold logic. |
| I/O | Input/Output. |
| ModuleBus | A communication link used by, for example, ABB controllers. ACS880 drives can be connected to the optical ModuleBus link of the controller. |
| Network control | With fieldbus protocols based on the Common Industrial Protocol (CIP$^{TM}$), such as DeviceNet and Ethernet/IP, denotes the control of the drive using the Net Ctrl and Net Ref objects of the ODVA AC/DC Drive Profile. For more information, see www.odva.org, and the following manuals:<br>– FDNA-01 DeviceNet adapter module User's manual (3AFE68573360)<br>– FENA-01/-11 Ethernet adapter module User's manual (3AUA0000093568). |
| Parameter | User-adjustable operation instruction to the drive. |
| PID controller | Proportional-integral-derivative controller. The speed control is based on a PID algorithm. |
| PLC | Programmable logic controller. |
| Power unit | Contains the power electronics and power connections of the drive. The drive control unit is connected to the power unit. |
| PTC | Positive temperature coefficient. |
| PU | See power unit. |
| RDCO-0x | DDCS communication module. |
| RFG | Ramp function generator. |
| RO | Relay output; interface for a digital output signal. Implemented with a relay. |
| Signal | Value measured or calculated by the drive. |
| SSI | Synchronous serial interface. |
| STO | Safe torque off. |

| Term/Abbreviation | Definition |
|---|---|
| TTL | Transistor-transistor logic. |
| UPS | Uninterruptible power supply; power supply equipment with battery to maintain output voltage during power failure. |

## Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is the customer's sole responsibility to provide and continuously ensure a secure connection between the product and the customer network or any other network (as the case may be). The customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

# Start-up

## Chapter overview

This chapter describes the basic start-up procedure of the drive. A more detailed description of the signals and parameters involved in the procedure can be found in section *Parameters*.

## General

The drive can be operated:

- In local via the Drive composer entry, Drive composer pro or the control panel.
- In remote via local I/O or overriding control.

The following start-up procedure uses Drive composer pro (for further information about Drive composer pro, consult its online help). However, parameters can also be changed with Drive composer entry or the control panel.

The start-up procedure includes actions that need only be taken when powering up the drive for the first time in a new installation (e.g. entering the motor data). After the start-up, the drive can be powered up without using these start-up functions again. The start-up procedure can be repeated later if the start-up data needs to be altered.

Refer to section *Fault tracing* in case problems should arise. In case of a major problem, disconnect mains and wait for 5 minutes before attempting any work on the drive, the motor, or the motor cables.

## Start-up procedure

- The *Safety instructions* at the beginning of this manual have to be observed with extreme care during the start-up procedure!
- The start-up procedure should only be carried out by a qualified electrician.
- Check the mechanical and electrical installation the drive according to the DCS880 Hardware manual.

### Tools

For drive commissioning following software tools are mandatory:

- Drive composer pro including commissioning wizard and DriveAP and for fast drive signal monitoring.

For drive commissioning following tools are mandatory in addition to standard tools:

- An oscilloscope including memory function with either galvanically isolating transformer or isolating amplifier for safe measurements.
- A clamp on current probe. In case the scaling of the DC load current needs to be checked it must be a DC clamp on current probe.
- A voltmeter.

Make sure that all equipment in use is suitable for the voltage level applied to the power part!

### Checking with the power switched off

Check the settings of:

- The main breaker (e.g. overcurrent = $1.6 \ast I_n$, short circuit current = $10 \ast I_n$, time for thermal tripping = 10 s).
- Time, overcurrent, thermal and voltage relays.
- The earth fault protection (e.g. Bender relay).

Check the insulation of the mains voltage cables or busbars between the secondary side of the dedicated transformer and the drive:

- Disconnect the dedicated transformer from its incoming voltage.
- Check that all circuits between the mains and the drive (e.g. control/auxiliary voltage) are disconnected.
- Measure the insulation resistance between L1 - L2, L1 - L3, L2 - L3, L1 -PE, L2 - PE, L3 - PE. The result should be MΩs.

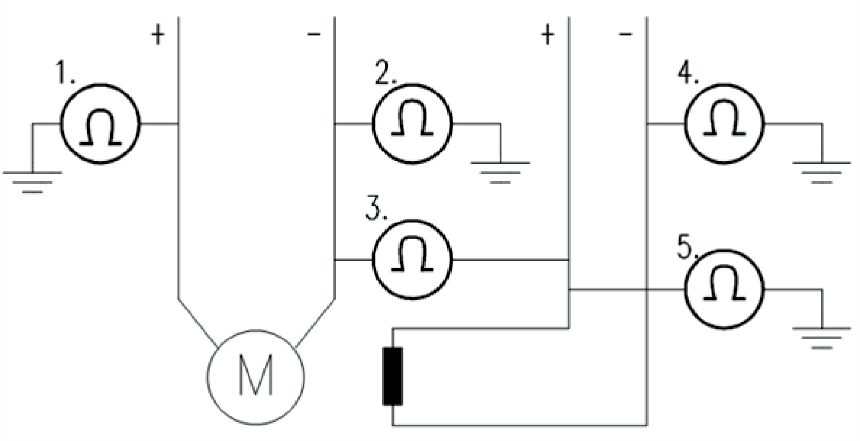
Check the installation:

- Crosscheck the wiring with the drawings.
- Check the mechanical mounting of the motor and pulse encoder and/or analog tacho.
- Make sure that the motor is connected in a correct way (armature, field, serial windings and cable shields).
- Check the connections of the motor fan, if existing.
- Make sure that the converter fan is connected correctly especially in modules size H7 and H8 were star or delta connection is possible.
- If a pulse encoder is used make sure that pulse encoder's auxiliary voltage connection corresponds to its voltage and that the channel connection corresponds to correct direction of rotation.

- Check that the shielding of the pulse encoder's cable is connected to the TE bar of the DCS880.
- If an analog tacho is used make sure that it is connected to the proper input at the SDCS-CON-H01 (AITAC:1 and 2).
- For all other cables make sure that both ends of the cables are connected and they do not cause any damage or danger when power is being switched on.

Measuring the insulation resistance of the motor cables and the motor:

- Isolate the motor cables from the drive before testing the insulation resistance or voltage withstand of the cables or the motor.



- Measure the insulation resistance between:

Armature + cables and PE.
Armature - cables and PE.
Armature cables and field cables.
Field - cable and PE.
Field + cable and PE.

- The result should be MΩs

Setting of Jumpers:

- The boards of the DCS880 include jumpers to adapt the boards to different applications. The position of the jumpers must be checked before connecting voltage.
- For specific jumper settings consult the DCS880 Hardware manual.

Drive data, check following items for each drive and mark the differences in the delivery documents:

- Motor, analog tacho or pulse encoder and cooling fans rating plate data.
- Direction of motor rotation.
- Maximum and minimum speed and if fixed speeds are used.
- Speed scaling factors:
- E.g. gear ratio, roll diameter.
- Acceleration and deceleration times.
- Operating modes:
- E.g. stop mode, E-stop mode.
- The amount of motors connected.

## Checking with the power switched on

- The *Safety instructions* at the beginning of this manual have to be observed with extreme care during the start-up procedure!
- The start-up procedure should only be carried out by a qualified electrician.

**WARNING**

- There is dangerous voltage inside the cabinet!

Switching the power on:

- Prior to connecting the voltage proceed as follows:
  1. Ensure that all the cable connections are checked and that the connections cannot cause any danger.
  2. Close all doors of enclosed converter before switching power on.
  3. Be ready to trip the supply transformer if anything abnormal occurs.
  4. Switch the power on.

Measurements made with power on:

- Check the operation of the auxiliary equipment.
- Check the circuits for external interfaces on site:
  1. Safety circuits, like Safe Torque Off (STO), Off2 (emergency off/electrical disconnect/fast current off) and Off3 (emergency stop).
  2. Remote control of the main breaker.
  3. Signals connected to the control system.
  4. Other signals which remain to be checked.

Connecting voltage to the drive:

- Check from the delivery diagrams the type of boards and converters which are used in the system.
- Check all time relay and breaker settings.
- Close the supply disconnecting device (check the connection from the delivery diagrams).
- Close all protection switches one at a time and measure for proper voltage.

## Commissioning a DCS880

Nominal values of the converter can be found in group *07 System info*, check following signals:

- 07.60 Drive size, recognized converter type read from 07.03 Drive rating ID set or 95.25 Set: Type code.
- 07.61 Drive block bridge 2 set, recognized converter quadrant type read from 07.03 Drive rating ID set or 95.26 Set: Drive block bridge 2.
- 07.62 Drive DC current scaling set, nominal converter DC current in A read from 07.03 Drive rating ID set or 95.27 Set: Drive DC current scaling.
- 07.64 Drive AC voltage scaling set, nominal AC converter voltage in V read from 07.03 Drive rating ID set or 95.28 Set: Drive AC voltage scaling.
- 07.65 Drive max bridge temperature set, maximum bridge temperature in degree centigrade read from 07.03 Drive rating ID set or 95.29 Set: Drive max bridge temperature.
- If signals are not correct adapt them, see group *95 HW configuration* in this manual.

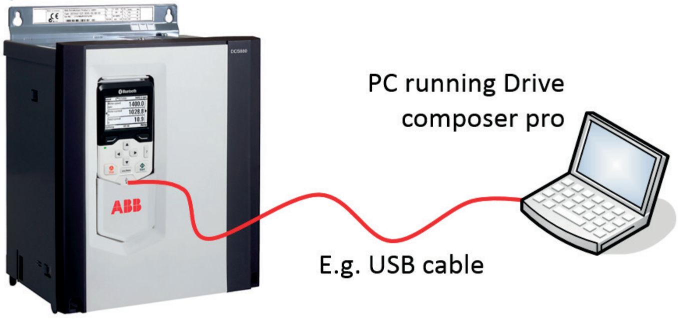
### Connect DCS880 and PC with Drive composer

To establish a connection between Drive composer and drive, connect a USB type A (PC) type mini B (control panel) cable to the USB port of the PC and the USB port of the control panel. The maximum length of the USB cable should be 3 m.

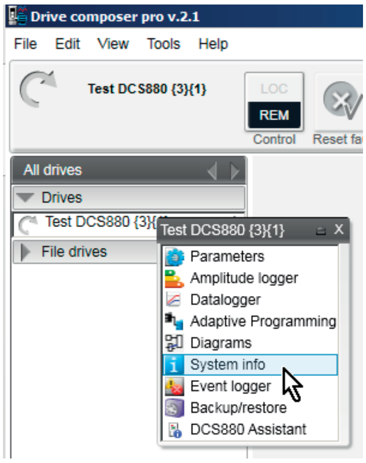
*Drive composer Start-up and maintenance PC tool User's manual (3AUA0000094606)*.

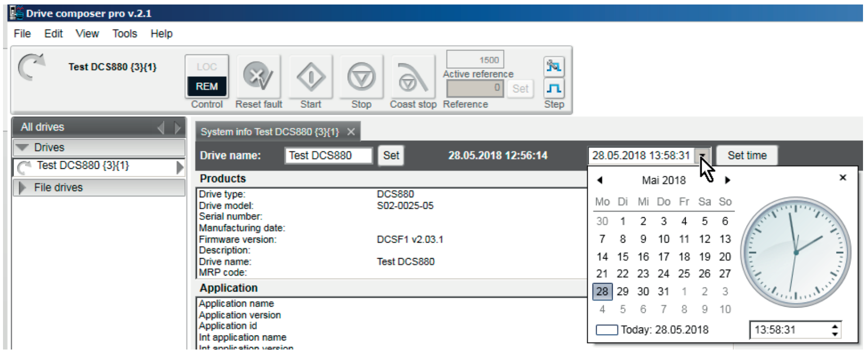
## Commissioning a DCS880 using the DCS880 Assistant

The DCS880 Assistant works only in a single drive point-to-point connection.



Start Drive composer pro and choose System info and set date and time.





1500
Active reference
0

Drive name: Test DCS880 28.05.2018 12:56:14

28.05.2018 13:58:31

Products

Drive type: DCS880
Drive model: S02-0025-05
Serial number:
Manufacturing date:
Firmware version: DCSF1 v2.03.1
Description:
Drive name: Test DCS880
MRP code:

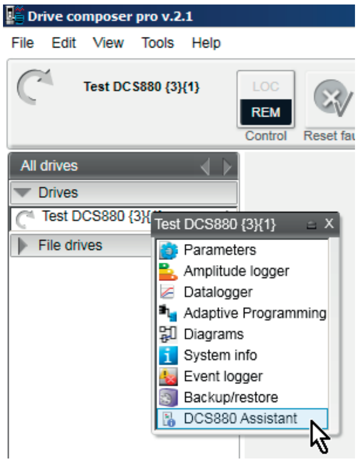
Application

Application name
Application version
Application id
Int application name

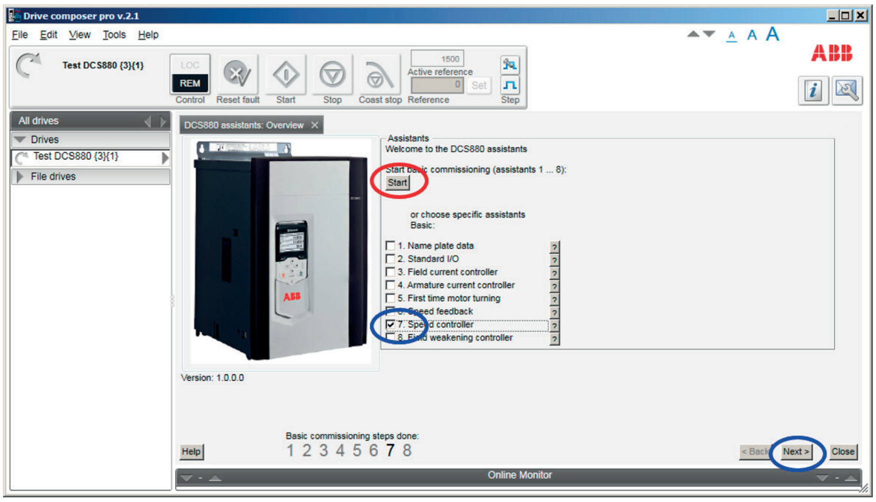
Today: 28.05.2018

13:58:31

Then choose DCS880 Assistant.



For basic commissioning press the Start button or select a specific assistant and press Next.

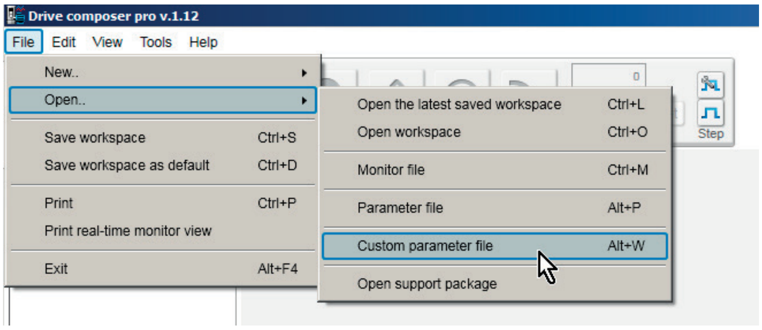


## Commissioning a DCS880 using custom parameter files

### Requirements

Before starting the commissioning, connect one drive (via control panel) with the Drive composer. Make sure, that you have the custom parameter files available. The custom parameter files are available from your local ABB agent.

How to open a custom parameter file in Drive composer pro:



### 01 Name plate data

Open the custom parameter set named:

- 01 Name plate data.dccustparams.
- Set all parameters to default by means of:
- 96.15 Parameter restore = Default.
- Check with 96.11 Macro active.

Enter the motor data, the mains (supply) data and the most important protections:

- 96.01 Language.
- 99.11 M1 nominal current.
- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.13 M1 nominal field current.
- 31.30 M1 overspeed trip margin.
- 31.44 Armature overcurrent level.
- 99.10 Nominal mains voltage.

### 02 Standard I/O

Set the I/O according to need using parameters in groups 10 … 13.

### 03 Field current controller

Open the custom parameter set named:

- 03 Field current controller.dccustparams.

Set the field exciter type by means of:

- 99.07 M1 used field exciter type.

- Check with 7.41 M1 field exciter type.

Enter the field circuit data:

- 99.13 M1 nominal field current.
- 28.17 M1 EMF/field control mode.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:

- 99.20 Tuning request = Field current autotuning.
- Set On within 20 s.

During the autotuning the mains or field contactor will be closed. The field circuit is measured by means of increasing the field current to nominal field current and the field current control parameters are set. The armature current is not released while the autotuning is active and thus the motor should not turn.

When the autotuning is finished successfully, check the parameters set by the autotuning:

- 28.44 M1 field control voltage limit, typical values around 4.
- 28.45 M1 field current proportional gain, typical values around 66 ms.
- 28.46 M1 field current integration time.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

**04 Armature current controller**

Open the custom parameter set named:

- 04 Armature current controller.dccustparams.

Enter the motor nominal current and the basic current limitations:

- 99.11 M1 nominal current.
- 30.19 Minimum torque 1.
- 30.20 Maximum torque 1.
- 30.34 M1 current limit bridge 2.
- 30.35 M1 current limit bridge 1.

**Attention:** Do not manually change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance. Changing them will falsify the results of the autotuning.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:

- 99.20 Tuning request = Armature current autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor will be closed, the armature circuit is measured by means of armature current bursts and the armature current control parameters are set. The field current is not released while the autotuning is active and thus the motor should not turn, but due to remanence in the field circuit about 40 % of all motors will turn (create torque). These motors have to be locked.

When the autotuning is finished successfully, check the parameters set by the autotuning:

- 27.29 M1 current proportional gain, typical values around 0.2.
- 27.30 M1 current integration time, typical values 25 … 50 ms.
- 27.31 M1 discontinuous current limit, typical values 20 … 60 %.
- 27.32 M1 armature resistance.
- 27.33 M1 armature inductance.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

**05 First time motor turning**

Open the custom parameter set named:

- 05 First time motor turning.dccustparams.

Make sure, the speed feedback is set to EMF and check minimum- and maximum speed:

- 90.41 M1 feedback selection = EMF.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.

Switch the drive to local mode (Drive composer or local I/O). Set On, Run. Begin with a small speed reference from about 10 % of maximum speed. Then slowly increase to maximum speed.

The mains contactor and the field contactor, if existing, will be closed and the motor will run up to the requested speed reference.

Check following parameters if applicable:
- 01.21 Armature voltage in V.
- 01.29 M1 field current in A.
- 94.01 EMF speed.
- 94.03 Tacho speed.
- 94.04 OnBoard encoder speed.
- 25.02 Speed proportional gain 1.
- 25.03 Speed integration time 1.

To stop remove Run and On.

**06 Speed feedback**

Open the custom parameter set named:
- 06 Speed feedback.dccustparams.

Enter the EMF speed feedback parameters and, if applicable, the parameters for the OnBoard encoder or the analog tacho:
- 90.41 M1 feedback selection.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 94.24 OnBoard encoder type.
- 94.25 OnBoard encoder speed calculation mode.
- 94.23 OnBoard encoder pulses/revolution.
- 94.08 M1 tacho voltage at 1000 rpm.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:
- 99.20 Tuning request = Speed feedback assistant.
- Set On and Run within 20 s.

The speed feedback assistant detects the kind of speed feedback - EMF, OnBoard encoder or analog tacho - the drive is using.

During the autotuning the mains contactor and the field contactor, if existing, will be closed and the motor might run up to base speed. See 99.14 M1 nominal (base) speed. During the whole procedure the drive will be in EMF speed control despite the setting of 90.41 M1 feedback selection.

When the autotuning is finished successfully, check the parameter set by the autotuning:
- 90.41 M1 feedback selection.

Remove Run and On.

If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

**Analog tacho fine tune procedure**

In case an analog tacho is detected, 90.41 M1 feedback selection = Tacho, it is recommended to fine tune the analog tacho.

Switch the drive to local mode (Drive composer or local I/O).

Start the autotuning by means of:
- 99.20 Tuning request = Tacho fine-tuning.
- Set On and Run within 20 s.

Measure the motor speed with a hand held tacho and write the value into:
- 94.11 M1 tacho fine-tuning adjust.

Check for proper speed feedback by means of:
- 94.03 Tacho speed.
- 24.01 Used speed reference.

To stop remove Run and On.

**07 Speed controller**

Open the custom parameter set named:
- 07 Speed controller.dccustparams.

Enter the basic speed parameters, ramp times, torque and current limits and the speed filter times:
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.

- 23.12 Acceleration time 1.
- 23.13 Deceleration time 1.
- 21.08 M1 zero speed level.
- 30.19 Minimum torque 1.
- 30.20 Maximum torque 1.
- 30.34 M1 current limit bridge 2.
- 30.35 M1 current limit bridge 1.
- 24.18 Speed error filter time 1.
- 24.19 Speed error filter time 2.
- 90.42 Motor speed filter time.

**Attention:** For better results set the filters, especially when using EMF speed feedback.
Switch the drive to local mode (Drive composer or local I/O).
Start the autotuning by means of:

- 99.20 Tuning request = Speed controller autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor and the field contactor, if existing, will be closed, the ramp is bypassed and torque respectively current limits are valid. The speed controller is tuned by means of speed bursts up to base speed, see 99.14 M1 nominal (base) speed, and the speed controller parameters are set.
**Attention:** During the autotuning the torque and/or current limits will be reached.
When the autotuning is finished successfully, check the parameter set by the autotuning:

- 25.02 Speed proportional gain 1.
- 25.03 Speed integration time 1.

Remove Run and On.
If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.
**Attention:** The assistant is using the setting of 90.41 M1 feedback selection. If using setting OnBoard encoder, Encoder 1, Encoder 2 or Tacho make sure the speed feedback is working properly!

**08 Field weakening**
Open the custom parameter set named:

- 08 Field weakening.dccustparams.

Enter the motor data and the field circuit data:

- 99.12 M1 nominal voltage.
- 99.14 M1 nominal (base) speed.
- 30.11 M1 minimum speed.
- 30.12 M1 maximum speed.
- 99.13 M1 nominal field current.
- 31.58 M1 field current low level.
- 28.17 M1 EMF/field control mode.

Switch the drive to local mode (Drive composer or local I/O).
Start the autotuning by means of:

- 99.20 Tuning request = Flux linearization autotuning.
- Set On and Run within 20 s.

During the autotuning the mains contactor and the field contactor, if existing, will be closed and the motor will run up to base speed. See 99.14 M1 nominal (base) speed. The flux linearization is tuned by means of a constant speed while decreasing the field current and the flux linearization parameters are set.
When the autotuning is finished successfully, check the parameter set by the autotuning:

- 28.31 Field current at 40 % flux.
- 28.32 Field current at 70 % flux.
- 28.33 Field current at 90 % flux.

Remove Run and On.
If the autotuning fails, warning AF90 Autotuning is generated. For more details check the AUX code of AF90 Autotuning and repeat the autotuning.

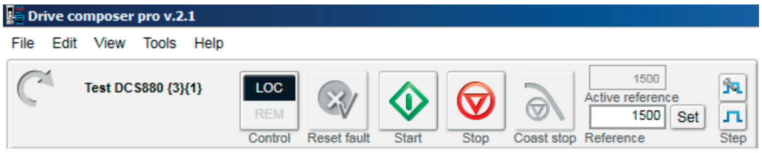
## Commissioning a DCS880 manually

### I/O configuration

To set the in- and outputs see chapter *I/O configuration*.

### Field current controller

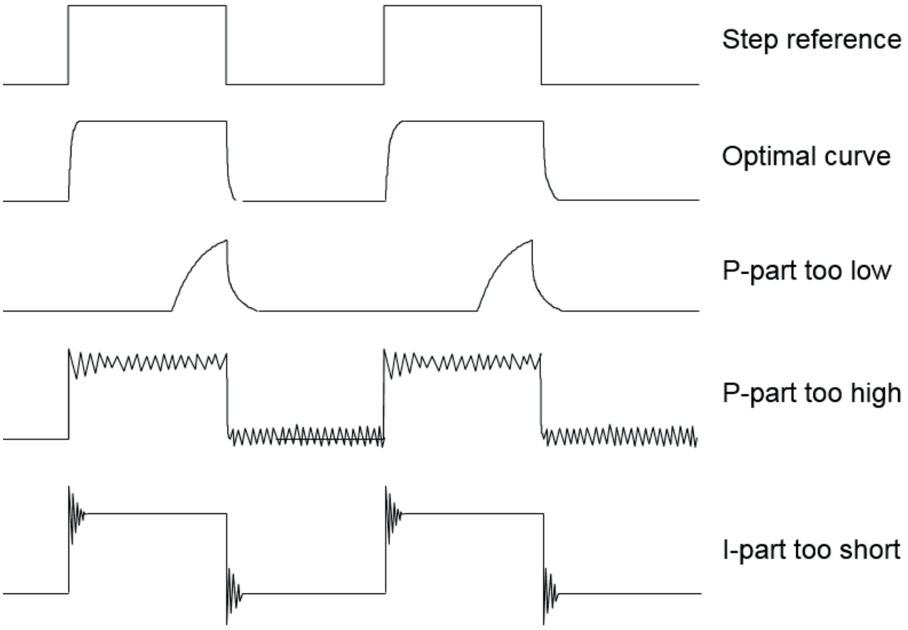
Drive composer information:



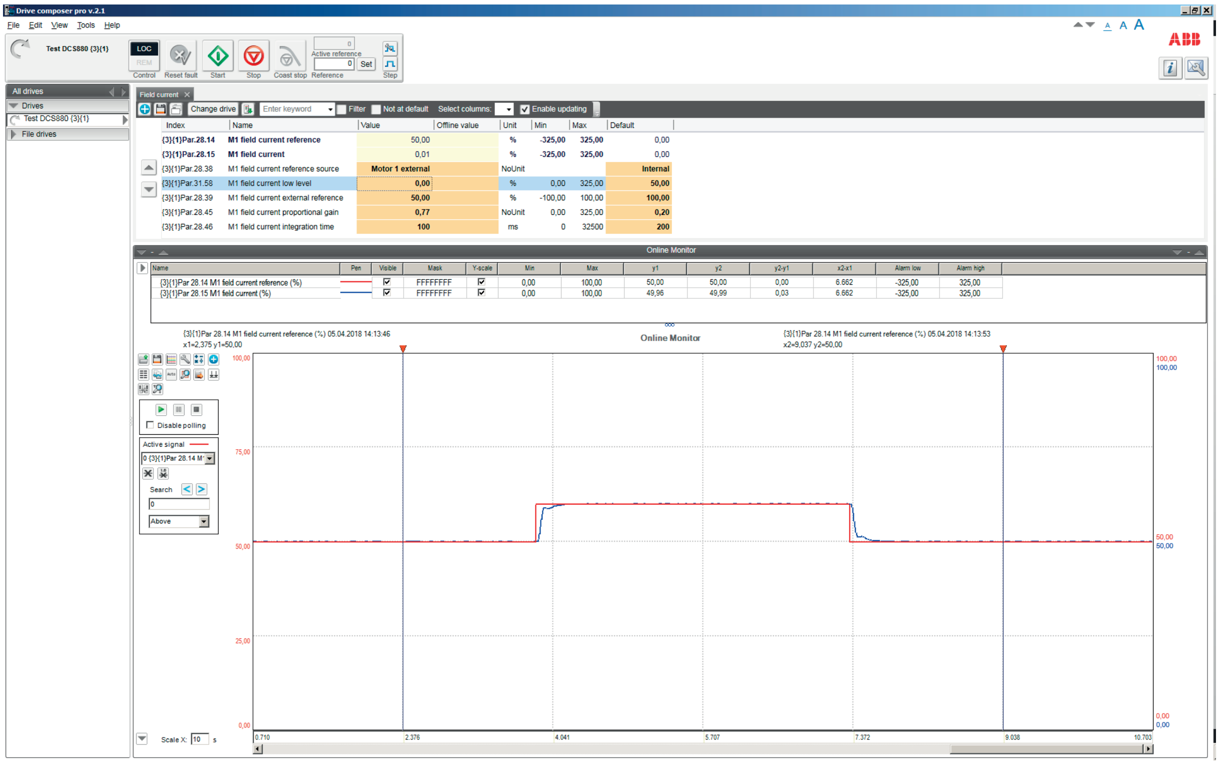
Manual tuning of the field current controller:

- Connect Drive composer to the drive and choose local mode.
- Monitor 28.14 M1 field current reference and 28.15 M1 field current.
- Set 28.38 M1 field current reference source = Motor 1 external.
- Set 31.58 M1 field current low level = 0.00 %.
- Start the drive via Drive composer.
- Use 28.39 M1 field current external reference to step the field current controller.
- Tune the field current controller by means of 28.45 M1 field current proportional gain and 28.46 M1 field current integration time.
  - Step size: about 2 % … 5 % of nominal field current (do not hit any limits during stepping, e.g. maximum field current, α or supply voltage).
  - Step response time: 50 ms … 60 ms (count only from 10 % … 90 %).
  - Where to step: 30 %, 60 % and 80 % of nominal field current.

Field current controller step responses:



Drive composer manual tuning of the field current controller:



| Index | Name | Value | Offline value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|---|
| {3}{1}Par.28.14 | M1 field current reference | 50,00 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.15 | M1 field current | 0,01 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.38 | M1 field current reference source | Motor 1 external | | NoUnit | | | Internal |
| {3}{1}Par.31.58 | M1 field current low level | 0,00 | | % | 0,00 | 325,00 | 50,00 |
| {3}{1}Par.28.39 | M1 field current external reference | 50,00 | | % | -100,00 | 100,00 | 100,00 |
| {3}{1}Par.28.45 | M1 field current proportional gain | 0,77 | | NoUnit | 0,00 | 325,00 | 0,20 |
| {3}{1}Par.28.46 | M1 field current integration time | 100 | | ms | 0 | 32500 | 200 |

Online Monitor

| Name | Pen | Visible | Mask | Y-scale | Min | Max | y1 | y2 | y2-y1 | x2-x1 | Alarm low | Alarm high |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {3}{1}Par 28.14 M1 field current reference (%) | 🟥 | ☑ | FFFFFFFF | ☑ | 0,00 | 100,00 | 50,00 | 50,00 | 0,00 | 6.662 | -325,00 | 325,00 |
| {3}{1}Par 28.15 M1 field current (%) | 🟦 | ☑ | FFFFFFFF | ☑ | 0,00 | 100,00 | 49,96 | 49,99 | 0,03 | 6.662 | -325,00 | 325,00 |

{3}{1}Par 28.14 M1 field current reference (%) 05.04.2018 14:13:46
x1=2,375 y1=50,00

Online Monitor

{3}{1}Par 28.14 M1 field current reference (%) 05.04.2018 14:13:53
x2=9,037 y2=50,00

- Set 28.39 M1 field current external reference = 0.00 %.
- Stop the drive via Drive composer.
- Set 31.58 M1 field current low level and 28.38 M1 field current reference source back to their original settings.

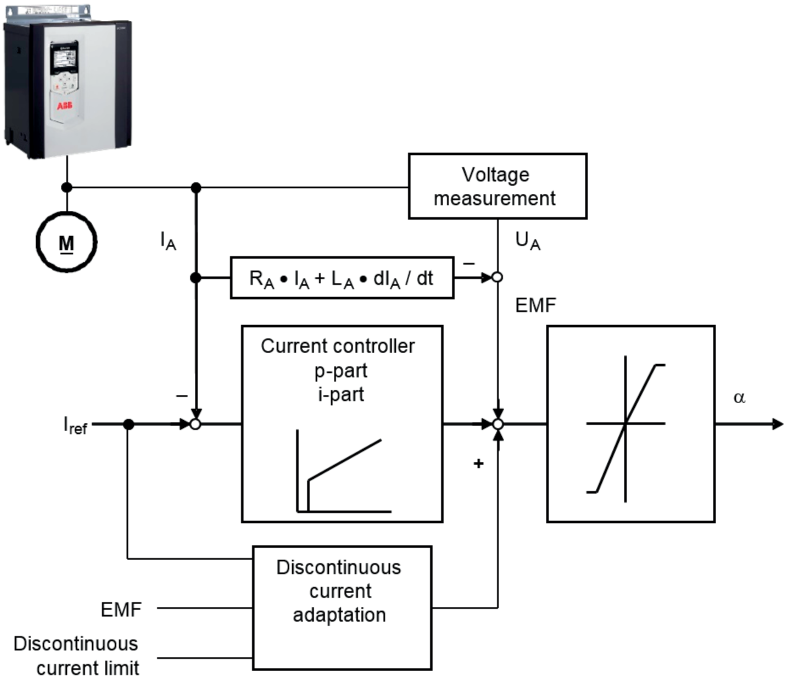
## Armature current controller

To keep a PI-controller as fast as possible idealistically the integral part should stay at zero. The worst case is that the integral part is running into the limits and thus needs a long time to recover. To prevent this and to achieve an integral part as small as possible two feed forwards are used for the current controller:

1. During discontinuous current the signal from the current controller is boosted by means of the discontinuous current adaptation, depending on discontinuous current limit, current reference and EMF. The discontinuous current limit has to be determined during the commissioning.
2. Additionally the EMF itself is used as feed forward. Unfortunately it is not possible to measure the EMF directly. It has to be calculated by means of following formula:

$$EMF = U_A - R_A \times I_A - L_A \times \frac{dI_A}{dt}.$$

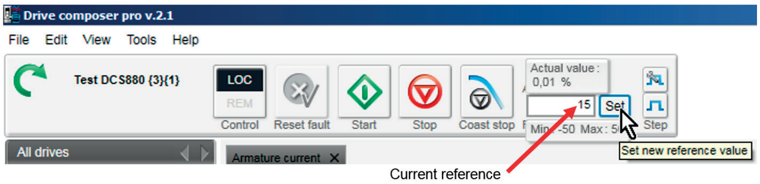
The value for the resistance ($R_A$) of the motor has to be determined during the commissioning. The resistance is needed for the EMF controller and the speed calculated from the EMF.
Control principle armature current controller:



Manual tuning:
Thus the manual tuning of the armature current controller has to be divided into three parts:

1. Determine the resistance of the motor.
2. Determine the discontinuous current limit of the motor.
3. Manual tuning of the armature current controller (p- and i-part).

Drive composer information:



Actual value : 0,01 %

15

Min: -50 Max: 5

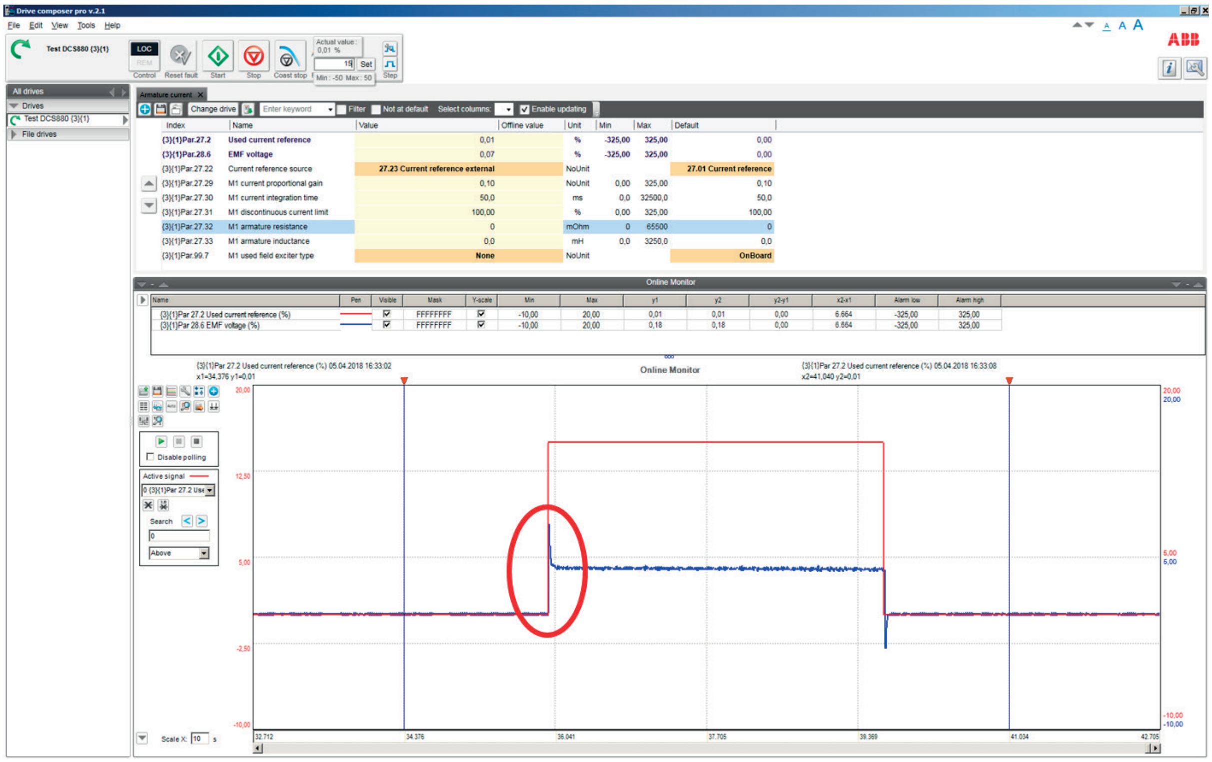
Set new reference value

Current reference

Part 1, determine the resistance of the motor:

- Connect Drive composer to the drive and choose local mode.
- Monitor 27.02 Used current reference and 28.06 EMF voltage.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 27.29 M1 current proportional gain, 27.30 M1 current integration time, 27.31 M1 discontinuous current limit, 27.32 M1 armature resistance and 27.33 M1 armature inductance to default.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to set the current reference and step the armature current controller.
- Watch the EMF.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).

Before tuning of 27.32 M1 armature resistance:



| Index | Name | Value | Offline value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|---|
| {3}{1}Par.27.2 | Used current reference | 0,01 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.6 | EMF voltage | 0,07 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.27.22 | Current reference source | 27.23 Current reference external | | NoUnit | | | 27.01 Current reference |
| {3}{1}Par.27.29 | M1 current proportional gain | 0,10 | | NoUnit | 0,00 | 325,00 | 0,10 |
| {3}{1}Par.27.30 | M1 current integration time | 50,0 | | ms | 0,0 | 32500,0 | 50,0 |
| {3}{1}Par.27.31 | M1 discontinuous current limit | 100,00 | | % | 0,00 | 325,00 | 100,00 |
| {3}{1}Par.27.32 | M1 armature resistance | 0 | | mOhm | 0 | 65500 | 0 |
| {3}{1}Par.27.33 | M1 armature inductance | 0,0 | | mH | 0,0 | 3250,0 | 0,0 |
| {3}{1}Par.99.7 | M1 used field exciter type | None | | NoUnit | | | OnBoard |

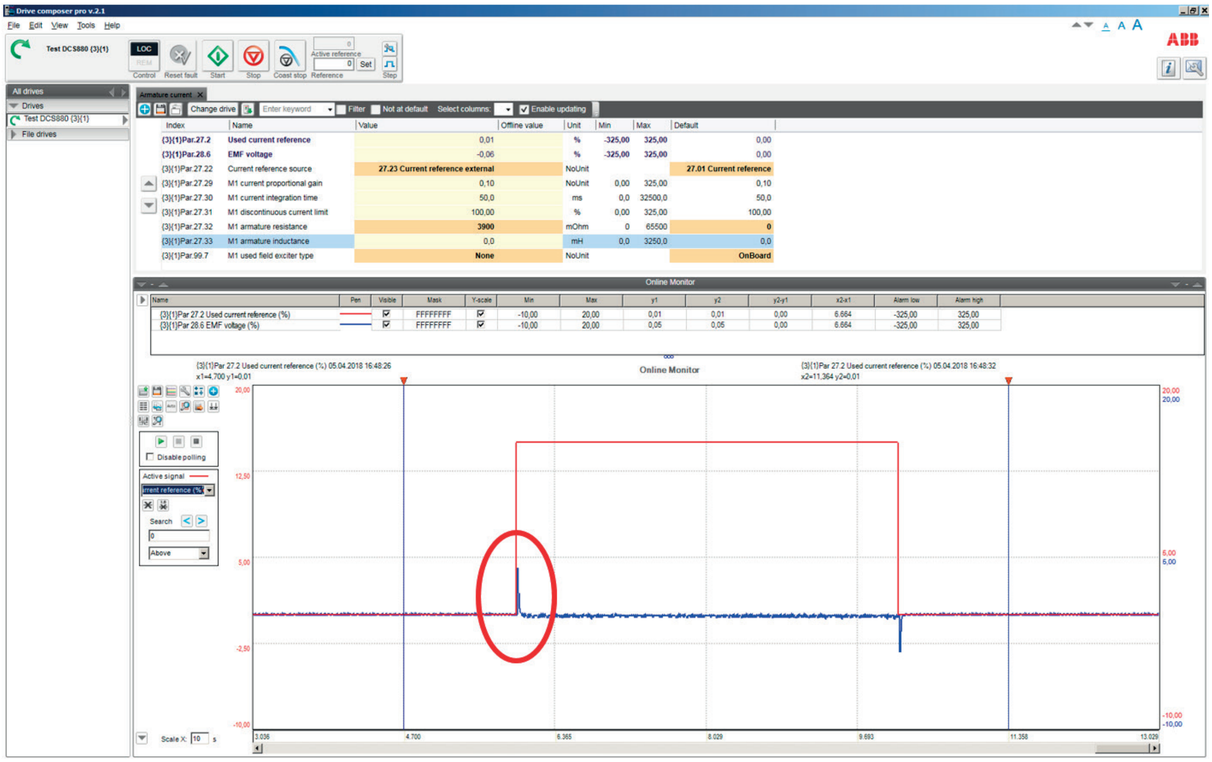
| Name | Pen | Visible | Mask | Y-scale | Min | Max | y1 | y2 | y2-y1 | x2-x1 | Alarm low | Alarm high |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {3}{1}Par 27.2 Used current reference (%) | 🟥 | ☑ | FFFFFFFF | ☑ | -10,00 | 20,00 | 0,01 | 0,01 | 0,00 | 6.664 | -325,00 | 325,00 |
| {3}{1}Par 28.6 EMF voltage (%) | 🟦 | ☑ | FFFFFFFF | ☑ | -10,00 | 20,00 | 0,18 | 0,18 | 0,00 | 6.664 | -325,00 | 325,00 |

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:33:02
x1=34.376 y1=0.01

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:33:08
x2=41.040 y2=0.01

– In this example 27.32 M1 armature resistance is too low. Tune 27.32 M1 armature resistance until the EMF is as close as possible to zero and does not change its value during the current step.

After tuning of 27.32 M1 armature resistance:



| Index | Name | Value | Offline value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|---|
| {3}{1}Par.27.2 | Used current reference | 0,01 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.6 | EMF voltage | -0,06 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.27.22 | Current reference source | 27.23 Current reference external | | NoUnit | | | 27.01 Current reference |
| {3}{1}Par.27.29 | M1 current proportional gain | 0,10 | | NoUnit | 0,00 | 325,00 | 0,10 |
| {3}{1}Par.27.30 | M1 current integration time | 50,0 | | ms | 0,0 | 32500,0 | 50,0 |
| {3}{1}Par.27.31 | M1 discontinuous current limit | 100,00 | | % | 0,00 | 325,00 | 100,00 |
| {3}{1}Par.27.32 | M1 armature resistance | 3900 | | mOhm | 0 | 65500 | 0 |
| {3}{1}Par.27.33 | M1 armature inductance | 0,0 | | mH | 0,0 | 3250,0 | 0,0 |
| {3}{1}Par.99.7 | M1 used field exciter type | None | | NoUnit | | | OnBoard |

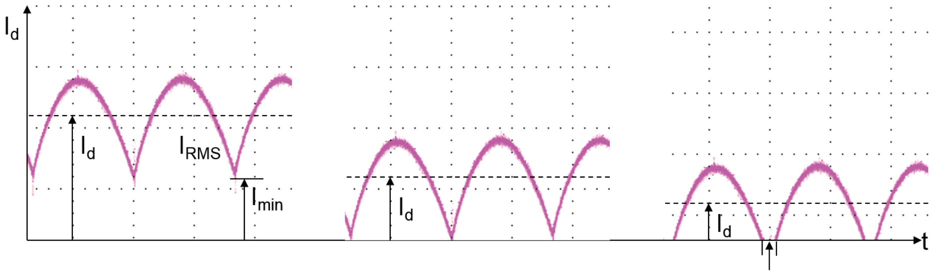
| Name | Pen | Visible | Mask | Y-scale | Min | Max | y1 | y2 | y2-y1 | x2-x1 | Alarm low | Alarm high |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {3}{1}Par 27.2 Used current reference (%) | 🟥 | ☑ | FFFFFFFF | ☑ | -10,00 | 20,00 | 0,01 | 0,01 | 0,00 | 6.664 | -325,00 | 325,00 |
| {3}{1}Par 28.6 EMF voltage (%) | 🟦 | ☑ | FFFFFFFF | ☑ | -10,00 | 20,00 | 0,05 | 0,05 | 0,00 | 6.664 | -325,00 | 325,00 |

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:48:26
x1=4.700 y1=0.01

{3}{1}Par 27.2 Used current reference (%) 05.04.2018 16:48:32
x2=11.364 y2=0.01

- It is not possible to tune 27.33 M1 armature inductance manually. Thus, leave 27.33 M1 armature inductance at default.
- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.

Part 2, determine discontinuous current limit of the motor:



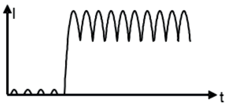
Continuous current Discontinuous current limit Discontinuous current

- Connect an oscilloscope at the fixed AO named IACT (XAO:4/5 on the SDCS-CON-H01).
- Connect Drive composer to the drive and choose local mode.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 27.31 M1 discontinuous current limit to default.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to increase the armature current reference.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).
- Watch the current bubbles and increase the current reference until the current is continuous. See recordings above.
- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.
- Copy the current reference used in Drive composer and paste it into 27.31 M1 discontinuous current limit.

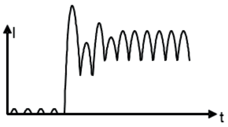
Part 3, manual tuning of the armature current controller:

- Connect an oscilloscope at the fixed AO named IACT (XAO:4/5 on the SDCS-CON-H01).
- Connect Drive composer to the drive and choose local mode.
- Set 27.22 Current reference source = 27.23 Current reference external.
- Set 99.07 M1 used field exciter type = None.
- Start the drive via Drive composer.
- Use Drive composer to set the current reference (must be higher than 27.31 M1 discontinuous current limit) and step the armature current controller.
- Make sure the motor is not turning (**Attention:** let the drive run only for a short time).
- Tune the armature current controller by means of 27.29 M1 current proportional gain and 27.30 M1 current integration time.

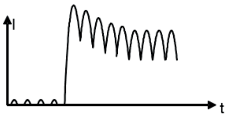
Armature current controller step responses:



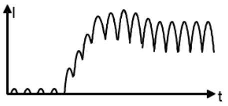
Optimal



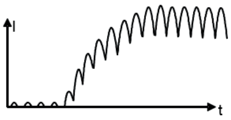
P-part too high



I-part too short



I-part too long

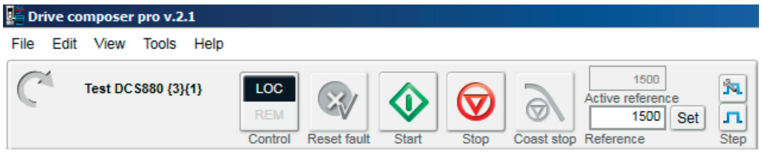


P-part too low and
i-part too long

- Stop the drive via Drive composer.
- Set 27.22 Current reference source and 99.07 M1 used field exciter type back to their original settings.

**Analog tacho**

In case an analog tacho is used for speed feedback it has to be tuned.
Drive composer information:



Manual tuning of the analog tacho:

- Set speed and analog tacho parameters:
    - 30.11 M1 minimum speed.
    - 30.12 M1 maximum speed.
    - 31.30 M1 overspeed trip margin.
    - 94.08 M1 tacho voltage at 1000 rpm.
    - 99.14 M1 nominal (base) speed.
- The maximum tacho speed is calculated automatically and shown in 94.09 M1 tacho max displayable speed.

Analog tacho connections:

| XTAC | Analog tacho | |
|---|---|---|
| 1 | AITACH+ | ±8 … 270 $V_{DC}$ |
| 2 | AITACH- | |

- Set 94.12 M1 tacho fine-tuning factor to default.
- Make sure that the drive is in EMF control, 90.41 M1 feedback selection = EMF.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference.
- Measure the speed feedback at the motor shaft using a hand held tacho.
- Rescale 94.12 M1 tacho fine-tuning factor in small steps, e.g. ± 0.01 until the measured speed feedback at the shaft and the measured speed feedback with the analog tacho match, see 94.03Tacho speed.
- Stop the drive via Drive composer.

### Speed controller

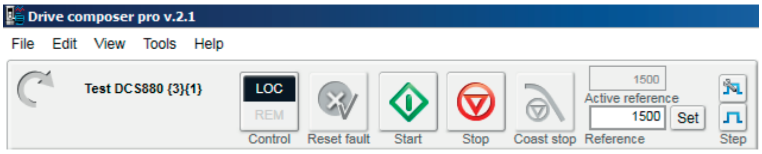
When tuning the drive, change one parameter at a time, then monitor the effect on the step response and possible oscillations. The effect of each parameter change must be checked over a wide speed range and not just at one point. The set speed controller values mainly depend on:

- The relationship between the motor power and the attached masses.
- Backlashes and natural frequencies of the attached mechanics (filtering).

The step response tests must be carried out at different speeds, from minimum up to maximum speed, at several different points. The whole speed range must also be tested carefully, e.g. at 25 % … 30 % of maximum speed (step has to be in base speed range) and 80 % of maximum speed (step has to be in field weakening area) in order to find any oscillation points.

A suitable speed step is about 2 % of maximum speed. A too large step reference or incorrect values of the speed controller might force the drives into torque/current limits, damage the mechanical parts (e.g. gear boxes) or cause tripping of the drive.

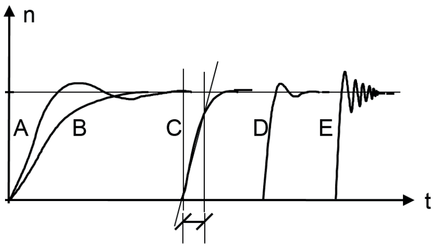
Drive composer information:



Manual tuning of the speed controller:

- Connect Drive composer to the drive and choose local mode.
- Monitor 24.01 Used speed reference and 24.02 Used speed feedback.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference.
- The step must bypass the ramp. Thus, use 24.11 Speed correction to step the speed controller.
- Tune the speed controller by means of 25.02 Speed proportional gain 1 and 25.03 Speed integration time 1.
  - Step size: 2 % of maximum speed (do not hit any torque or current limits during stepping).
  - Disable the i-part by setting 25.03 Speed integration time 1 = 0 ms.
  - Increase 25.02 Speed proportional gain 1 until the step response shows an overshoot.
  - Decrease 25.02 Speed proportional gain 1 by about 30 %.
  - Adjust 25.03 Speed integration time 1 in such a way, that there is no overshoot or only a slight overshoot, depending on the application (the function of the i-part is to reduce the difference between speed reference and speed feedback as quickly as possible).
  - Step response time: 100 ms (count only from 10 % … 90 %) in cold mills and 60 ms in rod and bar mills.
  - Where to step: 25 % … 30 % of maximum speed (step has to be in base speed range) and 80 % of maximum speed (step has to be in field weakening area).
  - Filter time ∆n: Above 30 ms. See 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2.
  - Filter time speed feedback: E.g. 5 ms … 10 ms. See 90.42 Motor speed filter time.

Speed controller step responses:

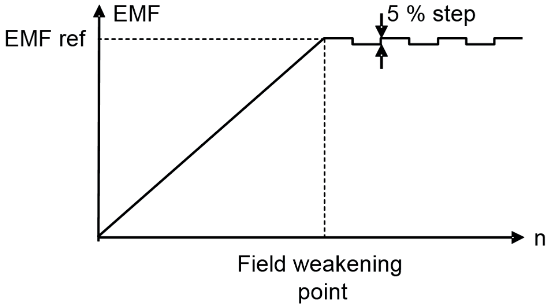


A: Undercompensated, p-part too small and i-part too short
B: Undercompensated, p-part too small
C: Normal
D: Normal, when a low impact speed drop is required
E: Overcompensated, p-part too large and i-part too short

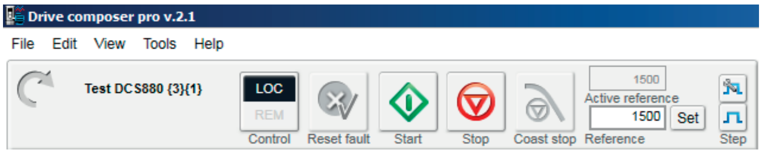
- Set 24.11 Speed correction = 0.00 rpm.
- Stop the drive via Drive composer.

## EMF controller

The EMF controller has to be tuned in case the motor needs to be used in the field weakening area and the drive trips on F503 Armature overvoltage during acceleration. The EMF controller needs to have a quick response. Usually 2 … 3 times slower than the field current controller.
The tuning has to be done in the field weakening area, because the EMF controller is blocked in the base speed range.
EMF reference for manual tuning EMF controller:



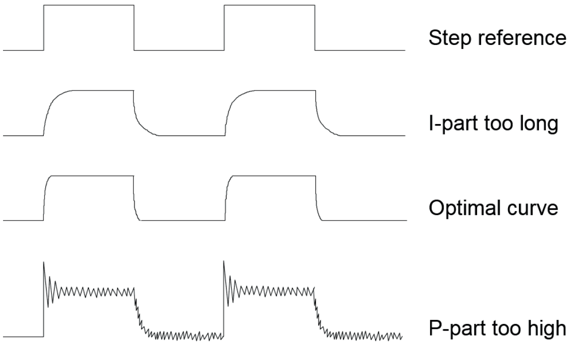
Drive composer information:



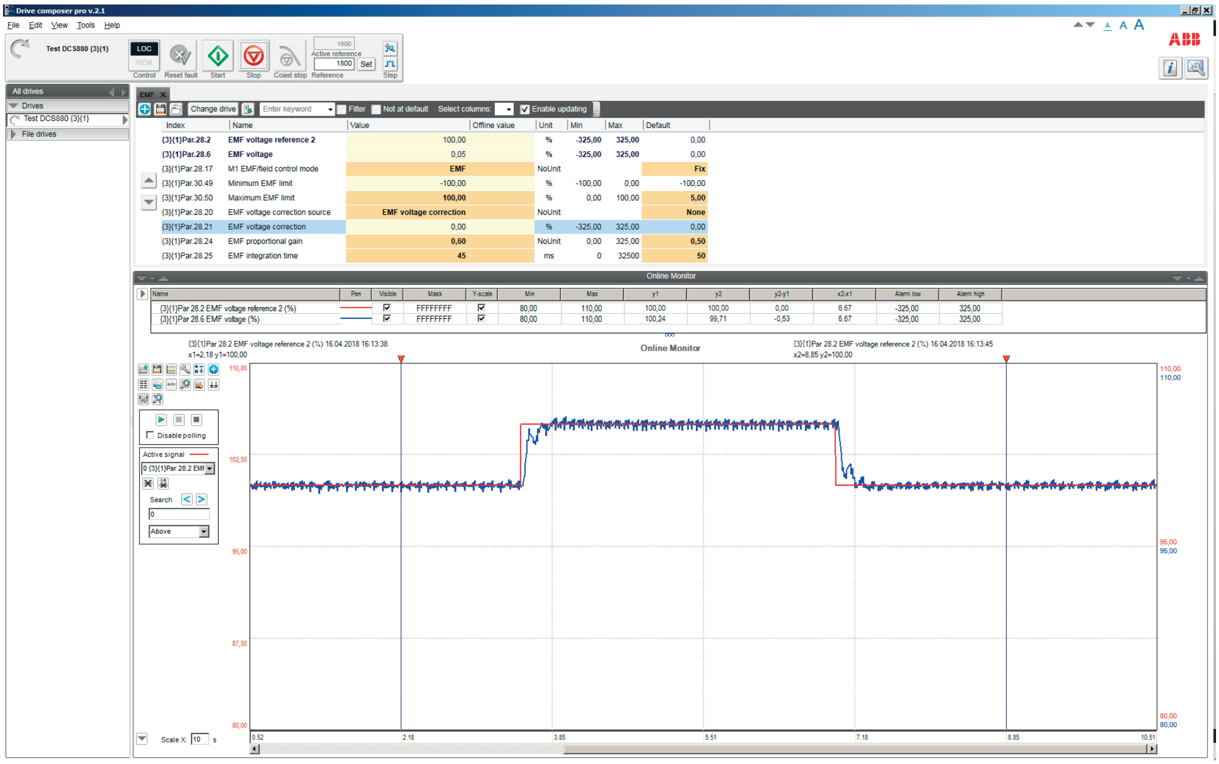
Manual tuning of the EMF controller:

- Connect Drive composer to the drive and choose local mode.
- Monitor 28.02 EMF voltage reference and 28.06 EMF voltage.
- Set 28.17 M1 EMF/field control mode = EMF.
- Set 28.20 EMF voltage correction source = EMF voltage correction.
- Set 30.49 Minimum EMF limit = -100.00 %.
- Set 30.50 Maximum EMF limit = 100.00 %.
- Start the drive via Drive composer.
- Use Drive composer to set a constant speed reference in the field weakening area.
- Use 28.21 EMF voltage correction to step the EMF controller.
- Tune the EMF controller by means of 28.24 EMF proportional gain and 28.25 EMF integration time.
    - Step size: 2 % … 5 % (do not hit any limits during stepping).
    - Step response time: 2 … 3 times slower than the field current controller.
    - Where to step: in the field weakening area.

EMF controller step responses:



Drive composer manual tuning of the EMF controller:



| Index | Name | Value | Offline value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|---|
| {3}{1}Par.28.2 | EMF voltage reference 2 | 100,00 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.6 | EMF voltage | 0,05 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.17 | M1 EMF/field control mode | EMF | | NoUnit | | | Fix |
| {3}{1}Par.30.49 | Minimum EMF limit | -100,00 | | % | -100,00 | 0,00 | -100,00 |
| {3}{1}Par.30.50 | Maximum EMF limit | 100,00 | | % | 0,00 | 100,00 | 5,00 |
| {3}{1}Par.28.20 | EMF voltage correction source | EMF voltage correction | | NoUnit | | | None |
| {3}{1}Par.28.21 | EMF voltage correction | 0,00 | | % | -325,00 | 325,00 | 0,00 |
| {3}{1}Par.28.24 | EMF proportional gain | 0,60 | | NoUnit | 0,00 | 325,00 | 0,50 |
| {3}{1}Par.28.25 | EMF integration time | 45 | | ms | 0 | 32500 | 50 |

| Name | Pen | Visible | Mask | Y-scale | Min | Max | y1 | y2 | y2-y1 | x2-x1 | Alarm low | Alarm high |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {3}{1}Par 28.2 EMF voltage reference 2 (%) | 🟥 | ☑ | FFFFFFFF | ☑ | 80,00 | 110,00 | 100,00 | 100,00 | 0,00 | 6.67 | -325,00 | 325,00 |
| {3}{1}Par 28.6 EMF voltage (%) | 🟦 | ☑ | FFFFFFFF | ☑ | 80,00 | 110,00 | 100,24 | 99,71 | -0,53 | 6.67 | -325,00 | 325,00 |

{3}{1}Par 28.2 EMF voltage reference 2 (%) 16.04.2018 16:13:38
x1=2,18 y1=100,00

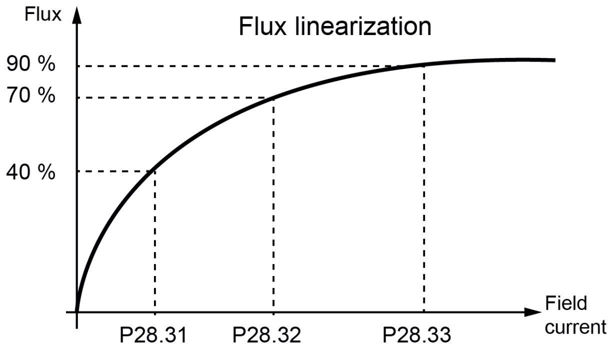
{3}{1}Par 28.2 EMF voltage reference 2 (%) 16.04.2018 16:13:45
x2=8,85 y2=100,00

- Set 28.20 EMF voltage correction source = Zero.
- Set 28.21 EMF voltage correction = 0.00 %,
- Stop the drive via Drive composer.
- Set 28.17 M1 EMF/field control mode, 30.49 Minimum EMF limit and 30.50 Maximum EMF limit back to their original settings.

## Flux linearization

In case the motor needs to be used in the field weakening area the flux linearization has to be set. The flux linearization is needed because of the non-linear relation of flux and field current due to saturation effects of the field winding.

Flux of DC-motor versus field current:



DZ_LIN_044_Flux linear_b.ai

The magnetization of the motor starts to saturate at a certain field current and thus the flux does not increase linearly. For this reason the field current cannot be directly used to calculate the flux inside the motor.

In base speed area EMF and speed are directly proportional because the flux is kept constant:

$$n = \frac{k * EMF}{\Phi}$$

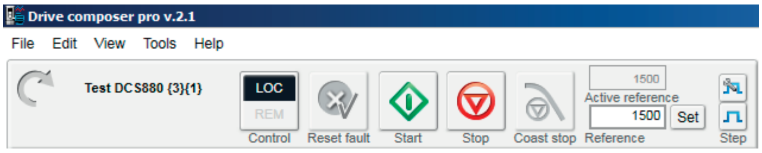
k = constant

$\Phi$ = Flux

**Example:** If the nominal armature voltage is 440 $V_{DC}$ and the motor is running at half speed with full flux, then the armature voltage is about 220 $V_{DC}$. Now the flux is reduced to 50 % at constant speed, then the armature voltage drops to about 110 $V_{DC}$.
Since the EMF is directly proportional to the flux it is possible to define a relationship between the field current and the flux by means of measuring the armature voltage without load (= EMF).
Thus the main idea of the flux linearization is to find field currents which produces desired EMF-voltage at a certain speed. The flux linearization is done by means of a function block defined by 3 values:

- 28.31 Field current at 40 % flux.
- 28.32 Field current at 70 % flux.
- 28.33 Field current at 90 % flux.

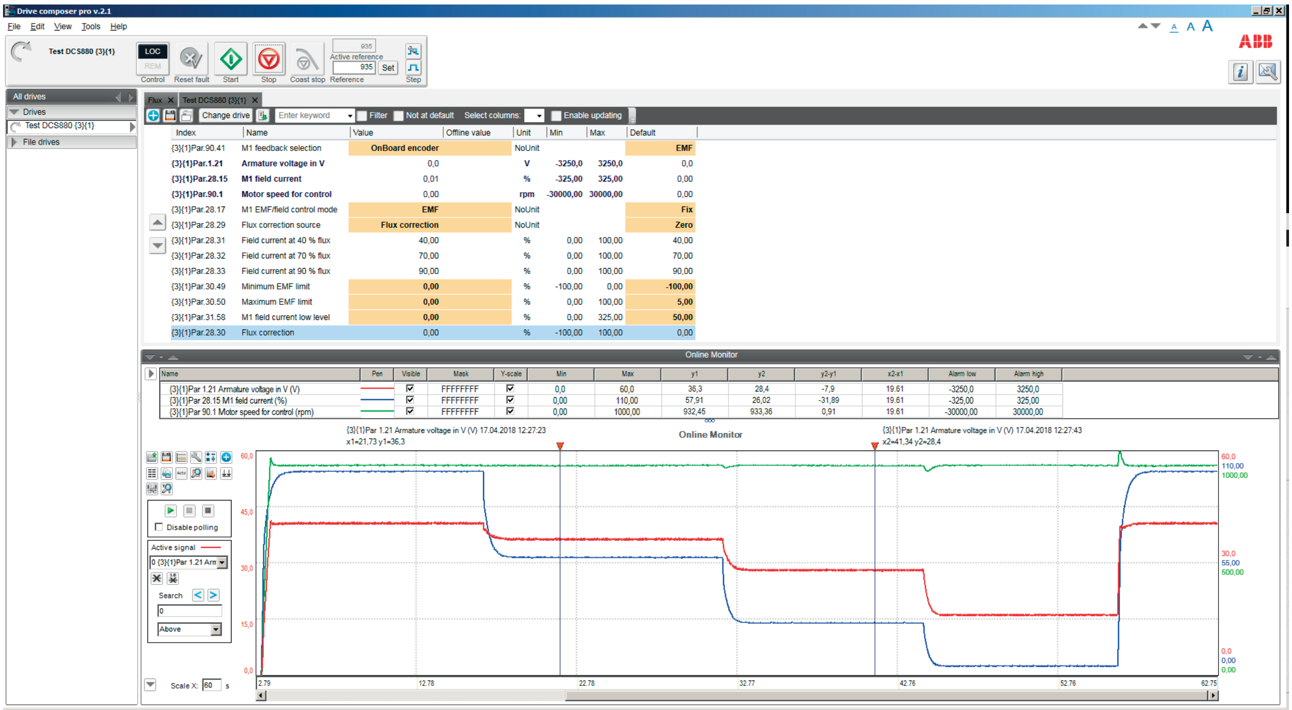
The intermediate values are interpolated. During commissioning all 3 parameters must be set, if the flux linearization is needed.
Drive composer information:



Manual tuning of the flux linearization:

- Connect Drive composer to the drive and choose local mode.
- Make sure the speed feedback is encoder or analog tacho, 90.41 M1 feedback selection = OnBoard encoder, Encoder 1, Encoder 2 or Tacho and not EMF or EMF voltage!
- Monitor 01.21 Armature voltage in V, 28.15 M1 field current and 90.01 Motor speed for control.
- Set 28.17 M1 EMF/field control mode = EMF.
- Set 28.29 Flux correction source = Flux correction.
- Set 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux to default.
- Set 30.49 Minimum EMF limit = 0.00 %.
- Set 30.50 Maximum EMF limit = 0.00 %.
- Set 31.58 M1 field current low level = 10.00 % or lower.
- Start the drive via Drive composer.
- Use Drive composer to run the motor at e.g. half base speed.
- Make sure, that the motor is running without load.
- Read 01.21 Armature voltage in V, e.g. the measured value is 220 $V_{DC}$ (this is the 1st measurement).
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 90 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.33 Field current at 90 % flux after this procedure is finished.
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 70 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.32 Field current at 70 % flux after this procedure is finished.
- Reduce the flux with 28.30 Flux correction (negative value) until 01.21 Armature voltage in V reaches 40 % of the 1st measurement.
- Read the value of 28.15 M1 field current, keep it in mind and write it into 28.31 Field current at 40 % flux after this procedure is finished.

Drive composer manual tuning of the flux linearization:



| Index | Name | Value | Offline value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|---|
| {3}{1}Par.90.41 | M1 feedback selection | OnBoard encoder | | NoUnit | | | EMF |
| **{3}{1}Par.1.21** | **Armature voltage in V** | 0,0 | | **V** | **-3250,0** | **3250,0** | 0,0 |
| **{3}{1}Par.28.15** | **M1 field current** | 0,01 | | **%** | **-325,00** | **325,00** | 0,00 |
| **{3}{1}Par.90.1** | **Motor speed for control** | 0,00 | | **rpm** | **-30000,00** | **30000,00** | 0,00 |
| {3}{1}Par.28.17 | M1 EMF/field control mode | EMF | | NoUnit | | | Fix |
| {3}{1}Par.28.29 | Flux correction source | Flux correction | | NoUnit | | | Zero |
| {3}{1}Par.28.31 | Field current at 40 % flux | 40,00 | | % | 0,00 | 100,00 | 40,00 |
| {3}{1}Par.28.32 | Field current at 70 % flux | 70,00 | | % | 0,00 | 100,00 | 70,00 |
| {3}{1}Par.28.33 | Field current at 90 % flux | 90,00 | | % | 0,00 | 100,00 | 90,00 |
| {3}{1}Par.30.49 | Minimum EMF limit | 0,00 | | % | -100,00 | 0,00 | -100,00 |
| {3}{1}Par.30.50 | Maximum EMF limit | 0,00 | | % | 0,00 | 100,00 | 5,00 |
| {3}{1}Par.31.58 | M1 field current low level | 0,00 | | % | 0,00 | 325,00 | 50,00 |
| {3}{1}Par.28.30 | Flux correction | 0,00 | | % | -100,00 | 100,00 | 0,00 |

| Name | Pen | Visible | Mask | Y-scale | Min | Max | y1 | y2 | y2-y1 | x2-x1 | Alarm low | Alarm high |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| {3}{1}Par 1.21 Armature voltage in V (V) | 🟥 | ☑ | FFFFFFFF | ☑ | 0,0 | 60,0 | 36,3 | 28,4 | -7,9 | 19.61 | -3250,0 | 3250,0 |
| {3}{1}Par 28.15 M1 field current (%) | 🟦 | ☑ | FFFFFFFF | ☑ | 0,00 | 110,00 | 57,91 | 26,02 | -31,89 | 19.61 | -325,00 | 325,00 |
| {3}{1}Par 90.1 Motor speed for control (rpm) | 🟩 | ☑ | FFFFFFFF | ☑ | 0,00 | 1000,00 | 932,45 | 933,36 | 0,91 | 19.61 | -30000,00 | 30000,00 |

{3}{1}Par 1.21 Armature voltage in V (V) 17.04.2018 12:27:23
x1=21,73 y1=36,3

{3}{1}Par 1.21 Armature voltage in V (V) 17.04.2018 12:27:43
x2=41,34 y2=28,4

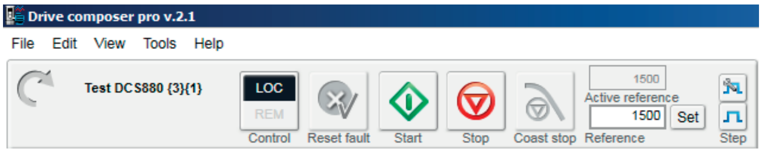
- Set 28.29 Flux correction source = Zero.
- Set 28.30 Flux correction = 0.00 %.
- Stop the drive via Drive composer.
- Set 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux to the determined values.
- Set 28.17 M1 EMF/field control mode, 30.49 Minimum EMF limit, 30.50 Maximum EMF limit and 31.58 M1 field current low level back to their original settings.

## Thyristor test

Thyristor diagnosis basically provides two possibilities:

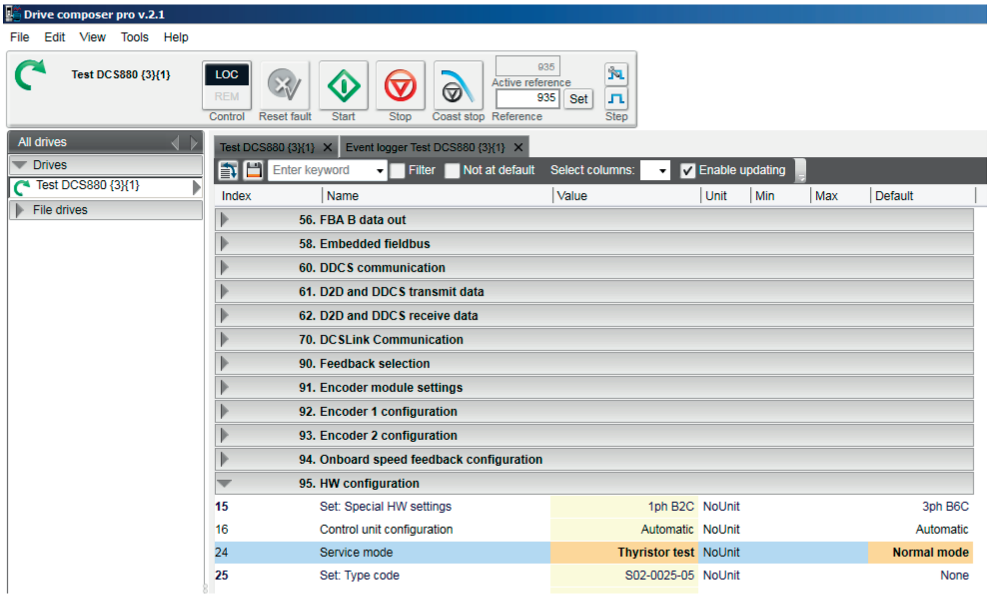
- Check all thyristors of the drive for proper function.
- Check individual firing pulses.

Drive composer information:



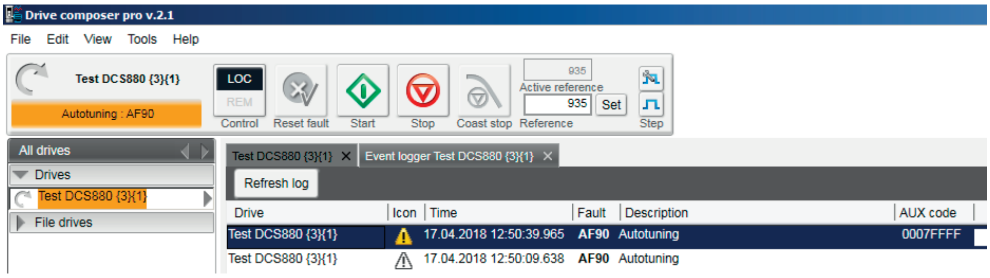
Check all thyristors of the drive for proper function:

- Connect Drive composer to the drive and choose local mode.
- Set 95.24 Service mode = Thyristor test.
- Start the drive via Drive composer.



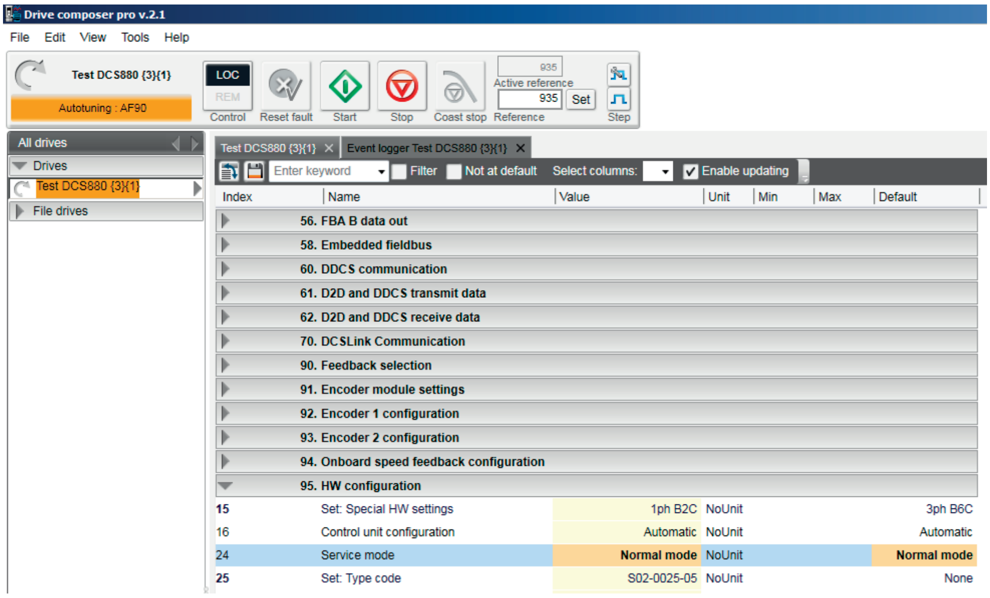
| Index | Name | Value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|
| | 56. FBA B data out | | | | | |
| | 58. Embedded fieldbus | | | | | |
| | 60. DDCS communication | | | | | |
| | 61. D2D and DDCS transmit data | | | | | |
| | 62. D2D and DDCS receive data | | | | | |
| | 70. DCSLink Communication | | | | | |
| | 90. Feedback selection | | | | | |
| | 91. Encoder module settings | | | | | |
| | 92. Encoder 1 configuration | | | | | |
| | 93. Encoder 2 configuration | | | | | |
| | 94. Onboard speed feedback configuration | | | | | |
| | 95. HW configuration | | | | | |
| 15 | Set: Special HW settings | 1ph B2C | NoUnit | | | 3ph B6C |
| 16 | Control unit configuration | Automatic | NoUnit | | | Automatic |
| 24 | Service mode | **Thyristor test** | NoUnit | | | **Normal mode** |
| 25 | Set: Type code | S02-0025-05 | NoUnit | | | None |

– The main contactor is closed and the thyristor test is started.
– The result is written into the AUX code of warning AF90 Autotuning after the thyristor test is finished.



| Drive | Icon | Time | Fault | Description | AUX code |
|---|---|---|---|---|---|
| Test DCS880 {3}{1} | ⚠ | 17.04.2018 12:50:39.965 | AF90 | Autotuning | 0007FFFF |
| Test DCS880 {3}{1} | ⚠ | 17.04.2018 12:50:09.638 | AF90 | Autotuning | |

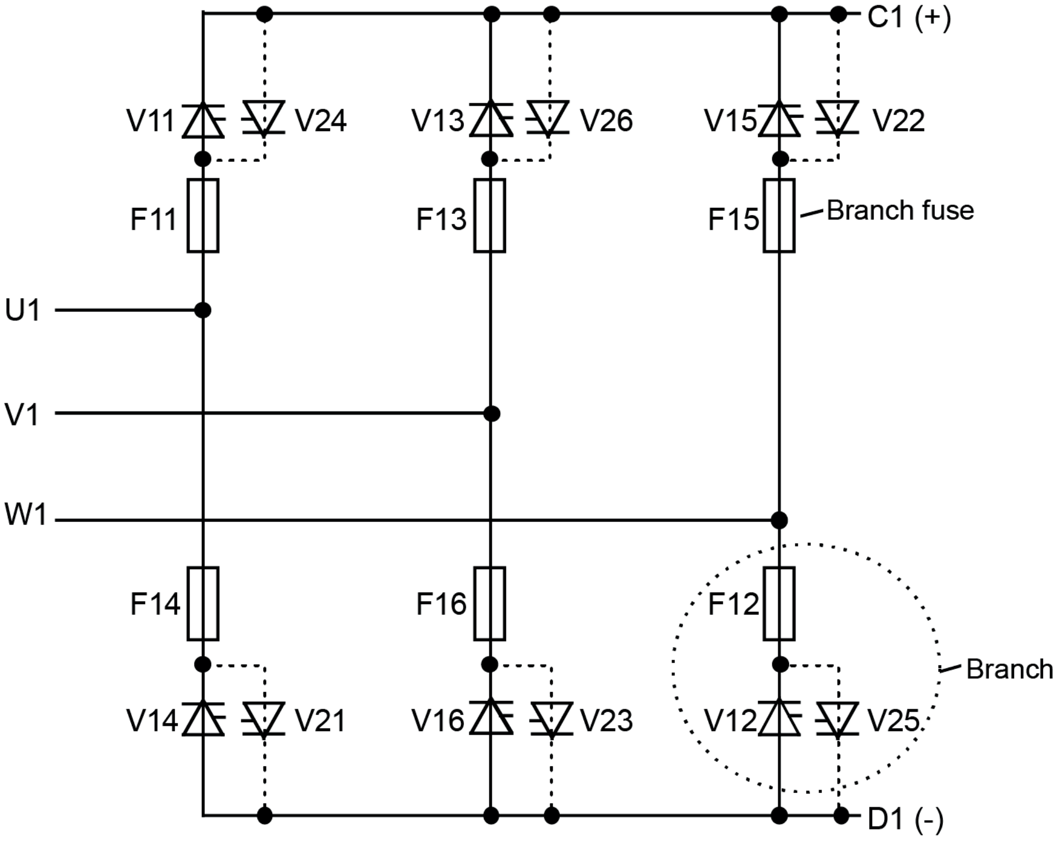
– The 95.24 Service mode is automatically set back to Normal mode.
– The drive is automatically switched off.



| Index | Name | Value | Unit | Min | Max | Default |
|---|---|---|---|---|---|---|
| | 56. FBA B data out | | | | | |
| | 58. Embedded fieldbus | | | | | |
| | 60. DDCS communication | | | | | |
| | 61. D2D and DDCS transmit data | | | | | |
| | 62. D2D and DDCS receive data | | | | | |
| | 70. DCSLink Communication | | | | | |
| | 90. Feedback selection | | | | | |
| | 91. Encoder module settings | | | | | |
| | 92. Encoder 1 configuration | | | | | |
| | 93. Encoder 2 configuration | | | | | |
| | 94. Onboard speed feedback configuration | | | | | |
| | 95. HW configuration | | | | | |
| 15 | Set: Special HW settings | 1ph B2C | NoUnit | | | 3ph B6C |
| 16 | Control unit configuration | Automatic | NoUnit | | | Automatic |
| 24 | Service mode | **Normal mode** | NoUnit | | | **Normal mode** |
| 25 | Set: Type code | S02-0025-05 | NoUnit | | | None |

Check individual firing pulses:

- Make sure, that the main contactor cannot close (e.g. disconnect the digital output controlling the main contactor) or that the mains voltage is off (e.g. high voltage breaker is open).
- Connect a current clamp to one of the firing pulse cables.
- Connect Drive composer to the drive and choose local mode.
- Set 95.24 Service mode = Firing pulses V11 … Firing pulses V26 depending individual firing pulse to be checked.



SF_DCS_003_principle_b.ai

- Make sure, that the mains voltage is zero.
- Check the firing pulse with the current clamp.
- Set 95.24 Service mode back to Normal mode.
- Cycle power, otherwise the drive will not start after checking individual firing pulses.

# Using the control panel

Refer to the *ACX-AP-x assistant control panel's user's manual (3AUA0000085685)*.

# Firmware description

## Chapter overview

This chapter describes how to control the drive with standard firmware.

### Identification of the firmware versions

The DCS880 is controlled by a control unit (3ADT220166R0002). This control un it include the SCDS-CON-H01. The firmware version details of the armature converter can be checked from:

- 07.02 Power unit set.
- 07.05 Firmware version.
- 07.04 Firmware name.

The firmware version details of the field exciters can be checked from:

- 07.68 M1 field exciter type.
- 07.69 M1 field exciter firmware version.
- 07.72 M2 field exciter type.
- 07.73 M2 field exciter firmware version.

## Field exciter mode

### General

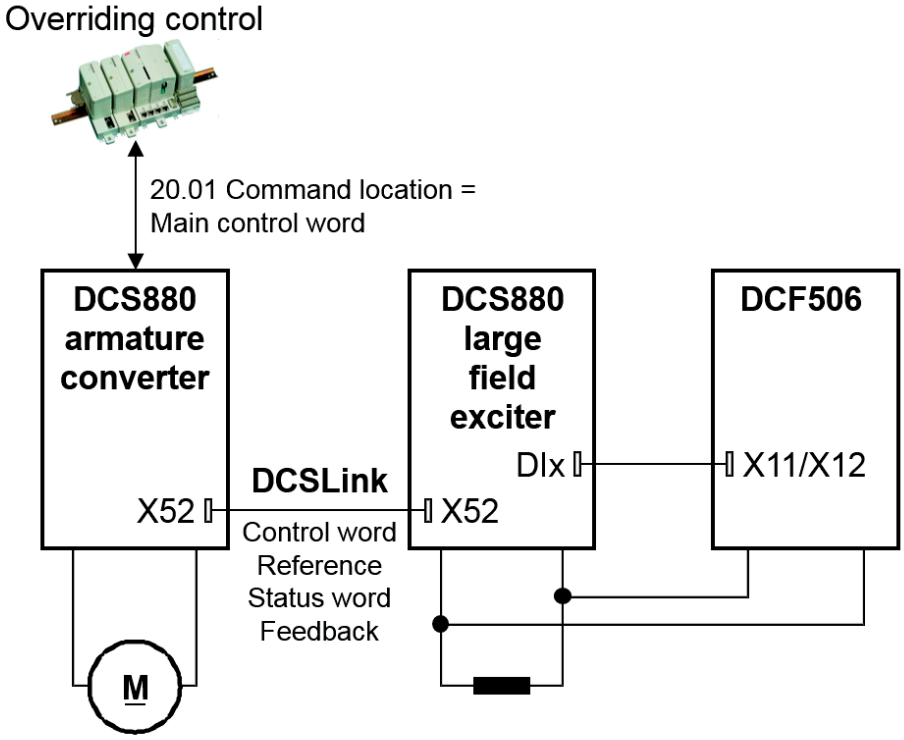
The standard DCS880-S0x module can be operated as large field exciter by simply setting parameters. It is either controlled by a DCS880 armature converter or can be configured as stand-alone field exciter.

The field exciter mode uses the standard armature current controller as field current controller. Thus the current of the converter equals the field current of the motor. See 01.10 Motor current in A. For these configurations an overvoltage protection (DCF505 or DCF506) is mandatory.

**Attention:** Connector XSTO including the Save Torque Off function is not to be used. Using this feature will seriously damage the large field exciter.

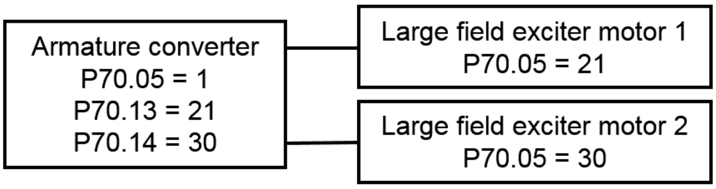
### DCS800-S0b large field exciter controlled by a DCS800 armature converter

Communication in field exciter mode:



**DCSLink**

Armature converter with one or two large field exciters:



| Parameter | Armature converter | Large field exciter | Comments |
|---|---|---|---|
| 70.05 DCSLink node ID | 1, default. | 21<br>30 | Large field exciter motor 1.<br>Large field exciter motor 2. |
| 70.13 M1 field exciter node ID | 21, default. | - | Use the same node number as in 70.05 DCSLink node ID of the large field exciter. |
| 70.14 M2 field exciter node ID | 30, default. | - | |
| 70.12 Field exciter timeout | 100 ms, default. | - | Generates either F516 M1 field exciter communication and/or F519 M2 field exciter communication. |

**Armature converter (DCS880)**

Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.
In the armature converter set:

| Parameter | Armature converter | Comments |
|---|---|---|
| 28.17 M1 EMF/field control mode | 1: EMF. | EMF controller released, field weakening active, depending on the application. |
| | | |
| 31.57 Minimum field current trip delay | 2000 ms, default. | Delays F541 M1 field exciter low current. |
| 31.58 M1 field current low level | xxx %. | Sets level for F541 M1 field exciter low current. |
| | | |
| 99.13 M1 nominal field current | xxx A. | $I_{FN}$ = xxx A, rated field current. |
| 99.07 M1 used field exciter type | 10: DCS880-S01.<br>11: DCS880-S02. | |

**Large field exciter (DCS880-S0b)**

Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.
In the large field exciter set:

| Parameter | Large field exciter | Comments |
|---|---|---|
| 20.01 Command location | 4: Field exciter link. | Control from the armature converter. Source for the control word (On/Off1, Run/Stop and Reset). |
| 20.47 Overvoltage protection trigger source | 3: DI1 … 8: DI6.<br>11: DIO1.<br>12: DIO2.<br>19: DIL. | Depending on the hardware connection to the DCF506. |
| | | |
| 27.22 Current reference source | 30: FieldRef via DCSLink. | Field current reference from the armature converter. |
| 27.31 M1 discontinuous current limit | 0.00 %. | |
| 27.38 Reversal delay | 50.0 ms. | |

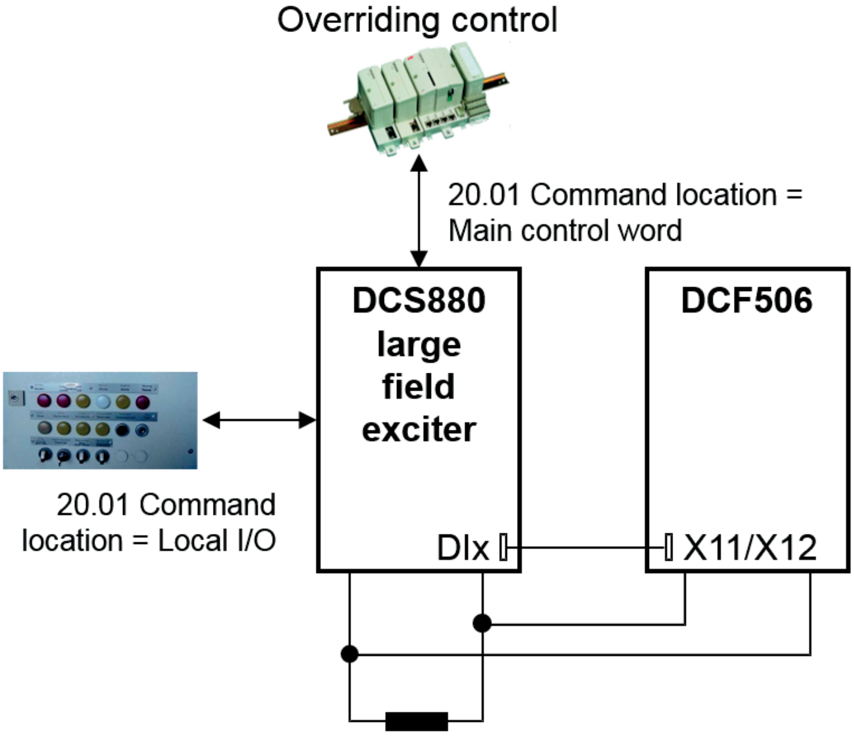
| | | |
|---|---|---|
| 27.40 Zero current timeout | 500 ms. | To be set longer than 27.38 Reversal delay. |
| | | |
| 28.17 M1 EMF/field control mode | 0: Fix, default. | |
| | | |
| 31.50 Armature overvoltage level | 1000.0 %. | Inactivates the overvoltage supervision. |
| | | |
| 95.44 PLL deviation level | 20.00°. | To suppress F514 Mains synchronization lost. |
| | | |
| 99.06 Operation mode | 1: Large field exciter. | |
| 99.07 M1 used field exciter type | 0: None. | |
| 99.10 Nominal mains voltage | xxx V. | $U_{NetN}$ = xxx V; nominal supply voltage (AC). |
| 99.11 M1 nominal current | xxx A. | $I_{FN}$ = xxx A, rated field current. |
| 99.12 M1 nominal voltage | xxx V. | $U_{FN}$ = xxx V, rated field voltage. |
| | | |
| Use XSMC:1/2 to close the field contactor. Alternatively it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). | | |

Field current autotuning **must** be started **directly** in the large field exciter:

| **Parameter** | **Large field exciter** | **Comments** |
|---|---|---|
| 99.20 Tuning request | 1: Field current autotuning. | Give the On and Run commands within 20 s. |
| | | |
| 27.29 M1 current proportional gain | xxx | Is set by the field current autotuning. Typical p-part values are around 4. |
| 27.30 M1 current integration time | xxx | Is set by the field current autotuning. |
| 27.31 M1 discontinuous current limit | 0.00 %. | Is set to zero by the field current autotuning. |

## DCS800-S0b as stand-alone field exciter

Communication in field exciter mode:



**Large field exciter (DCS880-S0b)**

Before starting with the commissioning set all parameters to default by means of 96.15 Parameter restore = Default. Check with 96.11 Macro active.

In the large field exciter set:

| Parameter | Large field exciter | Comments |
|---|---|---|
| 20.01 Command location | 0: Local I/O, default.<br>1: Main control word. | Control from local I/O or overriding control system. Source for the control word (On/Off1, Run/Stop and Reset). |
| 20.47 Overvoltage protection trigger source | 3: DI1 … 8: DI6.<br>11: DIO1.<br>12: DIO2.<br>19: DIL. | Depending on the hardware connection to the DCF506. |
| | | |
| 27.22 Current reference source | 2: 27.23 Current reference external.<br>4: AI1 scaled.<br>5: AI2 scaled.<br>6: AI3 scaled. | Field current reference from overriding control system or local I/O. |
| 27.23 Current reference external | xxx % | E.g. written to by overriding control. |
| 27.31 M1 discontinuous current limit | 0.00 %. | |
| 27.38 Reversal delay | 50.0 ms. | |
| 27.40 Zero current timeout | 500 ms. | To be set longer than 27.38 Reversal delay. |
| | | |
| 28.17 M1 EMF/field control mode | 0: Fix, default. | |
| | | |
| 31.50 Armature overvoltage level | 1000.0 %. | Inactivates the overvoltage supervision. |
| | | |

| | | |
|---|---|---|
| 95.44 PLL deviation level | 20.00°. | To suppress F514 Mains synchronization lost. |
| | | |
| 99.06 Operation mode | 1: Large field exciter. | |
| 99.07 M1 used field exciter type | 0: None. | |
| 99.10 Nominal mains voltage | xxx V. | $U_{NetN}$ = xxx V; nominal supply voltage (AC). |
| 99.11 M1 nominal current | xxx A. | $I_{FN}$ = xxx A, rated field current. |
| 99.12 M1 nominal voltage | xxx V. | $U_{FN}$ = xxx V, rated field voltage. |
| | | |
| Use XSMC:1/2 to close the field contactor. Alternatively it is also possible to use 06.24.b07 Current controller status word 1 via a relay output (RO). | | |

Field current autotuning **must** be started **directly** in the large field exciter:

| **Parameter** | **Large field exciter** | **Comments** |
|---|---|---|
| 99.20 Tuning request | 1: Field current autotuning. | Give the On and Run commands within 20 s. |
| | | |
| 27.29 M1 current proportional gain | xxx | Is set by the field current autotuning. Typical p-part values are around 4. |
| 27.30 M1 current integration time | xxx | Is set by the field current autotuning. |
| 27.31 M1 discontinuous current limit | 0.00 %. | Is set to zero by the field current autotuning. |

## I/O configuration

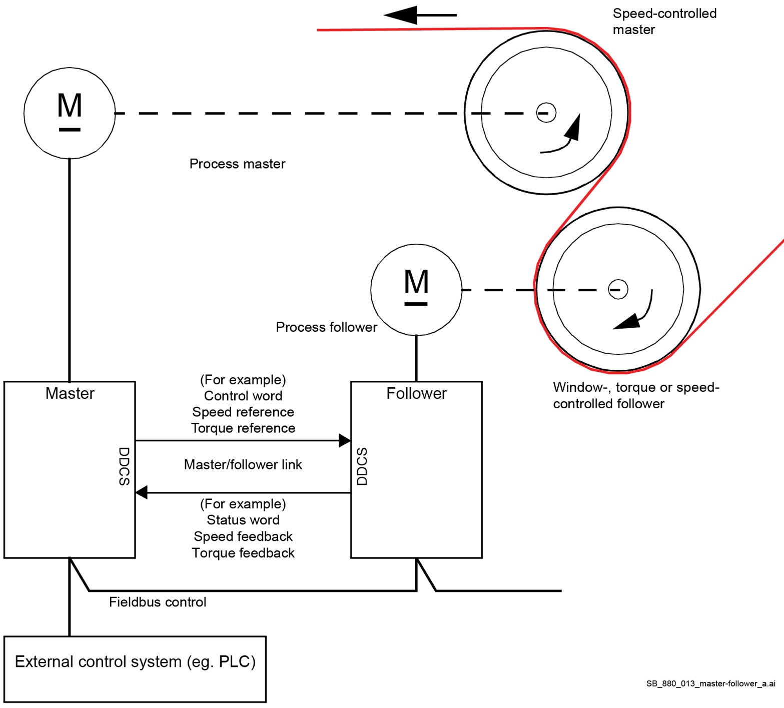
Not jet part of the manual.

# Master-follower link

## General

The master-follower link can be used to connect several drives, so that the load can be evenly distributed between the drives. This is ideal in applications where the motors are coupled to each other via gearing, chain, belt, etc.

The external control signals are typically connected to one drive only which acts as the master. The master controls up to 10 followers by sending broadcast messages over an electrical cable or fiber optic link. The master can read feedback signals from up to 3 selected followers.



The master is typically speed-controlled and the followers follow its torque or speed reference. In general, a follower should be:

- Window- or torque-controlled when the motor shafts of the master and the followers are rigidly coupled by gearing, chain etc. so that no speed difference between the drives is possible.
- Window- or speed-controlled when the motor shafts of the master and the follower are flexibly coupled so that a slight speed difference is possible.

## Communication

A master-follower link can be built by connecting the drives together with fiber optic cables (requires a FDCO-0x DDCS communication module per drive) or by wiring together the XD2D connectors of the drives. The medium is selected by 60.01 M/F communication port.

60.03 M/F mode defines whether the drive is the master or a follower on the master-follower link. Typically, the speed-controlled process master drive is also configured as the master in the link.

The communication on the master-follower link is based on the DDCS protocol, which employs data sets (specifically, data set 41). One data set contains three 16-bit words. The contents of the data set are freely configurable using parameters 61.01 … 61.03. The data set broadcast by the master typically contains its control word, speed reference and torque reference, while the followers typically return their status word (06.15 Main status word) for monitor purposes.

The default setting of 61.01 M/F data 1 selection is 06.06 Follower CW. With this setting in the master, 06.06 Follower control word, is broadcasted to all followers.

However, bit 3 (Run command) of the follower control word is modified so that it becomes zero when the master trips.

Three words of data can be read from followers with the node addresses 2, 3 and 4 (see 60.02 M/F node address). The followers from which data is read are selected by 60.14 M/F follower selection in the master. In each follower, the data to be sent are selected by parameters 61.01 … 61.03. The data is transferred in integer format over the link, and displayed by parameters 62.28 … 62.36 in the master. The data can then be forwarded using parameters 62.04…62.12.

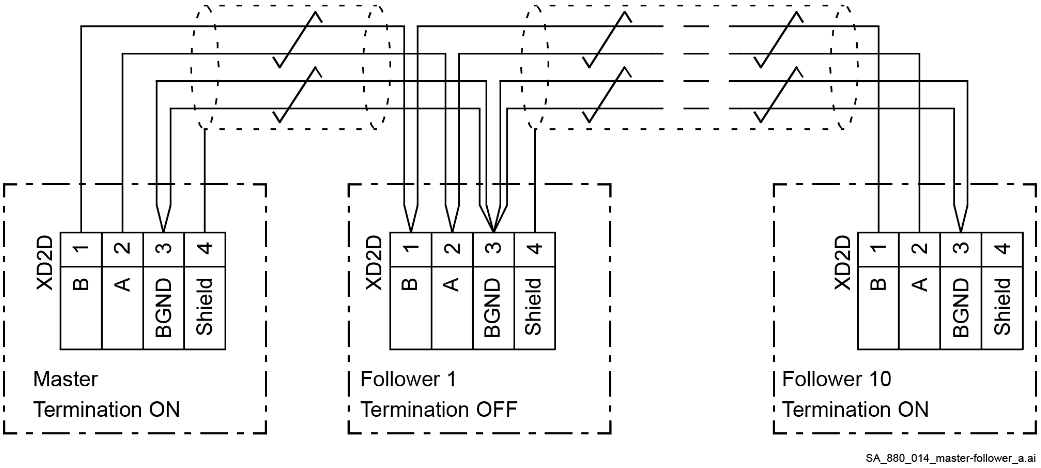
To indicate faults in the followers, each follower must be configured to transmit its status word (06.15 Main status word) in one of the above-mentioned data words. In the master, the corresponding target parameter must be set to Follower SW node x. The follower status words can be seen in parameters 06.122 … 06.124. The action to be taken when a follower is faulted is selected by 60.17 Follower fault action. External events (see group 31 Fault functions and fault levels) can be used to indicate the status of other bits of any follower status word.

## Configuration of the master-follower link

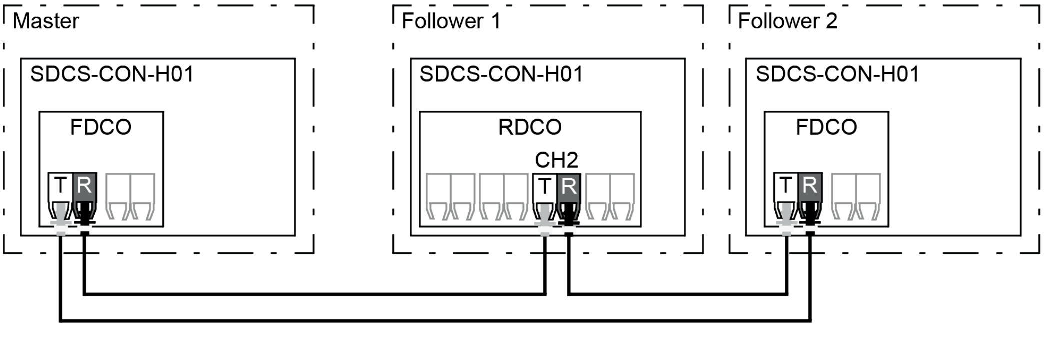
The master-follower link is formed by connecting the drives together using:

- Shielded twisted-pair cables between the XD2D terminals of the drives.
- Fiber optic cables. An additional FDCO-0x DDCS communication module per drive is needed.

Connection examples are shown below.



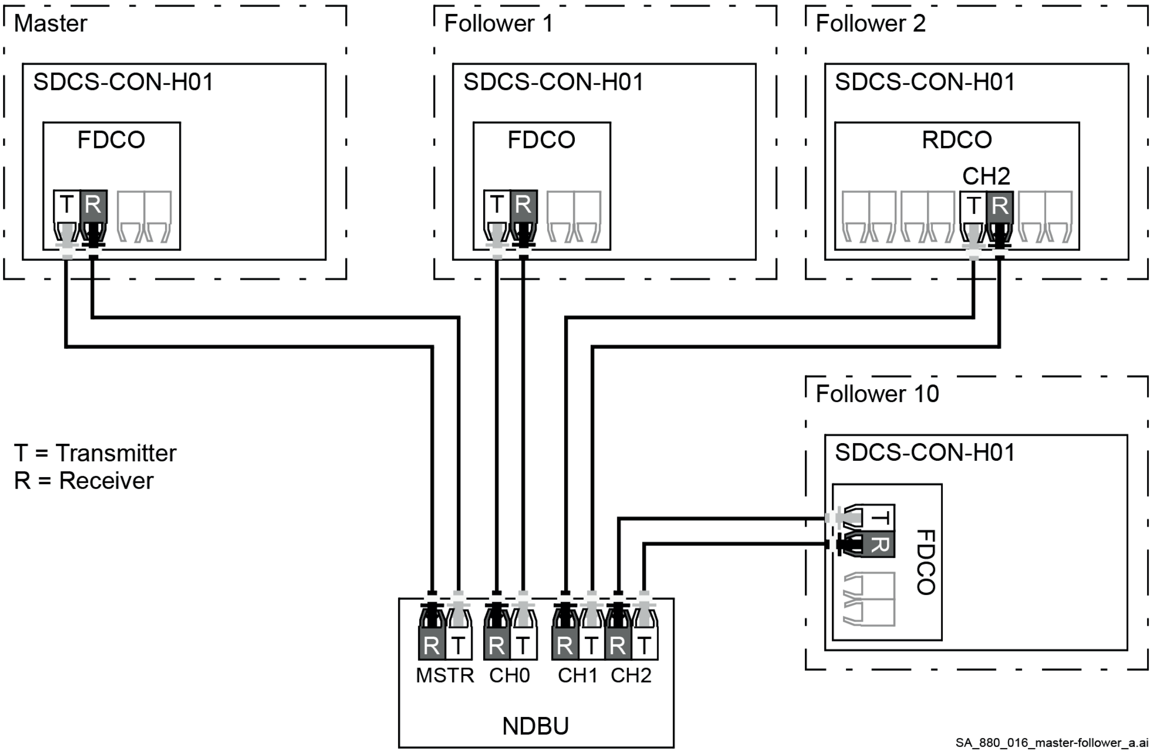
Master-follower wiring with electrical cables.



T = Transmitter; R = Receiver

Ring configuration with fiber optic cables.

**Note**: A maximum of 2 followers is possible.



Star configuration with fiber optic cables.

**Note:** A star configuration using fiber optic cables requires an NDBU-95C DDCS branching unit.

## Example parameter settings

The following is a checklist of parameters that need to be set when configuring the master-follower link. In this example, the master broadcasts the follower control word, a speed reference and a torque reference. The followers return their status words and two actual values (this is not compulsory but is shown for clarity).

### Settings in the master

Master-follower link activation:

- 60.01 M/F communication port. The communication port setting depends on the used hardware and its location.
- 60.02 M/F node address = 1. The allowable address for the master is 1.
- 60.03 M/F mode = FDCO-XD2D Master. For both fiber optic and wire connection.
- 60.05 M/F HW connection = Ring or Star for fiber optic. Always Star for wire.

Data to be sent from the master to the followers:

- 61.01 M/F data 1 selection = 06.06 Follower control word.
- 61.02 M/F data 2 selection = 23.03 Speed reference 7.
- 61.03 M/F data 3 selection = 26.02 Torque reference used.

Data to be read by the master from followers with node addresses 2, 3 and 4 (optional):

- 60.14 M/F follower selection. The selection of followers that data is read from.
  60.17 Follower fault action = Fault. Selects how the master reacts to a faulty follower. To indicate faults in the followers, each follower must be configured to transmit its status word. In the master, the corresponding target parameter must be set to Follower SW node x. Example:

| Follower | | Master |
|---|---|---|
| 61.01 M/F data 1 selection = 06.15 Main status word | ⇒ | 62.04 Follower node 2 data 1 sel = 06.122 Follower status word node 2 |

- 62.04 Follower node 2 data 1 sel … 62.12 Follower node 4 data 3 sel are used for mapping of data received from the followers.

**Follower settings**

Master-follower link activation:

- 60.01 M/F communication port. The communication port setting depends on the used hardware and its location.
- 60.02 M/F node address = 2 … 254. Only followers with node addresses 2, 3 or 4 can be supervised by the master.
- 60.03 M/F mode = FDCO-XD2D Master. For both fiber optic and wire connection.
- 60.05 M/F HW connection = Ring or Star for fiber optic. Always Star for wire.

Mapping of data received from the master

- 62.01 M/F data 1 selection = CW 16bit.
- 62.02 M/F data 2 selection = Ref1 16bit.
- 62.03 M/F data 3 selection = Ref2 16bit.

Scaling of the references:

- 60.10 M/F ref1 type = Speed.
- 60.11 M/F ref2 type = Torque.

Selection of reference sources:

- 06.08 Main control word source = Follower.
- 22.11 Speed reference 1 source = M/F or D2D ref 1.
- 26.11 Torque reference 1 source = M/F or D2D ref 2.

Selection of operating mode:

- 19.12 Ext1 control mode = Add, Torque or Speed.
- 20.01 Command location = Main control word.

Data to be sent from the followers with node addresses 2, 3 and 4 to the master (optional):

- 61.01 M/F data 1 selection = 06.15 Main SW.
- 61.02 M/F data 2 selection = Other, freely chosen.
- 61.03 M/F data 3 selection = Other, freely chosen.

## Specifications of the master-follower link

Maximum cable length:

- FDCO-0x with POF (Plastic Optic Fiber): 30 m.
- FDCO-0x with HCS (Hard-clad Silica Fiber): 200 m.
- Maximum shielded twisted-pair cable length: 50 m.

Transmission rate: 4 Mbit/s.

Total performance of the link: < 5 ms to transfer references between master and followers.

Protocol: DDCS (Distributed Drives Communication System)

## Settings and diagnostics

Parameter groups 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data.

## External controller interface

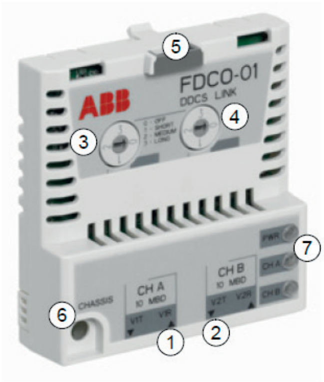
Not jet part of the manual.

# FEA-03 extension adapter

## Hardware

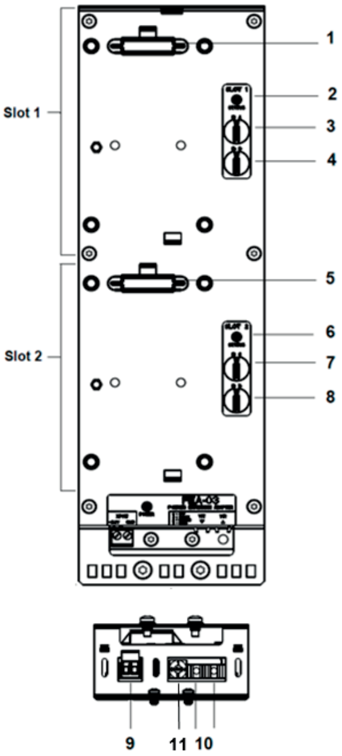
Following hardware is needed:

- FDCO-0x:



| Item | Description |
|---|---|
| 1 | Connector for Ch A. |
| 2 | Connector for Ch B. |
| 3 | Selector for Ch A. |
| 4 | Selector for Ch B. |
| 5 | Lock. |
| 6 | Mounting screw. |
| 7 | LEDs. |

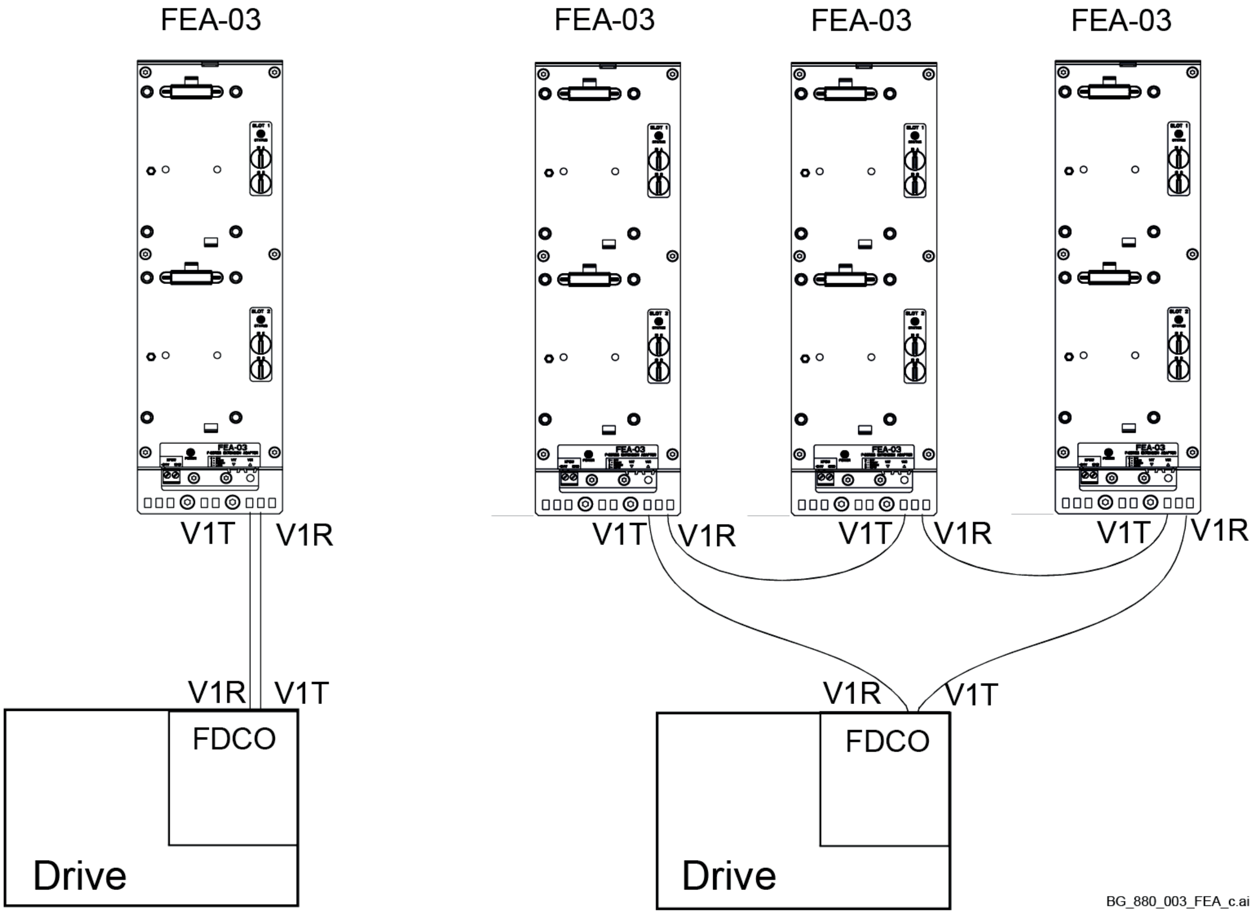
- A pair of fiber optic cables.
- FEA-03:



| Item | Description |
|---|---|
| 1 | Module connector 1 |
| 2 | Status LED for Slot 1 |
| 3 | Node address switch A (digit 10) |
| 4 | Node address switch B (digit 0) |
| 5 | Module connector 2 |
| 6 | Status LED for Slot 2 |
| 7 | Node address switch C (digit 10) |
| 8 | Node address switch D( digit 0) |
| 9 | Power supply connector (XPOW:+24 V/GND) |
| 10 | Transmitter V1T and receiver V1R |
| 11 | Selector for V1T and V1R. |

## Electrical installation

This connection diagram shows how to connect the FEA-03 to the drive:



**Attention:** Do not mix 10 MBd and 5 MBd channels. Thus, allowed channels for interconnection of FDCO-0x and FEA-03 are:

| Module type | Channel A (Ch A) | Channel B (Ch B) |
|---|---|---|
| FDCO-01 | OK (10 MBd) | OK (10 MBd) |
| FDCO-02 | Not allowed (5 MBd) | OK (10 MBd) |

## Diagnostics

FDCO -0x LEDs:

| Label | Color | Description |
|---|---|---|
| PWR OK | Green | Power/Internal 3.3 V OK. |
| Ch A Rx/Tx | Green/Red | DDCS channel A data activity. |
| Ch B Rx/Tx | Green/Red | DDCS channel B data activity. |

FEA-03 LEDs:

| Label | Color | Description |
|---|---|---|
| PWR OK | Green | Power 24 V OK. |
| SLOT 1 STATUS | Green | Initialization of the option module connected to Slot 1 OK. |
| SLOT 2 STATUS | Green | Initialization of the option module connected to Slot 2 OK. |

## Commissioning

- Set the selectors of both modules according to the used fiber optic cable type and length:

| Switch position | Cable length | |
|---|---|---|
| | **POF, 1 mm** | **HCS, 200 µm** |
| 0 - OFF | Disabled | |
| 1 - SHORT | 0.1 … 20 m | 0.1 … 50 m |
| 2 - MEDIUM | 20 … 25 m | 50 … 100 m |
| 3 - LONG | 25 … 30 m | 100 … 200 m |

- A node ID must be defined for each option module connected to the FEA-03. The node ID is a two-digit decimal number that must be unique for each option module connected to the drive. It is possible to set node ID numbers from 04 ... 99. Values 00, 01, 02, and 03 are reserved.
- The node IDs are defined using switches A (digit 10),B (digit 1) for slot 1 and C (digit 10), D (digit 1) for slot 2).
- Set the FDCO-0x channel that is used to connect the FEA-03 using 60.41 Extension adapter com port.
- Set the above node IDs according to the option module type.
  For I/O extension modules:
  - 14.02 Module 1 location.
  - 15.02 Module 2 location.
  - 16.02 Module 3 location.

  For FEN-x1 encoder interface modules:
  - 91.12 Module 1 location.
  - 91.14 Module 2 location.
- Connect the 24 $V_{DC}$ to XPOW at the base of the FEA-03.
- Check the diagnostics LEDs.
- For I/O extension modules check:
  - 14.03 Module 1 status.
  - 15.03 Module 2 status.
  - 16.03 Module 3 status.
- For FEN-x1 encoder interface modules check:
  - 91.02 Module 1 status.
  - 91.03 Module 2 status.

# Macros

Not jet part of the manual.

# Parameters

## What this chapter contains

The chapter describes the parameters and signals of the firmware.

### Terms and abbreviations

| Term | Definition |
|---|---|
| Signal | Type of parameter that is the result of a measurement or calculation by the drive, or contains status information. Most signals are read-only, but some (especially counter-type signals) can be reset. |
| Default (def.) | The default value of a parameter. |
| Scale/Fbeq16 | 16-bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 16-bit value is selected for transmission to an external system.<br>A dash (-) indicates that the parameter is not accessible in 16-bit format. |
| Other | The value is taken from another parameter.<br>Choosing “Other” displays a parameter list in which the user can specify the source parameter. |
| Other [bit] | The value is taken from a specific bit in another parameter.<br>Choosing “Other” displays a parameter list in which the user can specify the source parameter and bit. |
| Parameter | A user-adjustable operating instruction for the drive. |
| p.u. | Per unit |

### Summary of parameter groups

| Group | Contents |
|---|---|
| *01 Actual values* | Basic signals for monitoring the drive. |
| *03 Input references* | Values of references received from various sources. |
| *04 Warnings and faults* | Information on warnings and faults that occurred last. For explanations of individual warning and fault codes. |
| *05 Diagnostics* | Various run-time-type counters and measurements related to drive maintenance. |
| *06 Control and status words* | Drive control, status and event words. |
| *07 System info* | The drive’s hardware and firmware information. |
| *10 Standard DI, RO* | Configuration of digital inputs and relay outputs. |
| *11 Standard DIO, FI, FO* | Configuration of digital input/outputs and frequency inputs/outputs. |
| *12 Standard AI* | Configuration of standard analog inputs. |
| *13 Standard AO* | Configuration of standard analog outputs. |
| *14 I/O extension module 1* | Configuration of I/O extension module 1. |
| *15 I/O extension module 2* | Configuration of I/O extension module 2. |
| *16 I/O extension module 3* | Configuration of I/O extension module 3. |
| *19 I/O Operation mode* | Selection of local and external control locations and operating modes. |
| *20 Start/Stop/Direction* | Start/Stop/Direction and run/start/jog enable signal source selection. Positive/Negative reference enable source selection. Breaker and acknowledge source selection. |
| *21 Start/Stop mode* | Start and stop modes, emergency stop mode and zero speed. |
| *22 Speed reference selection* | Speed reference selection and motor potentiometer settings. |
| *23 Speed reference ramp* | Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive). |
| *24 Speed reference conditioning* | Speed error calculation, speed error window control configuration and speed error (Δn) step. |
| *25 Speed control* | Speed controller settings. |
| *26 Torque reference chain* | Settings for the torque reference chain. |
| *27 Armature current control* | Settings for the armature current control chain. |
| *28 EMF and field current control* | Settings for the EMF and field current control chain. |
| *29 12-pulse/Hardparallel* | Settings for 12-pulse and hardparallel. |
| *30 Control limits* | Drive operation limits. |

| | |
|---|---|
| *31 Fault functions and fault levels* | Configuration of external events. Selection of the drive behavior in fault situations. |
| *32 Supervision* | Configuration of signal supervision functions 1 … 3. Three values can be monitored. A warning or fault is generated whenever predefined limits are exceeded. |
| *33 Generic timer & counter* | Configuration of maintenance timers/counters. |
| *35 Motor thermal protection* | Motor thermal protection settings such as temperature measurement configuration and load curve definition. |
| *36 Load analyzer* | Peak value and amplitude logger settings. |
| *37 User load curve* | Settings for user load curve. |
| *40 Process PID* | Parameter values for process PID controller. |
| *42 Shared motion (2nd motor)* | Configuration of 2nd motor. |
| *44 Mechanical brake control* | Configuration of mechanical brake. |
| *45 Energy efficiency* | Settings for the energy saving calculators. |
| *46 Monitoring/Scaling settings* | Speed supervision settings, signal filtering and general scaling settings. |
| *47 Data storage* | Data storage parameters that can be written to and read from using other parameters' source and target settings. |
| *49 Panel port communication* | Communication settings for the control panel port on the drive. |
| *50 Fieldbus adapter (FBA)l* | Fieldbus communication configuration. |
| *51 FBA A settings* | Fieldbus adapter A configuration. |
| *52 FBA A data in* | Selection of data sent by fieldbus adapter A to the master (e.g. PLC). |
| *53 FBA A data out* | Selection of data sent by the master (e.g. PLC) to fieldbus adapter A. |
| *54 FBA B settings* | Description see group 51 FBA A settings. |
| *55 FBA B data in* | Description see group 52 FBA A data in. |
| *56 FBA B data out* | Description see group 53 FBA A data out. |
| *58 Embedded fieldbus* | Embedded fieldbus (EFB) configuration. |
| *60 DDCS Communication* | DDCS communication configuration. |
| *61 D2D and DDCS transmit data* | Defines the data sent from the drive to the DDCS/D2D link. |
| *62 D2D and DDCS receive data* | Defines the data sent from the DDCS/D2D link to the drive. |
| *70 DCSLink Communication* | Defines the DCSLink communication. |
| *74 … 89 Application specific groups* | Groups used for application programming. |
| *90 Feedback selection* | Motor and load feedback configuration. |
| *91 Encoder module settings* | Configuration of the encoder interface modules. |
| *92 Encoder 1 configuration* | Settings for encoder 1. |
| *93 Encoder 2 configuration* | Settings for encoder 2. |
| *94 OnBoard speed feedback configuration* | Settings for analog tacho and OnBoard encoder. |
| *95 HW configuration* | Various hardware-related settings. |
| *96 System* | Language selection; access levels; macro selection; parameter save and restore; control board reboot; user parameter sets; unit selection; data logger triggering; parameter checksum calculation; user lock. |
| *99 Motor data* | Motor configuration settings. |

# Parameter listing

## 01 Actual Values

Basic signals for monitoring the drive.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>01.01</b></td><td colspan="7"><b>Used motor speed filtered</b></td></tr>
<tr><td colspan="7">Measured or EMF motor speed.<br>Displays the measured or EMF motor speed depending on which feedback is used. See 90.41 M1 feedback selection. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.02</b></td><td colspan="7"><b>EMF speed filtered</b></td></tr>
<tr><td colspan="7">Motor speed calculated from EMF.<br>Displays the motor speed calculated from EMF in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.03</b></td><td colspan="7"><b>Tacho speed filtered</b></td></tr>
<tr><td colspan="7">OnBoard tacho speed.<br>Displays the motor speed measured with OnBoard tacho in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.04</b></td><td colspan="7"><b>OnBoard encoder speed filtered</b></td></tr>
<tr><td colspan="7">OnBoard encoder speed.<br>Displays the motor speed measured with OnBoard encoder in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.05</b></td><td colspan="7"><b>Encoder 1 speed filtered</b></td></tr>
<tr><td colspan="7">Encoder 1 speed.<br>Displays the motor speed measured with encoder 1 in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.06</b></td><td colspan="7"><b>Encoder 2 speed filtered</b></td></tr>
<tr><td colspan="7">Encoder 2 speed.<br>Displays the motor speed measured with encoder 2 in rpm. A filter time constant is defined by 46.11 Filter time motor speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.07</b></td><td colspan="7"><b>Speed change rate</b></td></tr>
<tr><td colspan="7">Rate of speed change.<br>Displays the rate of motor speed change. Positive values indicate acceleration. Negative values indicate deceleration. See 31.31 Emergency ramp supervision, 31.32 Emergency ramp supervision delay, 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay.</td></tr>
<tr><td>-15000 … 15000</td><td>-</td><td>rpm/s</td><td>1 = 1 rpm/s</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.10</b></td><td colspan="7"><b>Motor current in A</b></td></tr>
<tr><td colspan="7">Motor current.<br>Measured motor current in amperes.</td></tr>
<tr><td>-32500.0 … 32500.0</td><td>-</td><td>A</td><td>1 = 1 A</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>01.17</b></td><td colspan="7"><b>Motor torque filtered</b></td></tr>
<tr><td colspan="7">Filtered motor torque.<br>Displays the filtered motor torque in percent of 99.02 M1 nominal torque. A filter time constant is defined by 46.13 Filter time motor torque. Is used for the EMF controller and the EMF feed forward.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>01.20</b></td><td colspan="7"><b>Mains voltage in V</b></td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | Mains voltage.<br>Measured mains voltage in volt. Filtered with 10 ms. | | | | | | |
| | 0.0 … 3250.0 | - | V | 10 = 1 V | y | n | Signal |
| **01.21** | **Armature voltage in V** | | | | | | |
| | Armature voltage.<br>Measured armature voltage in volt. Filtered with 10 ms.<br>This value is also influenced by 95.34 DC voltage measurement adjust and 95.35 DC voltage measurement offset. | | | | | | |
| | -3250.0 … 3250.0 | - | V | 10 = 1 V | y | n | Signal |
| **01.24** | **Output power in kW** | | | | | | |
| | Output power.<br>Measured output power in kW. The unit is selected by 96.02 Unit selection. A filter time constant is defined by 46.14 Filter time power output. | | | | | | |
| | -32500 … 32500 | - | kW or hp | 1 = 1 kW or hp | y | n | Signal |
| **01.25** | **Output power** | | | | | | |
| | Output power.<br>Measured output power in percent of 99.03 M1nominal power. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.26** | **Reactive power** | | | | | | |
| | Reactive power.<br>Measured reactive power in percent of 99.03 M1nominal power. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.29** | **M1 field current in A** | | | | | | |
| | Motor 1 field current<br>Motor 1 measured field current in amps. Filtered with 500 ms. | | | | | | |
| | -3250.0 … 3250.0 | - | A | 10 = 1 A | y | n | Signal |
| **01.30** | **M2 field current in A** | | | | | | |
| | Motor 2 field current<br>Motor 2 measured field current in amps. Filtered with 500 ms. | | | | | | |
| | -3250.0 … 3250.0 | - | A | 10 = 1 A | y | n | Signal |
| **01.40** | **Drive current** | | | | | | |
| | Drive current.<br>Measured drive current in percent of 07.62 Drive DC current scaling set. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.41** | **Reactive current** | | | | | | |
| | Reactive motor current.<br>Measured reactive motor current in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.50** | **Current ripple** | | | | | | |
| | Armature current ripple output.<br>Displays the armature current ripple monitor output in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.51** | **Current ripple filtered** | | | | | | |
| | Filtered armature current ripple output.<br>Displays the filtered armature current ripple monitor output in percent of 99.11 M1 nominal current.<br>The filter time constant is 200 ms. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.60** | **12-pulse serial armature voltage sum in V** | | | | | | |
| | Summed armature voltage in volt (12-pulse serial/serial sequential master only). | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Summed measured armature voltage of 12-pulse serial/serial sequential master plus 12-pulse serial/serial sequential slave. | | | | | | |
| | -3250.0 … 3250.0 | - | V | 10 = 1 V | y | n | Signal |
| **01.61** | **12-pulse parallel current sum in A** | | | | | | |
| | Summed motor current in amperes (12-pulse parallel master only).<br>Summed measured motor current of 12-pulse parallel master plus 12-pulse parallel slave. | | | | | | |
| | -32500.0 … 32500.0 | - | A | 1 = 1 A | y | n | Signal |
| **01.62** | **12-pulse slave current in A** | | | | | | |
| | 12-pulse/serial sequential slave current in amperes (12-pulse/serial sequential master only).<br>Measured 12-pulse/serial sequential slave current. | | | | | | |
| | -32500.0 … 32500.0 | - | A | 1 = 1 A | y | n | Signal |
| **01.70** | **99.01 Mains voltage fast** | | | | | | |
| | Fast signal mirrored, 99.01 Mains voltage.<br>Measured mains voltage in percent of 99.10 Nominal mains voltage. | | | | | | |
| | 0.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.71** | **28.05 Armature voltage fast** | | | | | | |
| | Fast signal mirrored, 28.05 Armature voltage.<br>Measured armature voltage in in percent of 99.12 M1 nominal voltage. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.72** | **24.01 Used speed reference fast** | | | | | | |
| | Fast signal mirrored, 24.01 Used speed reference.<br>Speed reference for speed error calculation. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **01.73** | **24.02 Used speed feedback fast** | | | | | | |
| | Fast signal mirrored, 24.02 used speed feedback.<br>Speed feedback for speed error calculation. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **01.74** | **27.02 Used current reference fast** | | | | | | |
| | Fast signal mirrored, 27.02 Used current reference.<br>Displays the armature current reference in percent of 99.11 M1 nominal current after current limitation. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.75** | **27.05 Motor current fast** | | | | | | |
| | Fast signal mirrored, 27.05 Motor current.<br>Measured motor current in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.76** | **27.18 Firing angle fast** | | | | | | |
| | Fast signal mirrored, 27.18 Firing angle.<br>Displays the firing angel in degrees. | | | | | | |
| | 0.00 … 180.00 | - | ° | 100 = 1° | y | n | Signal |
| **01.77** | **28.14 M1 field current reference fast** | | | | | | |
| | Fast signal mirrored, 28.14 M1 field current reference.<br>Displays motor 1 field current reference in percent of 99.13 M1 nominal field current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.78** | **28.15 M1 field current fast** | | | | | | |
| | Fast signal mirrored, 28.15 M1 field current.<br>Motor 1 measured field current in percent of 99.13 M1 nominal field current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.79** | **42.45 M2 field current reference fast** | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Fast signal mirrored, 42.45 M2 field current reference.<br>Displays motor 2 field current reference in percent of 42.10 M2 nominal field current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **01.80** | **42.46 M2 field current fast** | | | | | | |
| | Fast signal mirrored, 42.46 M2 field current.<br>Motor 2 measured field current in percent of 42.10 M2 nominal field current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |

## 03 Input references

Values of references received from various sources.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **03.01** | **Panel reference 1** | | | | | | |
| | Panel reference 1.<br>Displays the local reference given from the control panel or PC tool. | | | | | | |
| | -100000.00 … 100000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.05** | **FBA A reference 1** | | | | | | |
| | Fieldbus adapter A reference 1.<br>Displays reference 1 received via fieldbus adapter A. | | | | | | |
| | -100000.00 … 100000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.06** | **FBA A reference 2** | | | | | | |
| | Fieldbus adapter A reference 2.<br>Displays reference 2 received via fieldbus adapter A. | | | | | | |
| | -100000.00 … 100000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.07** | **FBA B reference 1** | | | | | | |
| | Fieldbus adapter B reference 1.<br>Displays reference 1 received via fieldbus adapter B. | | | | | | |
| | -100000.00 … 100000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.08** | **FBA B reference 2** | | | | | | |
| | Fieldbus adapter B reference 2.<br>Displays reference 2 received via fieldbus adapter B. | | | | | | |
| | -100000.00 … 100000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.09** | **EFB reference 1** | | | | | | |
| | Embedded fieldbus reference 1.<br>Displays scaled reference 1 received via the embedded fieldbus interface. The scaling is defined by 58.26 EFB ref1 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.10** | **EFB reference 2** | | | | | | |
| | Embedded fieldbus reference 2.<br>Displays scaled reference 2 received via the embedded fieldbus interface. The scaling is defined by 58.27 EFB ref2 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.11** | **DDCS controller ref 1** | | | | | | |
| | DDCS controller reference 1<br>Displays scaled reference 1 received via a DDCS communication option module (FDCO-0x). The scaling is defined by 60.60 DDCS controller ref1 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.12** | **DDCS controller ref 2** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | DDCS controller reference 2<br>Displays scaled reference 2 received via a DDCS communication option module (FDCO-0x). The scaling is defined by 60.61 DDCS controller ref2 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.13** | **M/F or D2D ref1** | | | | | | |
| | Master-follower reference 1 (followers only)<br>Displays scaled master-follower reference 1 received from the master. The scaling is defined by 60.10 M/F ref1 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |
| **03.14** | **M/F or D2D ref2** | | | | | | |
| | Master reference 2 (followers only)<br>Displays scaled master-follower reference 2 received from the master. The scaling is defined by 60.11 M/F ref2 type. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 10 | y | n | Signal |

## 04 Warnings and faults

Information on warnings and faults that occurred last. For explanations of individual warning and fault codes. See chapter Fault tracing.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **04.01** | **Tripping fault** | | | | | | |
| | 1st active fault.<br>Code of the 1st active fault (the fault that caused the current trip). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.02** | **Active fault 2** | | | | | | |
| | 2nd active fault.<br>Code of the 2nd active fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.03** | **Active fault 3** | | | | | | |
| | 3rd active fault.<br>Code of the 3rd active fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.04** | **Active fault 4** | | | | | | |
| | 4th active fault.<br>Code of the 4th active fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.05** | **Active fault 5** | | | | | | |
| | 5th active fault.<br>Code of the 5th active fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.06** | **Active warning 1** | | | | | | |
| | 1st active warning.<br>Code of the 1st active warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.07** | **Active warning 2** | | | | | | |
| | 2nd active warning.<br>Code of the 2nd active warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| 04.08 | **Active warning 3** | | | | | | |
| | 3rd active warning.<br>Code of the 3rd active warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.09 | **Active warning 4** | | | | | | |
| | 4th active warning.<br>Code of the 4th active warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.10 | **Active warning 5** | | | | | | |
| | 1st active warning.<br>Code of the 1st active warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.11 | **Latest fault** | | | | | | |
| | 1st stored fault.<br>Code of the 1st stored (non-active) fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.12 | **2nd latest fault** | | | | | | |
| | 2nd stored fault.<br>Code of the 2nd stored (non-active) fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.13 | **3rd latest fault** | | | | | | |
| | 3rd stored fault.<br>Code of the 3rd stored (non-active) fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.14 | **4th latest fault** | | | | | | |
| | 4th stored fault.<br>Code of the 4th stored (non-active) fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.15 | **5th latest fault** | | | | | | |
| | 5th stored fault.<br>Code of the 5th stored (non-active) fault. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.16 | **Latest warning** | | | | | | |
| | 1st stored warning.<br>Code of the 1st stored (non-active) warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.17 | **2nd latest warning** | | | | | | |
| | 2nd stored warning.<br>Code of the 2nd stored (non-active) warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.18 | **3rd latest warning** | | | | | | |
| | 3rd stored warning.<br>Code of the 3rd stored (non-active) warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.19 | **4th latest warning** | | | | | | |
| | 4th stored warning.<br>Code of the 4th stored (non-active) warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 04.20 | **5th latest warning** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 5th stored warning.<br>Code of the 5th stored (non-active) warning. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.21** | **Fault word 1** | | | | | | |

DCS800 compatible fault word 1.
The bit assignments of this word correspond to *FaultWord1 (9.01)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | F501 Auxiliary undervoltage | F501 AuxUnderVolt |
| 1 | 2310 Armature overcurrent | F502 ArmOverCur |
| 2 | F503 Armature overvoltage | F503 ArmOverVolt |
| 3 | 4310 Bridge temperature measured | F504 ConvOverTemp |
| 4 | 2330 Residual current detected | F505 ResCurDetect |
| 5 | 4981 Motor temperature 1 measured/estimated | F506 M1OverTemp |
| 6 | 4981 Motor temperature 1 measured/estimated | F507 M1OverLoad |
| 7 | 7082 I/O extension communication | F508 I/OBoardLoss |
| 8 | 4982 Motor temperature 2 measured/estimated | F509 M2OverTemp |
| 9 | 4982 Motor temperature 2 measured/estimated | F510 M2OverLoad |
| 10 | - | F511 ConvFanCur |
| 11 | 3280 Mains low voltage | F512 MainsLowVolt |
| 12 | F513 Mains overvoltage | F513 MainsOvrVolt |
| 13 | F514 Mains synchronization lost | F514 MainsNotSync |
| 14 | F515 M1 field exciter overcurrent | F515 M1FexOverCur |
| 15 | F516 M1 field exciter communication | F516 M1FexCom |

| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **04.22** | **Fault word 2** | | | | | | |

DCS800 compatible fault word 2.
The bit assignments of this word correspond to *FaultWord2 (9.02)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | F517 Armature current ripple | F517 ArmCurRipple |
| 1 | F518 M2 field exciter overcurrent | F518 M2FexOverCur |
| 2 | F519 M2 field exciter communication | F519 M2FexCom |
| 3 | - | reserved |
| 4 | F521 Field acknowledge missing | F521 FieldAck |
| 5 | 7301 Motor speed feedback,<br>73A1 Load speed feedback | F522 SpeedFb |
| 6 | 71B1 Motor fan acknowledge | F523 ExtFanAck |
| 7 | F524 Main contactor acknowledge | F524 MainContAck |
| 8 | 50FE Type code | F525 TypeCode |
| 9 | 9081 External fault 1 … 9085 External fault 5 | F526 ExternalDI |
| 10 | 5080 Drive fan acknowledge | F527 ConvFanAck |
| 11 | 6681 EFB communication,<br>7510 FBA A communication,<br>7520 FBA B communication | F528 FieldBusCom |
| 12 | F529 M1 field exciter not OK | F529 M1FexNotOK |
| 13 | F530 M2 field exciter not OK | F530 M2FexNotOK |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 14 | 7121 Motor stall | F531 MotorStalled |
| 15 | 7310 Overspeed | F532 MotOverSpeed |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.23** **Fault word 3**

DCS800 compatible fault word 3.
The bit assignments of this word correspond to *FaultWord3 (9.03)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | F533 12-pulse reversal timeout | F533 12PRevTime |
| 1 | F534 12-pulse current difference | F534 12PCurDiff |
| 2 | F535 12-pulse communication | F535 12PulseCom |
| 3 | F536 12-pulse slave | F536 12PSlaveFail |
| 4 | F537 M1 field exciter ready lost | F537 M1FexRdyLost |
| 5 | F538 M2 field exciter ready lost | F538 M2FexRdyLost |
| 6 | F539 Fast current rise | F539 FastCurRise |
| 7 | - | F540 COM8Faulty |
| 8 | F541 M1 field exciter low current | F541 M1FexLowCur |
| 9 | F542 M2 field exciter low current | F542 M2FexLowCur |
| 10 | 7581 DDCS controller communication,<br>7582 Master-follower communication | F543 COM8Com |
| 11 | F544 P2P and M/F communication | F544 P2PandMFCom |
| 12 | 64A3 Application loading | F545 ApplLoadFail |
| 13 | 7081 Control panel/PC tool link communication | F546 LocalCmdLoss |
| 14 | F547 Drive hardware | F547 HwFailure |
| 15 | 6000 Internal firmware | F548 FwFailure |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.24** **Fault word 4**

DCS800 compatible fault word 4.
The bit assignments of this word correspond to *FaultWord4 (9.04)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | - | F549 ParComp |
| 1 | 64B2 User set fault | F550 ParMemRead |
| 2 | 80A0 AI supervision | F551 AIRange |
| 3 | 71A2 Mechanical brake not closed,<br>71A3 Mechanical brake not opened,<br>71A5 Mechanical brake opening not allowed | F552 MechBrake |
| 4 | 7381 Speed feedback device | F553 TachPolarity |
| 5 | 7381 Speed feedback device | F554 TachoRange |
| 6 | - | reserved |
| 7 | F556 Torque proving | F556 TorqProving |
| 8 | F557 Reversal time | F557 ReversalTime |
| 9 | - | reserved |
| 10 | - | reserved |
| 11 | - | F601 APFault1 |
| 12 | - | F602 APFault2 |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

|  |  |  |
|---|---|---|
| 13 | - | F603 APFault3 |
| 14 | - | F604 APFault4 |
| 15 | - | F605 APFault5 |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.25** **User fault word**

DCS800 compatible user fault word.
The bit assignments of this word correspond to *UserFaultWord (9.05)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | - | F610 UserFault1 |
| 1 | - | F611 UserFault2 |
| 2 | - | F612 UserFault3 |
| 3 | - | F613 UserFault4 |
| 4 | - | F614 UserFault5 |
| 5 | - | F615 UserFault6 |
| 6 | - | F616 UserFault7 |
| 7 | - | F617 UserFault8 |
| 8 | - | F618 UserFault9 |
| 9 | - | F619 UserFault10 |
| 10 | - | F620 UserFault11 |
| 11 | - | F621 UserFault12 |
| 12 | - | F622 UserFault13 |
| 13 | - | F623 UserFault14 |
| 14 | - | F624 UserFault15 |
| 15 | - | F625 UserFault16 |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.26** **M1 field exciter fault word**

DCS800 compatible motor 1 field exciter fault word.
The bit assignments of this DCS880 word and the DCS800 word *M1FexFaultWord (9.18)* are the same.
Bit assignment:

| Bit | DCS880/DCS800 fault name |
|---|---|
| 0 | DCSLink communication |
| 1 | Supply voltage synchronization |
| 2 | Overcurrent |
| 3 | Fast supply voltage rise |
| 4 | AC supply voltage < 30 $V_{AC}$ |
| 5 | AC supply voltage > 650 $V_{AC}$ |
| 6 | reserved |
| 7 | reserved |
| 8 | Temperature heatsink |
| 9 | Parameter flash read fault |
| 10 | Compatibility |
| 11 | Auxiliary voltage |
| 12 | reserved |
| 13 | General hardware |
| 14 | General firmware |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| Bit | |
|---|---|
| 15 | reserved |

| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.27** **M2 field exciter fault word**

DCS800 compatible motor 2 field exciter fault word.
The bit assignments of this DCS880 word and the DCS800 word *M2FexFaultWord (9.20)* are the same.
Bit assignment:

| Bit | DCS880/DCS800 fault name |
|---|---|
| 0 | DCSLink communication |
| 1 | Supply voltage synchronization |
| 2 | Overcurrent |
| 3 | Fast supply voltage rise |
| 4 | AC supply voltage < 30 $V_{AC}$ |
| 5 | AC supply voltage > 650 $V_{AC}$ |
| 6 | reserved |
| 7 | reserved |
| 8 | Temperature heatsink |
| 9 | Parameter flash read fault |
| 10 | Compatibility |
| 11 | Auxiliary voltage |
| 12 | reserved |
| 13 | General hardware |
| 14 | General firmware |
| 15 | reserved |

| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 04.27 | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.31** **Warning word 1**

DCS800 compatible warning word 1.
The bit assignments of this word correspond to *AlarmWord1 (9.06)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | AFE1 Off 2 (emergency off) | A101 Off2ViaDI |
| 1 | AFE2 Off 3 (emergency stop) | A102 Off3ViaDI |
| 2 | A103 DC-breaker acknowledge | A103 DC BreakAck |
| 3 | A4B0 Bridge temperature measured,<br>A581 Drive fan acknowledge | A104 ConvOverTemp |
| 4 | A105 Dynamic braking acknowledge | A105 DynBrakeAck |
| 5 | A491 Motor temperature 1 measured/estimated | A106 M1OverTemp |
| 6 | A491 Motor temperature 1 measured/estimated | A107 M1OverLoad |
| 7 | - | reserved |
| 8 | A492 Motor temperature 2 measured/estimated | A109 M2OverTemp |
| 9 | A492 Motor temperature 2 measured/estimated | A110 M2OverLoad |
| 10 | A111 Mains low voltage | A111 MainsLowVolt |
| 11 | A112 P2P and M/F communication | A112 P2PandMFCom |
| 12 | A7CA DDCS controller communication,<br>A7CB Master-follower communication | A113 COM8Com |
| 13 | A114 Armature current deviation | A114 ArmCurDev |
| 14 | A7E1 Speed feedback device | A115 TachoRange |

| **Index** | **Name**<br>**Text**<br>**Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 15 | A116 Brake long falling | A116 BrakeLongFalling |

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.32** **Warning word 2**

DCS800 compatible warning word 2.
The bit assignments of this word correspond to *AlarmWord2 (9.07)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| **Bit** | **DCS880 events correspond to following** | **DCS800 events** |
|---|---|---|
| 0 | A117 Armature current ripple | A117 ArmCurRipple |
| 1 | A118 Application | A118 FoundNewAppl |
| 2 | A118 Application | A119 ApplDiff |
| 3 | A120 Overvoltage protection active | A120 OverVoltProt |
| 4 | AF90 Autotuning | A121 AutotuneFail |
| 5 | A7A1 Mechanical brake not closed,<br>A7A2 Mechanical brake not opened,<br>A7A5 Mechanical brake opening not allowed | A122 MechBrake |
| 6 | - | A123 FaultSuppres |
| 7 | A124 Speed scaling | A124 SpeedScale |
| 8 | A7B0 Motor speed feedback,<br>A7B1 Load speed feedback | A125 SpeedFb |
| 9 | A981 External warning 1 … External Warning 5 A985 | A126 ExternalDI |
| 10 | A8A0 AI supervision | A127 AIRange |
| 11 | A7C1 FBA A communication,<br>A7C2 FBA B communication,<br>A7CE EFB communication | A128 FieldBusCom |
| 12 | - | A129 ParRestored |
| 13 | A7EE Control panel/PC tool link communication | A130 LocalCmdLoss |
| 14 | - | A131 ParAdded |
| 15 | A132 Parameter setting conflict | A132 ParConflict |

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.33** **Warning word 3**

DCS800 compatible warning word 3.
The bit assignments of this word correspond to *AlarmWord3 (9.08)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| **Bit** | **DCS880 events correspond to following** | **DCS800 events** |
|---|---|---|
| 0 | - | A133 RetainInv |
| 1 | - | A134 ParComp |
| 2 | - | A135 ParUpDwnLoad |
| 3 | - | A136 NoAPTaskTime |
| 4 | A137 Start condition conflict | A137 SpeedNotZero |
| 5 | AFE1 Off 2 (emergency off) | A138 Off2FieldBus |
| 6 | AFE2 Off 3 (emergency stop) | A139 Off3FieldBus |
| 7 | A6D1 FBA A parameter conflict,<br>A6D2 FBA B parameter conflict | A140 IllgFieldBus |
| 8 | - | A141 COM8FwVer |
| 9 | FB11 Memory unit missing | A142 MemCardMiss |
| 10 | FB12 Memory unit incompatible, | A143 MemCardFail |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| | FB13 Memory unit, firmware incompatible,<br>FB14 Memory unit, firmware load failed | |
| 11 | - | A301 APWarning1 |
| 12 | - | A302 APWarning2 |
| 13 | - | A303 APWarning3 |
| 14 | - | A304 APWarning4 |
| 15 | - | A305 APWarning5 |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.34** **Warning word 4**

Warning word 4.
DCS880 warning word. Each bit indicates a certain warning as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | - | reserved |
| 1 | - | reserved |
| 2 | - | reserved |
| 3 | - | reserved |
| 4 | - | reserved |
| 5 | - | reserved |
| 6 | - | reserved |
| 7 | - | reserved |
| 8 | - | reserved |
| 9 | - | reserved |
| 10 | - | reserved |
| 11 | - | reserved |
| 12 | - | reserved |
| 13 | - | reserved |
| 14 | - | reserved |
| 15 | - | reserved |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.35** **User warning word**

DCS800 compatible user warning word.
The bit assignments of this word correspond to *UserAlarmWord (9.09)* in the DCS800. Each bit can indicate several DCS880 events as listed below.
Bit assignment:

| Bit | DCS880 events correspond to following | DCS800 events |
|---|---|---|
| 0 | - | F310 UserWarning1 |
| 1 | - | F311 UserWarning2 |
| 2 | - | F312 UserWarning3 |
| 3 | - | F313 UserWarning4 |
| 4 | - | F314 UserWarning5 |
| 5 | - | F315 UserWarning6 |
| 6 | - | F316 UserWarning7 |
| 7 | - | F317 UserWarning8 |
| 8 | - | F318 UserWarning9 |
| 9 | - | F319 UserWarning10 |
| 10 | - | F320 UserWarning11 |
| 11 | - | F321 UserWarning12 |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 12 | - | F322 UserWarning13 |
| 13 | - | F323 UserWarning14 |
| 14 | - | F324 UserWarning15 |
| 15 | - | F325 UserWarning16 |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.36** **M1 field exciter warning word**

DCS800 compatible motor 1 field exciter warning word.
The bit assignments of this DCS880 word and the DCS800 word *M1FexAlarmWord (9.17)* are the same.
Bit assignment:

| Bit | DCS880/DCS800 warning name |
|---|---|
| 0 | Phase missing |
| 1 | Temperature heatsink |
| 2 | reserved |
| 3 | reserved |
| 4 | reserved |
| 5 | Parameters added |
| 6 | Parameter up- or download failed |
| 7 | Compatibility |
| 8 | Parameters restored |
| 9 | reserved |
| 10 | reserved |
| 11 | reserved |
| 12 | reserved |
| 13 | reserved |
| 14 | reserved |
| 15 | reserved |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**04.37** **M2 field exciter warning word**

DCS800 compatible motor 2 field exciter warning word.
The bit assignments of this DCS880 word and the DCS800 word *M2FexAlarmWord (9.19)* are the same.
Bit assignment:

| Bit | DCS880/DCS800 warning name |
|---|---|
| 0 | Phase missing |
| 1 | Temperature heatsink |
| 2 | reserved |
| 3 | reserved |
| 4 | reserved |
| 5 | Parameters added |
| 6 | Parameter up- or download failed |
| 7 | Compatibility |
| 8 | Parameters restored |
| 9 | reserved |
| 10 | reserved |
| 11 | reserved |
| 12 | reserved |
| 13 | reserved |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | 14 reserved<br>15 Reserved | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

## 05 Diagnostics

Various run-time-type counters and measurements related to drive maintenance.

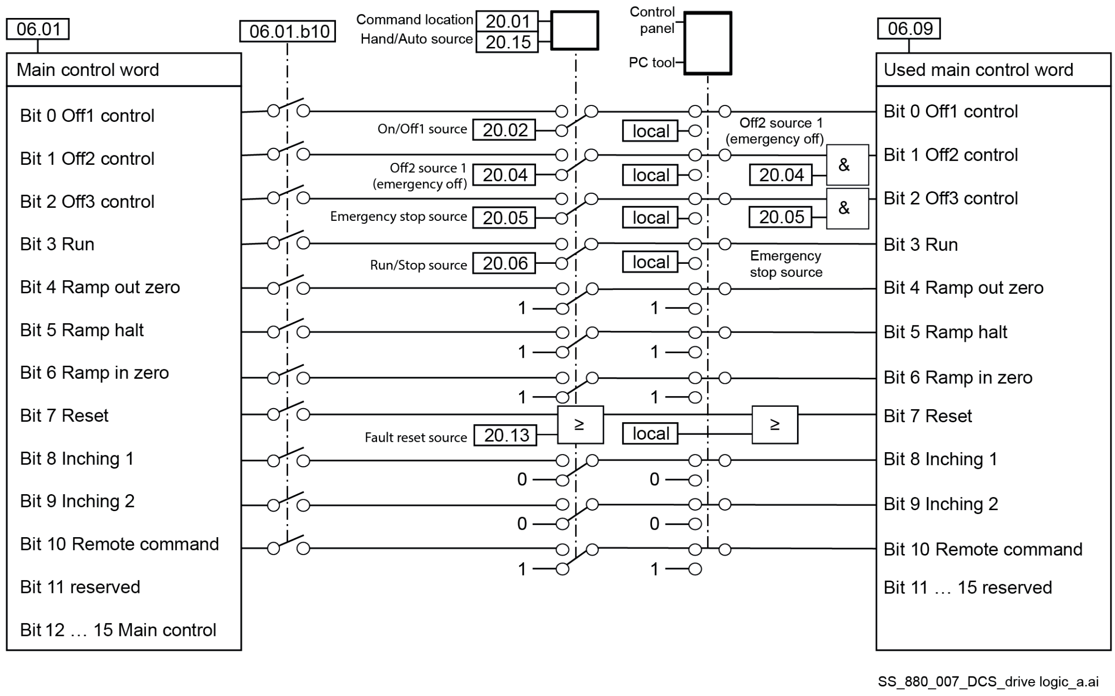
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| 05.01 | **On-time counter** | | | | | | |
| | On-time counter.<br>The counter runs when the drive is powered. | | | | | | |
| | 0 … 65535 | - | days | 1 = 1 day | y | n | Signal |
| 05.02 | **Run-time counter** | | | | | | |
| | Motor run-time counter.<br>The counter runs when the drive is in state ready for reference. See 06.15.b02 Main Status Word. | | | | | | |
| | 0 … 65535 | - | days | 1 = 1 day | y | n | Signal |
| 05.04 | **Fan on-time counter** | | | | | | |
| | Drive fan cooling run-time counter.<br>Displays the running time of the drives cooling fan.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 65535 | - | days | 1 = 1 day | y | n | Signal |
| 05.10 | **Control board temperature** | | | | | | |
| | Control board temperature.<br>Measured temperature of the control board.<br>Warning A4A0 Control board temperature measured is generated, if the measured control board temperature exceeds 75°C or 167°F. The used hysteresis is 1°.<br>The unit is selected by 96.02 Unit selection. | | | | | | |
| | -80.0 … 1000.0 | - | °C or °F | 1 = 1°C or °F | y | n | Signal |
| 05.11 | **Ch1 bridge temperature** | | | | | | |
| | Bridge temperature or channel 1 bridge temperature.<br>Measured bridge temperature or measured bridge temperature of the power unit connected to channel 1 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection.<br>See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured. | | | | | | |
| | -80.0 … 1000.0 | - | °C or °F | 1 = 1°C or °F | y | n | Signal |
| 05.12 | **Ch2 bridge temperature** | | | | | | |
| | Channel 2 bridge temperature.<br>Measured bridge temperature of power unit connected to channel 2 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured. | | | | | | |
| | -80.0 … 1000.0 | - | °C or °F | 1 = 1°C or °F | y | n | Signal |
| 05.13 | **Ch3 bridge temperature** | | | | | | |
| | Channel 3 bridge temperature.<br>Measured bridge temperature of the power unit connected to channel 3 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured. | | | | | | |
| | -80.0 … 1000.0 | - | °C or °F | 1 = 1°C or °F | y | n | Signal |
| 05.14 | **Ch4 bridge temperature** | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Channel 4 bridge temperature.<br>Measured bridge temperature of the power unit connected to channel 4 of the SDCS-DSL-H1x. The unit of the temperature is selected by 96.02 Unit selection. See also warning A4B0 Bridge temperature measured and fault 4310 Bridge temperature measured.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>05.22</b></td><td colspan="7"><b>Diagnostic</b></td></tr>
<tr><td colspan="7"><b>Attention:</b> 05.22 Diagnostic is set to zero by means of Reset.<br>Displays the diagnostics messages:
<table>
<tr><th colspan="2">Thyristor test</th></tr>
<tr><td>70002</td><td>– The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful.</td></tr>
<tr><td>70003</td><td>Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing.</td></tr>
<tr><td>70004</td><td>Field current not zero.</td></tr>
<tr><td>70005</td><td>Armature current not zero.</td></tr>
<tr><td>70006</td><td>Motor is turning. No speed zero indication.</td></tr>
<tr><td>70007</td><td>Thyristor block test failed.</td></tr>
<tr><td>70008</td><td>Motor connected to ground (near terminal C).</td></tr>
<tr><td>70009</td><td>Motor connected to ground (near terminal D).</td></tr>
<tr><td>70010</td><td>Armature winding is not connected (terminals C and D are open).</td></tr>
<tr><td>70011</td><td>V11 short circuit.</td></tr>
<tr><td>70012</td><td>V12 short circuit.</td></tr>
<tr><td>70013</td><td>V13 short circuit.</td></tr>
<tr><td>70014</td><td>V14 short circuit.</td></tr>
<tr><td>70015</td><td>V15 short circuit.</td></tr>
<tr><td>70016</td><td>V16 short circuit.</td></tr>
<tr><td>70C11</td><td>V11 not conducting.</td></tr>
<tr><td>70C12</td><td>V12 not conducting.</td></tr>
<tr><td>70C13</td><td>V13 not conducting.</td></tr>
<tr><td>70C14</td><td>V14 not conducting.</td></tr>
<tr><td>70C15</td><td>V15 not conducting.</td></tr>
<tr><td>70C16</td><td>V16 not conducting.</td></tr>
<tr><td>70C21</td><td>V21 not conducting.</td></tr>
<tr><td>70C22</td><td>V22 not conducting.</td></tr>
<tr><td>70C23</td><td>V23 not conducting.</td></tr>
<tr><td>70C24</td><td>V24 not conducting.</td></tr>
<tr><td>70C25</td><td>V25 not conducting.</td></tr>
<tr><td>70C26</td><td>V26 not conducting.</td></tr>
<tr><td>71124</td><td>V11 or V24 short circuit</td></tr>
<tr><td>71225</td><td>V12 or V25 short circuit.</td></tr>
<tr><td>71326</td><td>V13 or V26 short circuit.</td></tr>
<tr><td>71421</td><td>V14 or V21 short circuit.</td></tr>
<tr><td>71522</td><td>V15 or V22 short circuit.</td></tr>
<tr><td>71623</td><td>V16 or V23 short circuit.</td></tr>
<tr><td>72000</td><td>Armature winding is short-circuited (short circuit between terminals C and D).</td></tr>
<tr><td>7FFFF</td><td>Thyristor test finishes successful, stack okay.</td></tr>
</table>
</td></tr>
<tr><td>0 … 65535</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **05.41** | **Main fan service counter** | | | | | | |
| | Main cooling fan age.<br>Displays the age of the main cooling fan as a percentage of its estimated lifetime. The estimate is based on the duty, operating conditions and other operating parameters of the fan. When the counter reaches 100 %, warning A8C0 Fan service counter is generated.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 150 | - | % | 1 = 1 % | y | n | Signal |

## 06 Control and status words

Drive control, status and event words.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | **Drive logic:**  | | | | | | |

SS_880_007_DCS_drive logic_a.ai

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **06.01** | **Main control word** | | | | | | |
| | Main control word.<br>Displays the main control word of the drive. This signal shows the control signals as received from the selected sources, such as digital inputs, the fieldbus interfaces and the application program. See 06.08 Main control word source.<br>**Attention:** Do not write on this signal.<br>Bit assignment: | | | | | | |

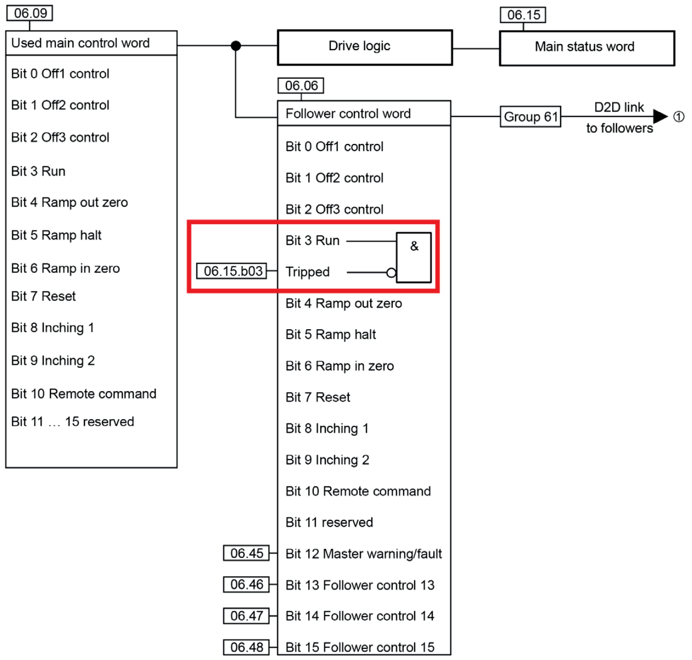
| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Off1 control | 1 | On command to Ready run state.<br>With 20.33 Mains contactor control mode = On:<br>Contactors are closed, field exciter and fans are started.<br>With 20.33 Mains contactor control mode = On and run:<br>Ready run flag in 06.15 Main Status Word is forced to 1. |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |

| | | | |
|---|---|---|---|
| | | 0 | Off1 command to Ready on state, unless other interlocks (Off2, Off3) are active.<br>Stopping via 21.02 Off1 mode. |
| 1 | Off2 control | 1 | Normal operation (Off2 inactive). |
| | | 0 | Off2 (emergency off/electrical disconnect/fast current off) command to Switch-on inhibited state.<br>Stop by coasting. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked, the contactors are opened, field exciter and fans are stopped.<br>Off2 control has priority over Off3 control and Off1 control. |
| 2 | Off3 control | 1 | Normal operation (Off3 inactive). |
| | | 0 | Off3 (emergency stop) command to Switch-on inhibited state.<br>Stopping via 21.03 Emergency stop mode.<br>Off3 control has priority over Off1 control. |
| 3 | Run | 1 | Run command to Ready for reference state.<br>The firing pulses are released and the drive is running with the selected speed reference. |
| | | 0 | Stop command to Ready run state.<br>Stop via 21.04 Stop mode from 21.03. |
| 4 | Ramp out zero | 1 | Normal operation. Speed ramp output is enabled. |
| | | 0 | Force speed ramp output to zero. The drive will immediately decelerate to zero speed. |
| 5 | Ramp halt | 1 | Normal operation. Speed ramp output is enabled. |
| | | 0 | Halt (freeze) speed ramp output. |
| 6 | Ramp in zero | 1 | Normal operation. Speed ramp input is enabled. |
| | | 0 | Force speed ramp input to zero |
| 7 | Reset | 0 → 1 | Acknowledge fault indications with the positive edge. |
| 8 | Inching 1 | 1 | Constant speed defined by 22.42 Jogging 1 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command.<br>If both Inching 1 and 2 are activated, the one that was activated first has priority. |
| 9 | Inching 2 | 1 | Constant speed defined by 22.43 Jogging 2 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command.<br>If both Inching 1 and 2 are activated, the one that was activated first has priority. |
| 10 | Remote command | 1 | Enable command:<br>Overriding control enabled (overriding control has to set this bit to 1). |
| | | 0 | Disable command:<br>Main control word and references are not getting through to the drive. Bits 0 … 2 and the main control bits 12 … 15 are not affected. |
| 11 | reserved | | |
| 12 | Main control 12 | 1 | Used by Adaptive Program, application program or overriding control as signal source for binary-source selector parameters. |
| | | 0 | |
| 13 | Main control 13 | 1 | |
| | | 0 | |
| 14 | | 1 | |

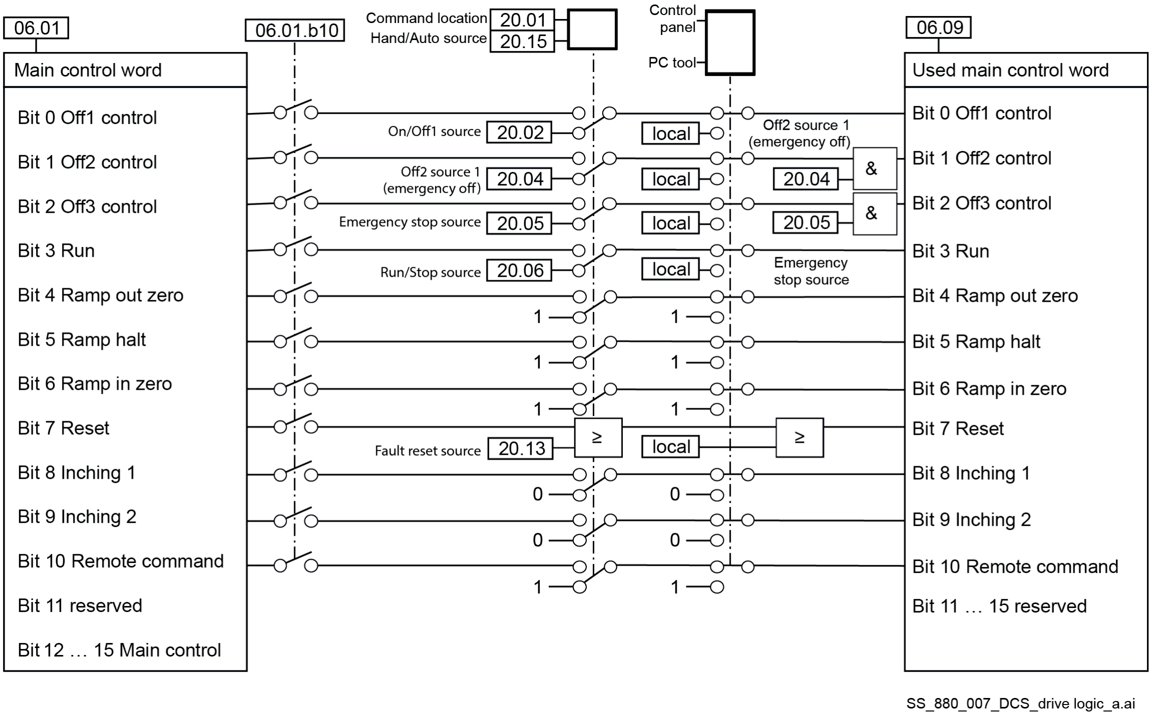
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td></td><td>Main control 14</td><td>0</td><td rowspan="3"></td></tr>
<tr><td rowspan="2">15</td><td rowspan="2">Main control 15</td><td>1</td></tr>
<tr><td>0</td></tr>
</table>
Bits 12 … 15 can be used to carry additional control data. E.g. as signal source for binary-source selector parameters (see: Other [bit], source selection).</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.02</b></td><td colspan="7"><b>Application control word</b></td></tr>
<tr><td colspan="7">Application program control word.<br>The drive control word received from the application program.</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>06.03</b></td><td colspan="7"><b>FBA A transparent control word</b></td></tr>
<tr><td colspan="7">Displays the unaltered control word received from the PLC via fieldbus adapter A when a transparent communication profile is selected. See group 51 FBA A settings.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.04</b></td><td colspan="7"><b>FBA B transparent control word</b></td></tr>
<tr><td colspan="7">Displays the unaltered control word received from the PLC via fieldbus adapter A when a transparent communication profile is selected. See group 54 FBA B settings.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.05</b></td><td colspan="7"><b>EFB transparent control word</b></td></tr>
<tr><td colspan="7">Displays the unaltered control word received from the PLC via the embedded fieldbus interface when a transparent communication profile is selected in 58.25 Control profile.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>06.06</b></td><td colspan="7"><b>Follower control word</b></td></tr>
<tr><td colspan="7">Follower control word to followers (master only).<br>Displays 06.06 Follower control word send by the master, using D2D link, to 06.07 Follower control word received in all followers.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Off1 control</td><td>1</td><td>On command and no active fault in the master to Ready run state.<br>With 20.33 Mains contactor control mode = On:<br>Contactors are closed, field exciter and fans are started.<br>With 20.33 Mains contactor control mode= On and run:<br>Ready run flag in 06.15 Main Status Word is forced to 1.</td></tr>
<tr><td>0</td><td>Off1 command or active fault in the master to Ready on state, unless other interlocks (Off2, Off3) are active.<br>Stopping via 21.02 Off1 mode.</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Off2 control</td><td>1</td><td>Normal operation (Off2 inactive).</td></tr>
<tr><td>0</td><td>Off2 (emergency off/fast current off) command to Switch-on inhibited state.<br>Stop by coasting. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked, the contactors are opened, field exciter and fans are stopped.<br>Off2 control has priority over Off3 control and Off1 control.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Off3 control</td><td>1</td><td>Normal operation (Off3 inactive).</td></tr>
<tr><td>0</td><td>Off3 (emergency stop) command to Switch-on inhibited state.<br>Stopping via 21.03 Emergency stop mode.</td></tr>
</table></td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | | | Off3 control has priority over Off1 control. |
| 3 | Run and master not tripped | 1 | Run command and no active fault in the master to Ready for reference state:<br><br> <br>The firing pulses are released and the drive is running with the selected speed reference. |
| | | 0 | Stop command or active fault in the master to Ready run state.<br>Stop via 21.04 Stop mode from 21.03. |
| 4 | Ramp out zero | 1 | Normal operation. Speed ramp output is enabled. |
| | | 0 | Force speed ramp output to zero. The drive will immediately decelerate to zero speed. |
| 5 | Ramp halt | 1 | Normal operation. Speed ramp output is enabled. |
| | | 0 | Halt (freeze) speed ramp output. |
| 6 | Ramp in zero | 1 | Normal operation. Speed ramp input is enabled. |
| | | 0 | Force speed ramp input to zero |
| 7 | Reset | 0 → 1 | Acknowledge fault indications with the positive edge. |
| 8 | Inching 1 | 1 | Constant speed defined by 22.42 Jogging 1 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command.<br>If both Inching 1 and 2 are activated, the one that was activated first has priority. |
| 9 | Inching 2 | 1 | Constant speed defined by 22.43 Jogging 2 reference, active only with 20.01 Command location = Main control word. Set Ramp out zero = Ramp hold = Ramp in zero = 0, then give On command and Run command.<br>If both Inching 1 and 2 are activated, the one that was activated first has priority. |
| 10 | | 1 | Enable command: |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td rowspan="2"></td><td rowspan="2">Remote command</td><td></td><td>Overriding control enabled (overriding control has to set this bit to 1).</td></tr>
<tr><td>0</td><td>Disable command:<br>Main control word and references are not getting through to the drive. Bits 0 … 2 and the follower control bits 12 … 15 are not affected.</td></tr>
<tr><td>11</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Master warning/fault</td><td>1</td><td>See 06.45 Follower CW user bit 0 selection.<br>Warning/Fault active in the master.</td></tr>
<tr><td>0</td><td>Warning/Fault inactive in the master.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Follower control 13</td><td>1</td><td rowspan="2">See 06.46 Follower CW user bit 1 selection.</td></tr>
<tr><td>0</td></tr>
<tr><td rowspan="2">14</td><td rowspan="2">Follower control 14</td><td>1</td><td rowspan="2">See 06.47 Follower CW user bit 0 selection.</td></tr>
<tr><td>0</td></tr>
<tr><td rowspan="2">15</td><td rowspan="2">Follower control 15</td><td>1</td><td rowspan="2">See 06.48 Follower CW user bit 0 selection.</td></tr>
<tr><td>0</td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.07</b></td><td colspan="7"><b>Follower control word received</b></td></tr>
<tr><td colspan="7">Follower control word received from master (followers only).<br>Displays 06.06 Follower control word send by the master, using D2D link, to 06.07 Follower control word received in all followers.<br>Bit assignment see 06.06 Follower control word.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.08</b></td><td colspan="7"><b>Main control word source</b></td></tr>
<tr><td colspan="7">Selects the source for 06.01 Main control word.<br><b>Other</b>; source selection.<br>0: <b>None</b>; inactive. All bits are forced to zero.<br>1: <b>FBA A</b>; 06.03 FBA A transparent control word.<br>2: <b>FBA B</b>; 06.04 FBA B transparent control word.<br>3: <b>EFB</b>; 06.05 EFB transparent control word.<br>4: <b>Application</b>; 06.02 Application control word.<br>5: <b>Follower</b>; 06.07 Follower control word received (follower only).<br>6: <b>User 1</b>; 06.100 User control word 1.<br>7: <b>User 2</b>; 06.101 User control word 2.<br>8: <b>DDCS control word</b>; 06.110 DDCS control word.</td></tr>
<tr><td>0 … 8</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>06.09</b></td><td colspan="7"><b>Used main control word</b></td></tr>
<tr><td colspan="7">Used main control word.<br>Displays the main control word used by the internal drive logic. The selection is depending on the drives local/remote control setting, 20.01 Command location and 20.15 Hand/Auto source.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|



Bit assignment see 06.01 Main control word. Bits 11 … 15 are reserved.

| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.10** **Auxiliary control word 1**

Auxiliary control word 1.
The auxiliary control word 1 can be written to by Adaptive Program, application program or overriding control.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Direct speed reference | 1 | The speed ramp output is overwritten and forced to 23.32 Direct speed reference. |
| | | 0 | Speed ramp is active. |
| 1 | Drive direction | 1 | Drive direction reverse (see note 1), changes the signs of 24.02 Used speed feedback and 27.01 Current reference. |
| | | 0 | Drive direction forward (see note 1). |
| 2 | Limit used speed reference | 1 | 24.01 Used speed reference is limited by 30.11 M1 minimum speed, 30.12 M1 maximum speed or by 42.19 M2 minimum speed, 42.20 M2 maximum speed. |
| | | 0 | 24.01 Used speed reference is not limited. |
| 3 | reserved | | |
| 4 | Bypass speed ramp | 1 | Bypass speed ramp (speed ramp output is forced to value of speed ramp input). |
| 5 | reserved | | |
| 6 | Halt speed controller | 1 | Halt (freeze) the speed controller integration time. |
| 7 | Reset speed controller | 1 | Reset the speed controller integration time. |
| 8 | Limit speed controller | 1 | No back calculation of the speed controller torque limitation. The speed controller output can run to the |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | | | settings of 30.13 Speed control min torque or 30.14 Speed control max torque.<br>This is typically used for winders. |
| | | 0 | Back calculation of the speed controller torque limitation. The speed controller integration time is limited by torque or current limits. See 30.02 Torque limit status. |
| 9 | reserved | | |
| 10 | Force max firing angle | 1 | Force single firing pulses to suppress the DC current and set the firing angle to 30.45 Maximum firing angle. |
| | | 0 | Normal firing pulses released. |
| 11 | reserved | | |
| 12 | Aux. control 12 | 1 | Used by Adaptive Program, application program or overriding control as signal source for binary-source selector parameters. |
| | | 0 | |
| 13 | Aux. control 13 | 1 | |
| | | 0 | |
| 14 | Aux. control 14 | 1 | |
| | | 0 | |
| 15 | Aux. control 15 | 1 | |
| | | 0 | |

**Note 1:** Changes of Drive direction become active only in drive state Ready run. Changing the speed direction of a running drive (Ready for reference state) by means of Drive direction is not possible.
**Note 2:** Bits 12 … 15 can be used to carry additional control data. E.g. as signal source for binary-source selector parameters (see: Other [bit], source selection).

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | y | y | Parameter |

**06.11** **Auxiliary control word 2**

Auxiliary control word 2.
The auxiliary control word 2 can be written to by Adaptive Program, application program or overriding control.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Dynamic braking on | 1 | Force dynamic braking regardless from settings of 19.20 Follower force ramp stop, 21.02 Off1 mode, 21.03 Emergency stop mode or 21.04 Stop mode. |
| 1 | reserved | | |
| 2 | Synchronizing command | 1 | Positioning:<br>Synchronizing command from overriding control for OnBoard encoder, encoder 1 or encoder 2. See 90.86 Pos counter init cmd source (trigger) and 90.51 Load feedback selection. |
| 3 | reserved | | |
| 4 | Torque proving OK | 1 | Selected motor torque proving is OK. This bit to be set by Adaptive Program, application program or overriding control. See 44.19 M1 brake torque proving time. |
| | | 0 | Selected motor torque proving is inactive. This bit is to be set by Adaptive Program, application program or overriding control. |
| 5 | Reset torque memory | 1 | Reset torque memory. Valid only if 44.09 M1 brake open torque source = Brake torque memory. |
| 6 | reserved | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 7 | Suppress armature current deviation | 1 | A114 Armature current deviation is blocked. See 04.31.12 Warning word 1. Usually used for non-motoric applications. |
| | | 0 | A114 Armature current deviation is released. See 04.31.12 Warning word 1 |
| 8 … 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | y | y | Parameter |

**06.15** **Main status word**

Main status word.
Displays the main status word of the drive.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Ready on | 1 | Ready to be switched on. |
| | | 0 | Not ready to be switched on. |
| 1 | Ready run | 1 | Ready to operate. |
| | | 0 | Not ready to operate e.g. Off1 active. |
| 2 | Ready reference | 1 | Operation enabled (drive is running). |
| | | 0 | Operation inhibited. |
| 3 | Tripped | 1 | Fault. |
| | | 0 | No fault. |
| 4 | Off2 status | 1 | Off2 inactive. |
| | | 0 | Off2 active (emergency off/fast current off), Switch-on inhibited state. |
| 5 | Off3 status | 1 | Off3 inactive. |
| | | 0 | Off3 active (emergency stop), Switch-on inhibited state. |
| 6 | Switch-on inhibited | 1 | Switch-on inhibited state is active after:<br>– Fault.<br>– Off2 (emergency off/fast current off) active.<br>– Off3 (emergency stop) active.<br>– Switch-on inhibited via digital input 20.04 Off2 source 1 (emergency off), 20.08 Off2 source 2 (emergency off) or 20.05 Emergency stop source. |
| | | 0 | Switch-on inhibited state inactive. |
| 7 | Warning | 1 | Warning. |
| | | 0 | No warning. |
| 8 | At setpoint | 1 | Setpoint: The feedback value equals the reference. Means it is within the tolerance limits. See 46.21 At speed hysteresis and 46.23 At torque hysteresis feedback. |
| | | 0 | Setpoint: The feedback value differs from the reference. Means it is outside the tolerance limits. See 46.21 At speed hysteresis and 46.23 At torque hysteresis feedback. |
| 9 | Remote | 1 | Drive control location: Remote. |
| | | 0 | Drive control location: Local. |
| 10 | Above level | 1 | See 06.29 MSW bit 10 sel.<br>Speed or torque feedback equals or exceeds levels defined by 46.31 Above speed level or 46.33 Above torque level. Valid in both rotation directions. |
| | | 0 | Within speed or torque levels. |
| 11 | Status control 11 | 1 | See 06.30 MSW bit 11 sel. |
| | | 0 | |
| 12 | | 1 | See 06.31 MSW bit 12 sel. |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |

| | | | |
|---|---|---|---|
| | Status control 12 | 0 | |
| 13 | Status control 13 | 1 | See 06.32 MSW bit 13 sel. |
| | | 0 | |
| 14 | Status control 14 | 1 | See 06.33 MSW bit 14 sel. |
| | | 0 | |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.16** **Drive status word 1**

Drive status word 1.
Displays the drive status word 1.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Tripped | 1 | Drive is tripped. A fault is active. |
| 1 | Inhibited | 1 | Start inhibited. See 06.19 Drive inhibit status word 2 and 06.20 Run inhibit status word for the source of the inhibiting signal. |
| 2 | Enabled | 1 | 20.08 Off2 source 2 (emergency off) is set to 1 = Off2 inactive.<br>This bit is not affected by the presence of a fault. |
| 3 | Ready on | 1 | Drive is ready to receive an On command. |
| 4 | Ready run | 1 | Drive is ready to receive a Run command. |
| 5 | Ready reference | 1 | Drive is ready to receive a reference (drive is running). |
| 6 | Stopping | 1 | Drive is stopping. |
| 7 | Off | 1 | Drive is off. |
| 8 | Off2 | 1 | Off2 active (emergency off/fast current off), Switch-on inhibited state. |
| 9 | Off3 | 1 | Off3 active (emergency stop), Switch-on inhibited state. |
| 10 | On requested | 1 | An On command was given. |
| 11 | Run requested | 1 | A Run command was given. |
| 12 | Limiting | 1 | One operating limit (speed, torque, etc.) is active. See 30.01 Limit word 1 and 30.02 Torque limit status. |
| 13 | Field current | 1 | Drive is generating field current. |
| 14 | Local control | 1 | Drive is in local control. |
| 15 | Network control | 1 | Drive is in network control. With fieldbus protocols based on the Common Industrial Protocol (CIPTM), such as DeviceNet and Ethernet/IP, denotes the control of the drive using the Net Ctrl and Net Ref objects of the ODVA AC/DC Drive Profile. For more information, see www.odva.org, and the following manuals:<br>– FDNA-01 DeviceNet adapter module User's manual (3AFE68573360 [English]).<br>– FENA-01/-11 Ethernet adapter module User's manual (3AUA0000093568 [English]) |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.17** **Drive status word 2**

Drive status word 2.
Displays the drive status word 2.
Bit assignment:

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |

| **Bit** | **Name** | **Value** | **Remarks** |
|---|---|---|---|
| 0 | Autotuning | 1 | The requested autotuning has been finished. |
| 1 | reserved | | |
| 2 | Torque control | 1 | Torque control mode active. |
| 3 | Speed control | 1 | Speed control mode active. |
| 4 | reserved | | |
| 5 | Safe reference | 1 | A safe speed reference is active. See functions such as 49.05 Communication loss action and 50.02 FBA A comm loss func. |
| 6 | Last speed | 1 | A last speed reference is active. See functions such as 49.05 Communication loss action and 50.02 FBA A comm loss func. |
| 7 | Loss of reference | 1 | Reference signal lost. |
| 8 | Emergency stop failed | 1 | Emergency stop failed. See 31.31 Emergency ramp supervision and 31.32 Emergency ramp supervision delay. |
| 9 | Jogging | 1 | Jogging is enabled. See 20.25 Jogging enable. |
| 10 | Above level | 1 | Speed or torque feedback equals or exceeds levels defined by 46.31 Above speed level or 46.33 Above torque level. Valid in both rotation directions. |
| 11 | Emergency stop | 1 | An emergency stop command signal is active or the drive is stopping after receiving an emergency stop command. |
| 12 | Reduced run | 1 | Reduced run active. See section Reduced run function. |
| 13 | reserved | | |
| 14 | Ramp stop failed | 1 | Ramp stop failed. See 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay. |
| 15 | reserved | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **06.18** | **Drive status word 3** | | | | | | |

Drive status word 3.
Displays the drive status word 3.
Bit assignment:

| **Bit** | **Name** | **Value** | **Remarks** |
|---|---|---|---|
| 0 | M1 field exciter | 1 | Motor 1 field exciter acknowledged. |
| 1 | M2 field exciter | 1 | Motor 2 field exciter acknowledged. |
| 2 | M1 field heating | 1 | Motor 1 field heating is active. See 28.34 Field heating source. |
| 3 | M2 field heating | 1 | Motor 2 field heating is active. See 28.34 Field heating source. |
| 4 | M1 (motor 1) | 1 | Motor 1 and field exciter 1 are active. |
| 5 | M2 (motor 2) | 1 | Motor 2 and field exciter 2 are active. |
| 6 | User set 1 | 1 | User parameter set 1 active. See 96.22 User set save/load. |
| 7 | User set 2 | 1 | User parameter set 2 active. See 96.22 User set save/load. |
| 8 | User set 3 | 1 | User parameter set 3 active. See 96.22 User set save/load. |
| 9 | User set 4 | 1 | User parameter set 4 active. See 96.22 User set save/load. |
| 10 | Auto-reclosing | 1 | Auto-reclosing logic is active. See 31.51 Mains loss mode. |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |

| | | | |
|---|---|---|---|
| 11 | Drive direction negative | 1 | Negative drive direction active. Controlled by 06.10.b01 Auxiliary control word 1. |
| 12 | Tripped or warning | 1 | Fault or warning active. |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.19** **Drive inhibit status word 2**

Drive inhibit status word 2.
The drive inhibit status word 2 specifies the source of the inhibiting signal that is preventing the drive from starting. See 06.16.b01 Drive status word 1 and 06.20 Run inhibit status word.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Follower | 1 | A follower is preventing the master from starting (master only). |
| 1 | Application | 1 | The application program is preventing the drive from starting. |
| 2 | Auxiliary power failure | 1 | Auxiliary power failure is preventing the drive from starting. |
| 3 | Encoder feedback | 1 | The encoder feedback configuration is preventing the drive from starting. |
| 4 | Reference source parametrization | 1 | A reference source parametrization conflict is preventing the drive from starting. See warning A6DA Reference source parametrization. |
| 5 | Speed not zero | 1 | Re-start of the drive is not possible, see also A137 Start condition conflict.<br>Speed zero has not been reached. See 21.08 M1 zero speed level.<br>Set On = Run = 0 (this includes jogging and inching) and check if the actual speed is within the zero speed limit.<br>This warning is valid:<br>– For a normal stop. Off1 command in case of 21.01 Start mode = Start from zero.<br>– For a coast stop. Off2 (emergency off/fast current off) command.<br>– For an emergency stop. Off3 (emergency stop) command.<br>– Even if the drive power is cycled.<br>Check:<br>– The settings of 21.08 M1 zero speed level, 21.01 Start mode and 90.41 M1 feedback selection.<br>– The function of the used speed feedback devices (tacho / encoder). |
| 6 | Re-start not possible | 1 | Re-start of the drive is not possible, see also A137 Start condition conflict.<br>Either On and/or Run (this includes jogging and inching) command has been set wrong. See 06.09 Used main control word.<br>In case of a wrong setting of either the On and/or the Run command, make sure, On = Run (this includes |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | | | jogging and inching) = 0. Additionally the timing of the commands must be checked.<br>E.g.:<br>– After a fault reset and On and/or Run command is still high. |
| 7 … 15 | reserved | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.20** **Run inhibit status word**

Run inhibit status word.
The Run inhibit status word specifies the source of the inhibiting signal that is preventing the drive from starting. The conditions marked with an asterisk (*) require that the On command is cycled. In all other instances, the inhibiting condition must be removed first.
See 06.16.b01 Drive status word 1 and 06.19 Drive inhibit status word 2.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Not ready run | 1 | Drive has not been parametrized correctly. Check the parameters in groups 95 HW configuration and 99 Motor data. |
| 1 | Control location changed | *1 | Control location has changed. |
| 2 | Firmware inhibit | 1 | Control program is keeping itself in inhibited state. See 64B1 Internal firmware. |
| 3 | Fault reset | *1 | A fault has been reset. |
| 4 | Off2 from source 2 | 1 | 20.08 Off2 source 2 (emergency off) is set to 0 = Off2 command (emergency off/fast current off). |
| 5 | reserved | | |
| 6 | FSO inhibit | 1 | Operation prevented by FSO-xx safety functions module. |
| 7 | STO | 1 | Safe torque off active |
| 8 | reserved | | |
| 9 | Autotuning finished | 1 | The requested autotuning has been finished. |
| 10 | Off3 stop mode 0 | 1 | Off3 active (emergency stop) using coast stop. See 21.03 Emergency stop mode. |
| 11 | Off3 stop mode 1 | 1 | Off3 active (emergency stop) using ramp stop. See 21.03 Emergency stop mode. |
| 12 | Off3 stop mode 2 | 1 | Off3 active (emergency stop) using emergency ramp stop. See 21.03 Emergency stop mode. |
| 13 | Off3 stop mode 3 | 1 | Off3 active (emergency stop) using torque limit. See 21.03 Emergency stop mode. |
| 14 | Off3 stop mode 4 | 1 | Off3 active (emergency stop) using dynamic braking. See 21.03 Emergency stop mode. |
| 15 | Jogging active | 1 | The jogging enable signal is inhibiting the operation. See 20.25 Jogging enable. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.21** **Speed control status word**

Speed control status word.
Displays the speed control status word of the drive.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|

| Index | Name | | | | | |
|---|---|---|---|---|---|---|
| | **Text** | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |

| | | | |
|---|---|---|---|
| 0 | Zero speed | 1 | Drive is running in the zero speed level area. The absolute value of 90.01 Motor speed for control has remained below 21.08 M1 zero speed level, 42.21 M2 zero speed level for longer than 21.09 M1 zero speed delay, 42.22 M2 zero speed delay.<br>**Notes:**<br>– This bit is not updated when mechanical brake control is enabled by 44.06 M1 brake control enable, 42.76 M2 brake control enable and the drive is running. See 06.15.b02 Main Status Word.<br>– During a ramp stop when the drive is running forward, the delay count runs whenever 90.01 < 21.08 or 42.21.<br>– During a ramp stop when the drive is running reverse, the delay count runs whenever 90.01 > (-1) • 21.08 or (-1) • 42.21. |
| 1 | Forward | 1 | 90.01 > 21.06 or 42.23, thus the drive is running forward above zero speed level. |
| 2 | Reverse | 1 | 90.01 < (-1) • 21.06 or (-1) • 42.23, thus the drive is running reverse below zero speed level. |
| 3 | Out of window | 1 | Speed error window control is active and the speed error is out of the window. See 24.41 Speed error window control enable. |
| 4 | EMF speed feedback | 1 | EMF speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection, 90.46 Force open loop or 31.35 Motor feedback fault in case the selected OnBoard tacho/encoder has faulted. |
| | | 0 | OnBoard tacho/Encoder is used for speed feedback. |
| 5 | OnBoard tacho speed feedback | 1 | OnBoard tacho speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection. |
| | | 0 | OnBoard tacho faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 90.46 Force open loop. |
| 6 | OnBoard encoder speed feedback | 1 | OnBoard encoder speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection. |
| | | 0 | OnBoard encoder faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 90.46 Force open loop. |
| 7 | Encoder 1 speed feedback | 1 | Encoder 1 speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection. |
| | | 0 | Encoder 1 faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 90.46 Force open loop. |
| 8 | Encoder 2 speed feedback | 1 | Encoder 2 speed feedback active. See 90.41 M1 feedback selection, 42.20 M2 feedback selection. |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | | 0 | Encoder 2 faulted or not selected as source of speed feedback. See 90.41 M1 feedback selection, 42.20 M2 feedback selection or 90.46 Force open loop. |
| 9 | Any constant speed request | 1 | A constant speed has been selected. See 06.22 Constant speed status word. |
| 10 | Follower speed correction min level | 1 | Minimum limit of speed correction in a speed-controlled follower has been reached. See parameters 23.39 … 23.42. |
| 11 | Follower speed correction max level | 1 | Maximum limit of speed correction in a speed-controlled follower has been reached. See parameters 23.39 … 23.42. |
| 12 … 15 | reserved | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.22** **Constant speed status word**

Constant speed status word.
Indicates which constant speed is active, if any. See 06.21.b09 Speed control status word.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Constant speed 1 | 1 | Constant speed 1 active. |
| 1 | Constant speed 2 | 1 | Constant speed 2 active. |
| 2 | Constant speed 3 | 1 | Constant speed 3 active. |
| 3 | Constant speed 4 | 1 | Constant speed 4 active. |
| 4 | Constant speed 5 | 1 | Constant speed 5 active. |
| 5 | Constant speed 6 | 1 | Constant speed 6 active. |
| 6 | Constant speed 7 | 1 | Constant speed 7 active. |
| 7 … 15 | reserved | | |

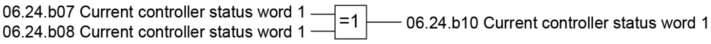
| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.24** **Current controller status word 1**

Current controller status word 1.
Displays the current controller status word 1 of the drive.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Fans | 1 | Fans On command for drive and motor fans. |
| | | 0 | Fans Off command for drive and motor fans. |
| 1 | reserved | | |
| 2 | reserved | | |
| 3 | Field heating | 1 | Active. |
| | | 0 | Inactive. |
| 4 | Field current direction | 1 | Reverse (negative field current). |
| | | 0 | Forward (positive field current). |
| 5 | Field exciter | 1 | Field exciter On command. |
| | | 0 | Field exciter Off command. |
| 6 | Dynamic braking | 1 | Dynamic braking active/started. |
| | | 0 | Dynamic braking inactive. |
| 7 | Mains contactor | 1 | Mains contactor Close command (see note 1). |
| | | 0 | Mains contactor Open command (see note 1). |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 8 | Dynamic braking contactor | 1 | Dynamic braking contactor close command. Close the contactor for the dynamic braking resistor. Armature current must be zero. |
| | | 0 | Dynamic braking contactor open command. Open the contactor for the dynamic braking resistor. |
| 9 | Energy flow | 1 | Drive is generating. |
| | | 0 | Drive is motoring. |
| 10 | US style DC contactor | 1 | US style changeover DC contactor close command. Close the DC contactor and open the resistor contactor. |
| | | 0 | US style changeover DC contactor open command. Open the DC contactor and close the resistor contactor.<br><br> |
| 11 | Firing pulses | 1 | Firing pulses active (on). |
| | | 0 | Firing pulses inactive (blocked). |
| 12 | Discontinuous current | 1 | Continuous armature current. |
| | | 0 | Discontinuous armature current. |
| 13 | Zero current | 1 | Zero armature current detected. |
| | | 0 | Armature current not zero. |
| 14 | DC-breaker (continuous) | 1 | DC-breaker trip command (continuous signal). |
| 15 | DC-breaker (pulse) | 1 | DC-breaker trip command (1 s pulse). |

**Note 1:** Fix connected to XSMC:1/2.

| | | | | | | |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**06.25** **Current controller status word 2**

Current controller status word 2.
Displays the current controller status word 2 of the drive. Value of zero means, that the status is OK. The firing angle is forced to the value of 30.45 Maximum firing angle if any of the bits is set.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Armature overcurrent | 1 | 2310 Armature overcurrent. See 04.21.b01 Fault word 1. |
| 1 | Mains overvoltage | 1 | F513 Mains overvoltage. See 04.21.b12 Fault word 1. |
| 2 | Mains undervoltage | 1 | A111 Mains low voltage. See 04.31.b10 Warning word 1 or 3280 Mains low voltage. See 04.21.b11 Fault word 1. |
| 3 | EMF reduction | 1 | A104 Reversal volt function or F504 Reversal volt function. See 31.60 Reversal volt function.<br>Waiting for the reduction of the EMF to match the mains voltage. See 27.42 Reversal volt margin. |
| 4 | Bridge reversal | 1 | F533 12-pulse reversal timeout. See 04.23.b00 Fault word 3.<br>F534 12-pulse current difference. See 04.23.b01 Fault word 3.<br>F557 Reversal time. See 04.24.b08 Fault word 4. |
| 5 | Operation mode | 1 | 99.06 Operation mode = 12-pulse parallel master.<br>12-pulse parallel slave.<br>12-pulse serial master.<br>12-pulse serial slave.<br>6-pulse serial master.<br>6-pulse serial slave. |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |

| | | | |
|---|---|---|---|
| | | | Serial sequential master.<br>Serial sequential slave.<br>1 = Partner blocked.<br>99.06 Operation mode = Large field exciter.<br>1 = Overvoltage protection active (freewheeling). |
| 6 | M1 field exciter self-test | 1 | F529 M1 field exciter not OK. See 04.22.b12 Fault word 2. |
| | | 0 | Motor 1 field exciter self-test OK. |
| 7 | M1 field exciter ready | 1 | F537 M1 field exciter ready lost. See 04.23.b04 Fault word 3. |
| | | 0 | Motor 1 field exciter ready. |
| 8 | M2 field exciter self-test | 1 | F530 M2 field exciter not OK. See 04.22.b13 Fault word 2. |
| | | 0 | Motor 2 field exciter self-test OK. |
| 9 | M2 field exciter ready | 1 | F538 M2 field exciter ready lost. See 04.23.b05 Fault word 3. |
| | | 0 | Motor 2 field exciter ready. |
| 10 | Zero current | 1 | Waiting for zero armature current, if 27.40 Zero current timeout elapses before bit 10 is set back to zero, F557 Reversal time is set. See 04.24.b08 Fault word 4. |
| 11 | Field reversal | 1 | Field reversal active. |
| | | 0 | Field reversal inactive. |
| 12 | reserved | | |
| 13 | PLL deviation level | 1 | A131 PLL deviation. PLL deviation level is exceeded. See 95.44 PLL deviation level. |
| | | 0 | Below PLL deviation level. See 95.44 PLL deviation level. |
| 14 | Mains synchronization | 1 | F514 Mains synchronization lost. See 04.21.b13 Fault word 1. |
| | | 0 | Mains synchronized. |
| 15 | Current controller | 1 | Disabled, the current controller is disabled and 27.02 Used current reference is forced to zero. |
| | | 0 | Enabled. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **06.26** | **M1 field exciter status word** | | | | | | |

Motor 1 field exciter status word.
Displays motor 1 field exciter status word of the drive.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | None | 1 | No field exciter connected. |
| 1 | OK | 1 | Field exciter and communication to armature drive OK. |
| 2 | Communication failed | 1 | F516 M1 field exciter communication. See 04.21.b15 Fault word 1. |
| | | 0 | Communication to armature drive OK. |
| 3 | Field exciter self-test failed | 1 | F529 M1 field exciter not OK. See 04.22.b12 Fault word 2. |
| | | 0 | Field exciter self-test OK. |
| 4 | Field exciter ready lost | 1 | F537 M1 field exciter ready lost. See 04.23.b04 Fault word 3. |
| | | 0 | Motor 1 field exciter ready. |
| 5 | Field exciter undercurrent | 1 | F541 M1 field exciter low current. See 04.23.b08 Fault word 3. |
| 6 | Field exciter overcurrent | 1 | F515 M1 field exciter overcurrent. See 04.21.b14 Fault word 1. |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td>7</td><td>Wrong setting</td><td>1</td><td>Check setting of 99.07 M1 used field exciter type and 42.49 M2 used field exciter type.</td></tr>
<tr><td>8 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.27</b></td><td colspan="7"><b>M2 field exciter status word</b></td></tr>
<tr><td colspan="7">Motor 2 field exciter status word.<br>Displays motor 1 field exciter status word of the drive.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>None</td><td>1</td><td>No field exciter connected.</td></tr>
<tr><td>1</td><td>OK</td><td>1</td><td>Field exciter and communication to armature drive OK.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Communication failed</td><td>1</td><td>F519 M2 field exciter communication. See 04.22.b02 Fault word 2.</td></tr>
<tr><td>0</td><td>Communication to armature drive OK.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Field exciter self-test failed</td><td>1</td><td>F530 M2 field exciter not OK. See 04.22.b13 Fault word 2.</td></tr>
<tr><td>0</td><td>Field exciter self-test OK.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Field exciter ready lost</td><td>1</td><td>F538 M2 field exciter ready lost. See 04.23.b05 Fault word 3.</td></tr>
<tr><td>0</td><td>Motor 2 field exciter ready.</td></tr>
<tr><td>5</td><td>Field exciter undercurrent</td><td>1</td><td>F542 M2 field exciter low current. See 04.23.b09 Fault word 3.</td></tr>
<tr><td>6</td><td>Field exciter overcurrent</td><td>1</td><td>F518 M2 field exciter overcurrent. See 04.22.b01 Fault word 2.</td></tr>
<tr><td>7</td><td>Wrong setting</td><td>1</td><td>Check setting of 99.07 M1 used field exciter type and 42.49 M2 used field exciter type.</td></tr>
<tr><td>8 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.29</b></td><td colspan="7"><b>MSW bit 10 sel</b></td></tr>
<tr><td colspan="7">Binary source for main status word bit 10 (Above level).<br>Selects a binary source whose status is transmitted as 06.15.b10 Main status word.<br><b>Other [bit]</b>; source selection.<br>0: <b>False</b>;<br>1: <b>True</b>;<br>2: <b>Above level</b>; see 06.17.b10 Drive status word 2.</td></tr>
<tr><td>0 … 2</td><td>Above level</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>06.30</b></td><td colspan="7"><b>MSW bit 11 sel</b></td></tr>
<tr><td colspan="7">Binary source for main status word bit 11 (Status control 11).<br>Selects a binary source whose status is transmitted as 06.15.b11 Main status word.<br><b>Other [bit]</b>; source selection.<br>0: <b>False</b>;<br>1: <b>True</b>;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>06.31</b></td><td colspan="7"><b>MSW bit 12 sel</b></td></tr>
<tr><td colspan="7">Binary source for main status word bit 12 (Status control 12).<br>Selects a binary source whose status is transmitted as 06.15.b12 Main status word.<br><b>Other [bit]</b>; source selection.<br>0: <b>False</b>;<br>1: <b>True</b>;</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | **Lost run enable** | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.32** | **MSW bit 13 sel** | | | | | | |
| | Binary source for main status word bit 13 (Status control 13).<br>Selects a binary source whose status is transmitted as 06.15.b13 Main status word.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.33** | **MSW bit 14 sel** | | | | | | |
| | Binary source for main status word bit 14 (Status control 14).<br>Selects a binary source whose status is transmitted as 06.15.b14 Main status word.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.45** | **Follower CW user bit 0 selection** | | | | | | |
| | Binary source for follower control word bit 12 (Master warning/fault) (master only).<br>Selects a binary source whose status is transmitted as 06.06.b12 Follower control word to all followers.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**;<br>2: **Main control 12**; see 06.01.b12 Main control word.<br>3: **Main control 13**; see 06.01.b13 Main control word.<br>4: **Main control 14**; see 06.01.b14 Main control word.<br>5: **Main control 15**; see 06.01.b15 Main control word.<br>6: **Master warning/fault**; see 06.18.b12 Drive status word 3. | | | | | | |
| | 0 … 6 | Master warning/fault | - | 1 = 1 | n | y | Parameter |
| **06.46** | **Follower CW user bit 1 selection** | | | | | | |
| | Binary source for follower control word bit 13 (Main control 13) (master only).<br>Selects a binary source whose status is transmitted as 06.06.b13 Follower control word to all followers.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**;<br>2: **Main control 12**; see 06.01.b12 Main control word.<br>3: **Main control 13**; see 06.01.b13 Main control word.<br>4: **Main control 14**; see 06.01.b14 Main control word.<br>5: **Main control 15**; see 06.01.b15 Main control word. | | | | | | |
| | 0 … 5 | Main control 13 | - | 1 = 1 | n | y | Parameter |
| **06.47** | **Follower CW user bit 2 selection** | | | | | | |
| | Binary source for follower control word bit 14 (Main control 14) (master only).<br>Selects a binary source whose status is transmitted as 06.06.b14 Follower control word to all followers.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**;<br>2: **Main control 12**; see 06.01.b12 Main control word.<br>3: **Main control 13**; see 06.01.b13 Main control word. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: <b>Main control 14</b>; see 06.01.b14 Main control word.<br>5: <b>Main control 15</b>; see 06.01.b15 Main control word.</td></tr>
<tr><td>0 … 5</td><td>Main control 14</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>06.48</b></td><td colspan="7"><b>Follower CW user bit 4 selection</b></td></tr>
<tr><td colspan="7">Binary source for follower control word bit 15 (Main control 15) (master only).<br>Selects a binary source whose status is transmitted as 06.06.b15 Follower control word to all followers.<br><b>Other [bit]</b>; source selection.<br>0: <b>False</b>;<br>1: <b>True</b>;<br>2: <b>Main control 12</b>; see 06.01.b12 Main control word.<br>3: <b>Main control 13</b>; see 06.01.b13 Main control word.<br>4: <b>Main control 14</b>; see 06.01.b14 Main control word.<br>5: <b>Main control 15</b>; see 06.01.b15 Main control word.</td></tr>
<tr><td>0 … 5</td><td>Main control 15</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>06.50</b></td><td colspan="7"><b>User status word 1</b></td></tr>
<tr><td colspan="7">User defined status word 1.<br>This word displays the status of the binary sources selected by parameters 06.60 … 06.36.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Remarks</th></tr>
<tr><td>0</td><td>User status bit 0</td><td>Status of source selected by 06.60 User status word 1 bit 0 sel.</td></tr>
<tr><td>1</td><td>User status bit 1</td><td>Status of source selected by 06.61 User status word 1 bit 1 sel.</td></tr>
<tr><td>2</td><td>User status bit 2</td><td>Status of source selected by 06.62 User status word 1 bit 2 sel.</td></tr>
<tr><td>3</td><td>User status bit 3</td><td>Status of source selected by 06.63 User status word 1 bit 3 sel.</td></tr>
<tr><td>4</td><td>User status bit 4</td><td>Status of source selected by 06.64 User status word 1 bit 4 sel.</td></tr>
<tr><td>5</td><td>User status bit 5</td><td>Status of source selected by 06.65 User status word 1 bit 5 sel.</td></tr>
<tr><td>6</td><td>User status bit 6</td><td>Status of source selected by 06.66 User status word 1 bit 6 sel.</td></tr>
<tr><td>7</td><td>User status bit 7</td><td>Status of source selected by 06.67 User status word 1 bit 7 sel.</td></tr>
<tr><td>8</td><td>User status bit 8</td><td>Status of source selected by 06.68 User status word 1 bit 8 sel.</td></tr>
<tr><td>9</td><td>User status bit 9</td><td>Status of source selected by 06.69 User status word 1 bit 9 sel.</td></tr>
<tr><td>10</td><td>User status bit 10</td><td>Status of source selected by 06.70 User status word 1 bit 10 sel.</td></tr>
<tr><td>11</td><td>User status bit 11</td><td>Status of source selected by 06.71 User status word 1 bit 11 sel.</td></tr>
<tr><td>12</td><td>User status bit 12</td><td>Status of source selected by 06.72 User status word 1 bit 12 sel.</td></tr>
<tr><td>13</td><td>User status bit 13</td><td>Status of source selected by 06.73 User status word 1 bit 13 sel.</td></tr>
<tr><td>14</td><td>User status bit 14</td><td>Status of source selected by 06.74 User status word 1 bit 14 sel.</td></tr>
<tr><td>15</td><td>User status bit 15</td><td>Status of source selected by 06.75 User status word 1 bit 15 sel.</td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>06.60</b></td><td colspan="7"><b>User status word 1 bit 0 sel</b></td></tr>
<tr><td colspan="7">Binary source for bit 0.<br>Selects a binary source whose status is shown as 06.50.b00 User Status Word 1.<br><b>Other [bit]</b>; source selection.<br>0: <b>False</b>;<br>1: <b>True</b>;</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>06.61</b></td><td colspan="7"><b>User status word 1 bit 1 sel</b></td></tr>
<tr><td colspan="7">Binary source for bit 1.<br>Selects a binary source whose status is shown as 06.50.b01 User Status Word 1.<br><b>Other [bit]</b>; source selection.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.62** | **User status word 1 bit 2 sel** | | | | | | |
| | Binary source for bit 2.<br>Selects a binary source whose status is shown as 06.50.b02 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.63** | **User status word 1 bit 3 sel** | | | | | | |
| | Binary source for bit 3.<br>Selects a binary source whose status is shown as 06.50.b03 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.64** | **User status word 1 bit 4 sel** | | | | | | |
| | Binary source for bit 4.<br>Selects a binary source whose status is shown as 06.50.b04 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.65** | **User status word 1 bit 5 sel** | | | | | | |
| | Binary source for bit 5.<br>Selects a binary source whose status is shown as 06.50.b05 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.66** | **User status word 1 bit 6 sel** | | | | | | |
| | Binary source for bit 6.<br>Selects a binary source whose status is shown as 06.50.b06 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.67** | **User status word 1 bit 7 sel** | | | | | | |
| | Binary source for bit 7.<br>Selects a binary source whose status is shown as 06.50.b07 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.68** | **User status word 1 bit 8 sel** | | | | | | |
| | Binary source for bit 8.<br>Selects a binary source whose status is shown as 06.50.b08 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.69** | **User status word 1 bit 9 sel** | | | | | | |
| | Binary source for bit 9.<br>Selects a binary source whose status is shown as 06.50.b09 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.70** | **User status word 1 bit 10 sel** | | | | | | |
| | Binary source for bit 10.<br>Selects a binary source whose status is shown as 06.50.b10 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.71** | **User status word 1 bit 11 sel** | | | | | | |
| | Binary source for bit 11.<br>Selects a binary source whose status is shown as 06.50.b11 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.72** | **User status word 1 bit 12 sel** | | | | | | |
| | Binary source for bit 12.<br>Selects a binary source whose status is shown as 06.50.b12 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.73** | **User status word 1 bit 13 sel** | | | | | | |
| | Binary source for bit 13.<br>Selects a binary source whose status is shown as 06.50.b13 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.74** | **User status word 1 bit 14 sel** | | | | | | |
| | Binary source for bit 14.<br>Selects a binary source whose status is shown as 06.50.b14 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.75** | **User status word 1 bit 15 sel** | | | | | | |
| | Binary source for bit 15.<br>Selects a binary source whose status is shown as 06.50.b15 User Status Word 1.<br>**Other [bit]**; source selection.<br>0: **False**;<br>1: **True**; | | | | | | |
| | 0 … 1 | False | - | 1 = 1 | n | y | Parameter |
| **06.86** | **FBA A generic control word** | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | ???? | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 06.87 | **FBA B generic control word** | | | | | | |
| | ???? | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 06.88 | **FBA A profile status word** | | | | | | |
| | ???? | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 06.89 | **FBA B profile status word** | | | | | | |
| | ???? | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 06.100 | **User control word 1** | | | | | | |
| | User defined control word 1.<br>Bit assignment: | | | | | | |

| Bit | Name | Remarks |
|---|---|---|
| 0 | User control word 1 bit 0 | User defined bits. |
| 1 | User control word 1 bit 1 | |
| 2 | User control word 1 bit 2 | |
| 3 | User control word 1 bit 3 | |
| 4 | User control word 1 bit 4 | |
| 5 | User control word 1 bit 5 | |
| 6 | User control word 1 bit 6 | |
| 7 | User control word 1 bit 7 | |
| 8 | User control word 1 bit 8 | |
| 9 | User control word 1 bit 9 | |
| 10 | User control word 1 bit 10 | |
| 11 | User control word 1 bit 11 | |
| 12 | User control word 1 bit 12 | |
| 13 | User control word 1 bit 13 | |
| 14 | User control word 1 bit 14 | |
| 15 | User control word 1 bit 15 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | 0000h | - | 1 = 1 | n | y | Parameter |
| 06.101 | **User control word 2** | | | | | | |
| | User defined control word 2.<br>Bit assignment: | | | | | | |

| Bit | Name | Remarks |
|---|---|---|
| 0 | User control word 2 bit 0 | User defined bits. |
| 1 | User control word 2 bit 1 | |
| 2 | User control word 2 bit 2 | |
| 3 | User control word 2 bit 3 | |
| 4 | User control word 2 bit 4 | |
| 5 | User control word 2 bit 5 | |
| 6 | User control word 2 bit 6 | |
| 7 | User control word 2 bit 7 | |
| 8 | User control word 2 bit 8 | |
| 9 | User control word 2 bit 9 | |
| 10 | User control word 2 bit 10 | |
| 11 | User control word 2 bit 11 | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 12 User control word 2 bit 12<br>13 User control word 2 bit 13<br>14 User control word 2 bit 14<br>15 User control word 2 bit 15 | | | | | | |
| | 0000h … FFFFh | 0000h | - | 1 = 1 | n | y | Parameter |
| **06.110** | **DDCS control word** | | | | | | |
| | Displays the unaltered control word received from an DDCS controller via a DDCS communication option module (FDCO-0x). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **06.122** | **Follower status word node 2** | | | | | | |
| | Master-follower link, 06.15 Main status word from follower node 2 via master-follower link to the master (master only).<br>06.15 Main status word can be transferred from follower node 2 to the master. See group 62.<br>Bit assignment see 06.15 Main status word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **06.123** | **Follower status word node 3** | | | | | | |
| | Master-follower link, 06.15 Main status word from follower node 3 via master-follower link to the master (master only).<br>06.15 Main status word can be transferred from follower node 3 to the master. See group 62.<br>Bit assignment see 06.15 Main status word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **06.124** | **Follower status word node 4** | | | | | | |
| | Master-follower link, 06.15 Main status word from follower node 4 via master-follower link to the master (master only).<br>06.15 Main status word can be transferred from follower node 4 to the master. See group 62.<br>Bit assignment see 06.15 Main status word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

## 07 System info

The drive's hardware and firmware information.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **07.02** | **Power unit set** | | | | | | |
| | Type of power unit.<br>The value is read from 95.14 Set: Power unit (saved on the SDCS-CON-H01).<br>0: **DCS converter**; the unit is a DCS880.<br>20: **DCT controller**; the unit is a DCT880.<br>40: **TSU supply unit**; the unit is a TSU880.<br>100: **Unsupported power unit type**; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged in memory unit. This event generates fault 50FE Type code and shows 95.14 Set: Power unit.<br>Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware. | | | | | | |
| | 0 … 100 | - | - | 1 = 1 | y | n | Signal |
| **07.03** | **Drive rating ID set** | | | | | | |
| | Type of the drive.<br>The value is read from 95.25 Set: Type code (saved on the SDCS-CON-H01).<br>**Example:** DCS880-S02-1000-05 | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 520 | - | - | 1 = 1 | y | n | Signal |
| **07.04** | **Firmware name** | | | | | | |
| | Firmware identification.<br>**Example:** DCSF1 = DCS880 Firmware. | | | | | | |
| | | - | - | - | y | n | Signal |
| **07.05** | **Firmware version** | | | | | | |
| | Version number of the firmware.<br>**Example:** 1.05.0.0 = Firmware version 1.05. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.08** | **Bootloader version** | | | | | | |
| | Version number of the firmware bootloader.<br>**Example:** 2.12.0.0 = Bootloader version 2.12. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.11** | **Cpu usage** | | | | | | |
| | Microprocessor load in percent. | | | | | | |
| | 0 … 100 | - | % | 1 = 1 % | y | n | Signal |
| **07.13** | **Control unit logic version** | | | | | | |
| | Version number of the control unit logic in the FPGA on the SDCS-CON-H01.<br>**Example:** 10.10.0.0 = Firmware version 10.10. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.14** | **Ch1 power unit logic version** | | | | | | |
| | Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel 1 of the SDCS-DSL-H1x.<br>**Example:** 10.10.0.0 = Firmware version 10.10. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.15** | **Ch2 power unit logic version** | | | | | | |
| | Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel 2 of the SDCS-DSL-H1x.<br>**Example:** 10.10.0.0 = Firmware version 10.10. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.16** | **Ch3 power unit logic version** | | | | | | |
| | Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel 3 of the SDCS-DSL-H1x.<br>**Example:** 10.10.0.0 = Firmware version 10.10. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.17** | **Ch4 power unit logic version** | | | | | | |
| | Version number of the power unit logic in the FPGA on the SDCS-OPL-H01 connected to channel 4 of the SDCS-DSL-H1x.<br>**Example:** 10.10.0.0 = Firmware version 10.10. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |
| **07.19** | **Control Builder system library version** | | | | | | |
| | Version number of the Control Builder system library.<br>**Example:** 1.01.0.0 = Control Builder system library version 1.01. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0.000.0.0 … 255.255.255.255 | - | - | 1 = 1 | y | n | Signal |

**07.20** **Control Builder application**

Control Builder application information.
Information about the Control Builder application.
0: **No license**; the memory unit contains no license. No Control Builder application programming possible.
1: **No application**; the memory unit contains a license. No Control Builder application loaded.
3: **Application: see 07.23 Application name**; the memory unit contains a license. A Control Builder application is loaded. The name can be found in 07.23 Application name.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 3 | - | - | 1 = 1 | y | n | Signal |

**07.21** **Application environment status 1**

Application program task status.
Shows, which tasks of the application program are running. See Drive (IEC 61131-3) application programming manual 3AUA0000127808.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Pre task | 1 | Pre-task running. |
| 1 | Application task 1 | 1 | Task 1 running. |
| 2 | Application task 2 | 1 | Task 2 running. |
| 3 | Application task 3 | 1 | Task 3 running. |
| 4 | reserved | | |
| 5 | reserved | | |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | Task monitoring | 1 | Task monitoring enabled. |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | y | n | Signal |

**07.22** **Application environment status 2**

Application program opening status.
Shows, which tasks of the openings in the application program. See Drive (IEC 61131-3) application programming manual 3AUA0000127808.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Opening 1 | 1 | Status of opening 1 in the application program. |
| 1 | Opening 2 | 1 | Status of opening 2 in the application program. |
| 2 | Opening 3 | 1 | Status of opening 3 in the application program. |
| 3 | Opening 4 | 1 | Status of opening 4 in the application program. |
| 4 | Opening 5 | 1 | Status of opening 5 in the application program. |
| 5 | Opening 6 | 1 | Status of opening 6 in the application program. |
| 6 | Opening 7 | 1 | Status of opening 7 in the application program. |
| 7 | Opening 8 | 1 | Status of opening 8 in the application program. |
| 8 | Opening 9 | 1 | Status of opening 9 in the application program. |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 9 | Opening 10 | 1 | Status of opening 10 in the application program. |
| 10 | Opening 11 | 1 | Status of opening 11 in the application program. |
| 11 | Opening 12 | 1 | Status of opening 12 in the application program. |
| 12 | Opening 13 | 1 | Status of opening 13 in the application program. |
| 13 | Opening 14 | 1 | Status of opening 14 in the application program. |
| 14 | Opening 15 | 1 | Status of opening 15 in the application program. |
| 15 | Opening 16 | 1 | Status of opening 16 in the application program. |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | y | n | Signal |

**07.23** **Application name**

Control Builder application program name.
Displays the first five ASCII signs of the name given to the application program. The full name is visible under System info on the control panel or in the PC tool.
_N/A_: **No name**;

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| | - | - | - | y | n | Signal |

**07.24** **Application version**

Control Builder application version number.
Displays the version number given to the application program. Also visible under System info on the control panel or in the PC tool.
**Example**: 1.04.0.0 = Application program version 4.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0.000.0.0 … 255.255.255.255 | - | - | 1 = 1 | y | n | Signal |

**07.30** **Adaptive program status**

Adaptive program status.
Displays the status of the adaptive program.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Initialized | 1 | Adaptive program initialized. |
| 1 | Editing | 1 | Adaptive program is being edited. |
| 2 | Edit done | 1 | Editing of adaptive program finished. |
| 3 | Running | 1 | Adaptive program running. |
| 4 | reserved | | |
| 5 | reserved | | |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | State changing | 1 | State change in progress in adaptive programming engine. |
| 15 | Faulted | 1 | Error in adaptive program. |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**07.40** **IEC application Cpu usage peak**

Peak microprocessor load caused by the application program.
Displays the peak load of the microprocessor caused by the application program. 07.40 IEC application Cpu usage peak can be used to check the effect of a given application program on the CPU load.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | The value is in percent of an internal microprocessor quota.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0.0 … 100.0 | - | % | 10 = 1 % | y | n | Signal |
| **07.41** | **IEC application Cpu load average** | | | | | | |
| | Average microprocessor load caused by the application program.<br>Displays the average load of the microprocessor caused by the application program.<br>The value is in percent of an internal microprocessor quota. | | | | | | |
| | 0.0 … 100.0 | - | % | 10 = 1 % | y | n | Signal |
| **07.51** | **Slot 1 option module** | | | | | | |
| | Slot 1 option module.<br>Displays the option module plugged into slot 1.<br>0: **No option**; no option module plugged into slot 1.<br>1: **No communication**; no communication to option module plugged into slot 1.<br>2: **Unknown**; option module plugged into slot 1 is unknown, wrong type or not valid.<br>8: **FPBA-01**;<br>10: **FCAN-01**;<br>11: **FDNA-01**;<br>13: **FENA-11**;<br>19: **FB COMMON**;<br>22: **FSCA-01**;<br>23: **FSEA-21**;<br>25: **FECA-01**;<br>26: **FENA-21**;<br>28: **FMAC-01**;<br>29: **FCNA-01**;<br>27: **FEPL-02**;<br>33: **FPTC-01/02**;<br>34: **FDCO-01/02**;<br>1015: **FIO-01**;<br>1016: **FEN-01**;<br>1017: **FEN-11**;<br>1018: **FEN-21**;<br>1020: **FIO-11**;<br>1021: **FEN-31**;<br>1024: **FAIO-01**;<br>1025: **FDIO-01**;<br>1026: **FSE-31**; | | | | | | |
| | 0 … 65535 | - | - | 1 = 1 | y | n | Signal |
| **07.52** | **Slot 2 option module** | | | | | | |
| | Slot 2 option module.<br>Displays the option module plugged into slot 2.<br>For values, see 07.51 Slot 1 option module. | | | | | | |
| | 0 … 65535 | - | - | 1 = 1 | y | n | Signal |
| **07.53** | **Slot 3 option module** | | | | | | |
| | Slot 3 option module.<br>Displays the option module plugged into slot 3.<br>For values, see 07.51 Slot 1 option module. | | | | | | |
| | 0 … 65535 | - | - | 1 = 1 | y | n | Signal |
| **07.60** | **Drive size** | | | | | | |
| | Recognized drive size.<br>Read from 95.25 Set: Type code.<br>0: **None**; when 95.25 Set: Type code = None. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 1: **H1**; drive size H1.<br>2: **H2**; drive size H2.<br>3: **H3**; drive size H3.<br>4: **H4**; drive size H4.<br>5: **H5**; drive size H5.<br>6: **H6**; drive size H6.<br>7: **H7**; drive size H7.<br>8: **H8**; drive size H8.<br>9: **Manual set**; set by user. 95.27 Set: Drive DC current scaling and/or 95.28 Set: Drive AC voltage scaling have been changed for e.g. rebuild kits. | | | | | | |
| | 0 … 9 | - | - | 1 = 1 | y | n | Signal |
| **07.61** | **Drive block bridge 2 set** | | | | | | |
| | Recognized drive quadrant type.<br>Displays the quadrant type of the drive (1 or 2 bridges). Read from 95.25 Set: Type code or set with 95.26 Set: Drive block bridge 2:<br>– Read from 95.25 Set: Type code, if 95.26 Set: Drive block bridge 2= 0.<br>– Read from 95.26 Set: Drive block bridge 2, if 95.26 Set: Drive block bridge 2 ≠ 0.<br>1: **Block bridge 2**; (reverse) bridge 2 blocked ≡ 2-Q operation.<br>2: **Release bridge 2**; (reverse) bridge 2 released ≡ 4-Q operation. | | | | | | |
| | 0 … 2 | - | - | 1 = 1 | y | n | Signal |
| **07.62** | **Drive DC current scaling set** | | | | | | |
| | Recognized drive nominal DC current.<br>Displays the drive nominal DC current measurement circuit. Adjustment of DC current measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). Read from 95.25 Set: Type code or set with 95.27 Set: Drive DC current scaling:<br>– Read from 95.25 Set: Type code, if 95.27 Set: Drive DC current scaling = 0.<br>Read from 95.27 Set: Drive DC current scaling, if 95.27 Set: Drive DC current scaling ≠ 0. | | | | | | |
| | 0 … 32500 | - | A | 1 = 1 A | y | n | Signal |
| **07.63** | **Drive DC overcurrent level** | | | | | | |
| | Drive DC overcurrent level.<br>Displays the drive current tripping level. This signal is set during initialization of the drive. New values are shown after the next power-up.<br>Drive DC overcurrent scaling:<br>2.3 • 95.25 Set: Type code, if 95.27 Set: Drive DC current scaling = 0.<br>2.3 • 95.27 Set: Drive DC current scaling, if 95.27 Set: Drive DC current scaling ≠ 0. | | | | | | |
| | 0 … 32500 | - | A | 1 = 1 A | y | n | Signal |
| **07.64** | **Drive AC voltage scaling set** | | | | | | |
| | Recognized drive nominal AC voltage.<br>Displays the drive nominal AC voltage measurement circuit. Adjustment of AC voltage measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). Read from 95.25 Set: Type code or set with 95.28 Set: Drive AC voltage scaling:<br>– Read from 95.25 Set: Type code, if 95.28 Set: Drive AC voltage scaling = 0.<br>Read from 95.28 Set: Drive AC voltage scaling, if 95.28 Set: Drive AC voltage scaling ≠ 0. | | | | | | |
| | 0.0 … 3250.0 | - | V | 10 = 1 V | y | n | Signal |
| **07.65** | **Drive max bridge temperature set** | | | | | | |
| | Recognized drive maximum bridge temperature.<br>Displays the drive maximum bridge temperature. Read from 95.25 Set: Type code or set with 95.29 Set: Drive max bridge temperature:<br>– Read from 95.25 Set: Type code, if 95.29 Set: Drive max bridge temperature = 0.<br>– Read from 95.29 Set: Drive max bridge temperature, if 95.29 Set: Drive max bridge temperature ≠ 0. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">The event generates fault 4310 Bridge temperature measured when 07.65 Drive max bridge temperature set is reached. The event generates warning A4B0 Bridge temperature measured is set, when the measured bridge temperature is approximately 5° below 07.65 Drive max bridge temperature.<br>The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td></td><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>07.68</b></td><td colspan="7"><b>M1 field exciter type</b></td></tr>
<tr><td></td><td colspan="7">Motor 1 field exciter type.<br>Read from 99.07 M1 used field exciter type.<br>0: <b>None</b>; no or third party field exciter connected.<br>1: <b>OnBoard</b>; integrated 1-Q field exciter (for sizes H1 … H4 only).<br>2: <b>DCF803-0016</b>; external 1-Q 16 A field exciter used for field currents from 0.3 A to 16 A.<br>3: <b>FEX-425-Int</b>; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A to 25 A.<br>4: <b>DCF803-0035</b>; external 1-Q 35 A field exciter used for field currents from 0.3 A to 35 A.<br>5: <b>DCF803 terminal 5 A</b>; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A to 5 A.<br><b>Note</b>: Use 5 A terminals.<br>6: <b>DCF803-0050</b>; external 1-Q 50 A field exciter.<br>7: <b>DCF804-0050</b>; external 4-Q 50 A field exciter.<br>8: <b>DCF803-0060</b>; external 1-Q 60 A field exciter.<br>9: <b>DCF804-0060</b>; external 4-Q 60 A field exciter.<br>10: <b>DCS880-S01</b>; external 2-Q standard DCS880 module.<br>11: <b>DCS880-S02</b>; external 4-Q standard DCS880 module.<br>16: <b>External field exciter via AI1</b>; third party field exciter, acknowledge via AI1.<br>17: <b>External field exciter via AI2</b>; third party field exciter, acknowledge via AI2.<br>18: <b>External field exciter via AI3</b>; third party field exciter, acknowledge via AI3.<br>19: <b>Multiple field exciters</b>; see DCS880 Multiple field exciters motor control (3ADW000xxx).</td></tr>
<tr><td></td><td>0 … 19</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>07.69</b></td><td colspan="7"><b>M1 field exciter firmware version</b></td></tr>
<tr><td></td><td colspan="7">Version number of Motor 1 field exciter firmware.<br><b>Example</b>: 1.02.0.0 = Firmware version 2.</td></tr>
<tr><td></td><td>0.000.0.0 …<br>255.255.255.255</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>07.72</b></td><td colspan="7"><b>M2 field exciter type</b></td></tr>
<tr><td></td><td colspan="7">Motor 2 field exciter type.<br>Read from 42.49 M2 used field exciter type.<br>0: <b>None</b>; no or third party field exciter connected.<br>1: <b>OnBoard</b>; integrated 1-Q field exciter (for sizes H1 … H4 only).<br>2: <b>DCF803-0016</b>; external 1-Q 16 A field exciter used for field currents from 0.3 A to 16 A.<br>3: <b>FEX-425-Int</b>; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A to 25 A.<br>4: <b>DCF803-0035</b>; external 1-Q 35 A field exciter used for field currents from 0.3 A to 35 A.<br>5: <b>DCF803 terminal 5 A</b>; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A to 5 A.<br><b>Note</b>: Use 5 A terminals.<br>6: <b>DCF803-0050</b>; external 1-Q 50 A field exciter.<br>7: <b>DCF804-0050</b>; external 4-Q 50 A field exciter.<br>8: <b>DCF803-0060</b>; external 1-Q 60 A field exciter.<br>9: <b>DCF804-0060</b>; external 4-Q 60 A field exciter.<br>10: <b>DCS880-S01</b>; external 2-Q standard DCS880 module.</td></tr>
</table>

| Index | Name | | | | | |
|---|---|---|---|---|---|---|
| | **Text** | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 11: **DCS880-S02**; external 4-Q standard DCS880 module.<br>16: **External field exciter via AI1**; third party field exciter, acknowledge via AI1.<br>17: **External field exciter via AI2**; third party field exciter, acknowledge via AI2.<br>18: **External field exciter via AI3**; third party field exciter, acknowledge via AI3.<br>19: **Multiple field exciters**; see DCS880 Multiple field exciters motor control (3ADW000xxx). | | | | | | |
| | 0 … 19 | - | - | 1 = 1 | y | n | Signal |
| **07.73** | **M2 field exciter firmware version** | | | | | | |
| | Version number of Motor 2 field exciter firmware.<br>**Example**: 1.01.0.0 = Firmware version 1. | | | | | | |
| | 0.000.0.0 …<br>255.255.255.255 | - | - | 1 = 1 | y | n | Signal |

## 10 Standard DI, RO

Configuration of digital inputs and relay outputs.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **10.01** | **DI status** | | | | | | |
| | Status of digital inputs.<br>Displays the electrical status of DI1 … DI6 and DIL. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 10.51 DI filter time.<br>Bits 0 … 5 reflect the status of DI1 … DI6. Bit 15 reflects the status of the DIL input.<br>**Example**: 1000000000010011b = DIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.<br>Bit assignment: | | | | | | |

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DI1 | 1 | On. |
| 1 | DI2 | 1 | On. |
| 2 | DI3 | 1 | On. |
| 3 | DI4 | 1 | On. |
| 4 | DI5 | 1 | On. |
| 5 | DI6 | 1 | On. |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | DIL | 1 | On. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **10.02** | **DI delayed status** | | | | | | |
| | Delayed status of digital inputs.<br>Displays the delayed status of DI1 … DI6 and DIL. This word is updated only after activation/deactivation delays (if any are specified).<br>Bits 0 … 5 reflect the delayed status of DI1 … DI6. Bit 15 reflects the delayed status of the DIL input. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

**Example**: 1000000000010011b = DIL, DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DI1 | 1 | On. |
| 1 | DI2 | 1 | On. |
| 2 | DI3 | 1 | On. |
| 3 | DI4 | 1 | On. |
| 4 | DI5 | 1 | On. |
| 5 | DI6 | 1 | On. |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | DIL | 1 | On. |

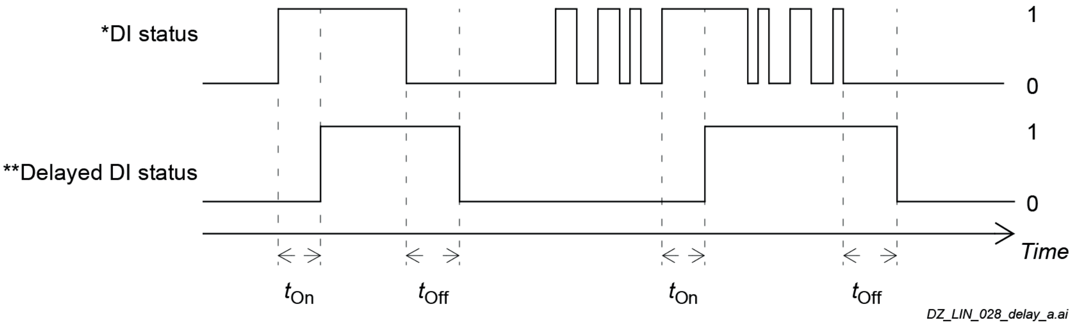
| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**10.03** **DI force selection**

Override selection for digital inputs.
The electrical status of DI1 … DI6 and DIL can be overridden for e.g. testing purposes. A bit in 10.04 DI force data is provided for each digital input and its value is applied whenever the corresponding bit in 10.03 DI force selection is 1.
Bit assignment:

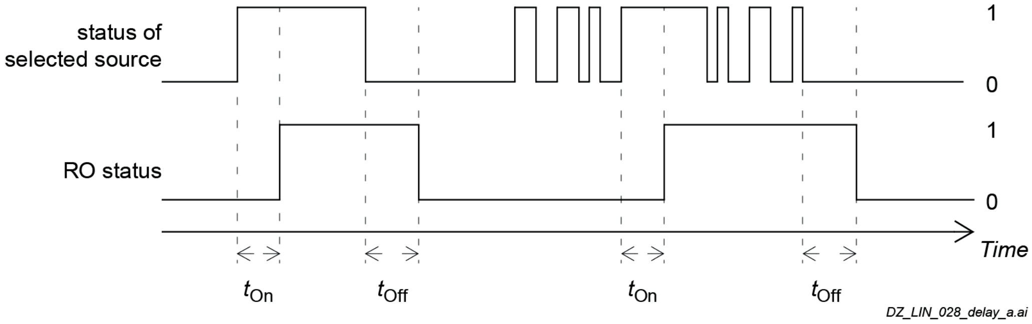
| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DI1 | 1 | Force DI1 to value of bit 0 of 10.04 DI force data. |
| 1 | DI2 | 1 | Force DI2 to value of bit 1 of 10.04 DI force data. |
| 2 | DI3 | 1 | Force DI3 to value of bit 2 of 10.04 DI force data. |
| 3 | DI4 | 1 | Force DI4 to value of bit 3 of 10.04 DI force data. |
| 4 | DI5 | 1 | Force DI5 to value of bit 4 of 10.04 DI force data. |
| 5 | DI6 | 1 | Force DI6 to value of bit 5 of 10.04 DI force data. |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | DIL | 1 | Force DIL to value of bit 15 of 10.04 DI force data. |

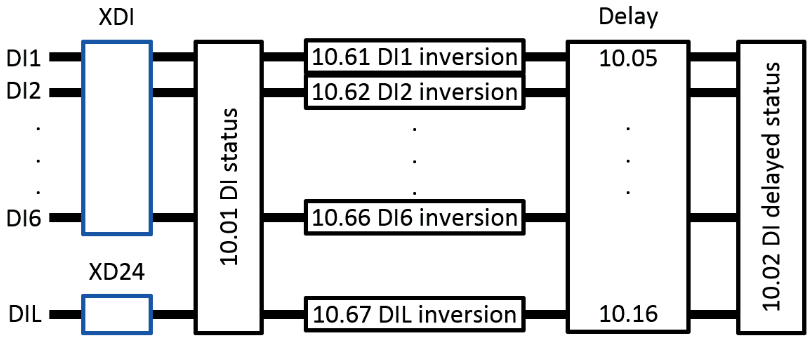
| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 10.03 | 0000h … FFFFh | 0000h | - | 1 = 1 | y | y | Parameter |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>10.04</b></td><td colspan="7"><b>DI force data</b></td></tr>
<tr><td colspan="7">Forced values of digital inputs.<br>Allows the data value of a forced DI1 … DI6 and DIL to be changed from 0 to 1. It is only possible to force an input that has been selected in 10.03 DI force selection.<br>Bits 0 … 5 are the forced values for DI1 … DI6. Bit 15 is the forced value for the DIL input.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DI1</td><td>1</td><td>Force DI1 to on.</td></tr>
<tr><td>1</td><td>DI2</td><td>1</td><td>Force DI2 to on.</td></tr>
<tr><td>2</td><td>DI3</td><td>1</td><td>Force DI3 to on.</td></tr>
<tr><td>3</td><td>DI4</td><td>1</td><td>Force DI4 to on.</td></tr>
<tr><td>4</td><td>DI5</td><td>1</td><td>Force DI5 to on.</td></tr>
<tr><td>5</td><td>DI6</td><td>1</td><td>Force DI6 to on.</td></tr>
<tr><td>6</td><td>reserved</td><td></td><td></td></tr>
<tr><td>7</td><td>reserved</td><td></td><td></td></tr>
<tr><td>8</td><td>reserved</td><td></td><td></td></tr>
<tr><td>9</td><td>reserved</td><td></td><td></td></tr>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>reserved</td><td></td><td></td></tr>
<tr><td>12</td><td>reserved</td><td></td><td></td></tr>
<tr><td>13</td><td>reserved</td><td></td><td></td></tr>
<tr><td>14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>DIL</td><td>1</td><td>Force DIL to on.</td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>10.05</b></td><td colspan="7"><b>DI1 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for digital input DI1.<br>Defines the activation delay for DI1.<br><br> <br>$t_{On}$ = 10.05 DI1 ON delay<br>$t_{Off}$ = 10.06 DI1 OFF delay<br>*Electrical status of digital input. Indicated by 10.01 DI status.<br>**Indicated by 10.02 DI delayed status.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>10.06</b></td><td colspan="7"><b>DI1 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI1.<br>Defines the deactivation delay for DI1.<br>See 10.05 DI1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| **10.07** | **DI2 ON delay** | | | | | | |
| | Activation delay for digital input DI2.<br>Defines the activation delay for DI2.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.08** | **DI2 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI2.<br>Defines the deactivation delay for DI2.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.09** | **DI3 ON delay** | | | | | | |
| | Activation delay for digital input DI3.<br>Defines the activation delay for DI3.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.10** | **DI3 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI3.<br>Defines the deactivation delay for DI3.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.11** | **DI4 ON delay** | | | | | | |
| | Activation delay for digital input DI4.<br>Defines the activation delay for DI4.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.12** | **DI4 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI4.<br>Defines the deactivation delay for DI4.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.13** | **DI5 ON delay** | | | | | | |
| | Activation delay for digital input DI5.<br>Defines the activation delay for DI5.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.14** | **DI5 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI5.<br>Defines the deactivation delay for DI5.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.15** | **DI6 ON delay** | | | | | | |
| | Activation delay for digital input DI6.<br>Defines the activation delay for DI6.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.16** | **DI6 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI6.<br>Defines the deactivation delay for DI6.<br>See 10.05 DI1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>10.21</b></td><td colspan="7"><b>RO status</b></td></tr>
<tr><td colspan="7">Status of relay outputs.<br>Displays the status of RO1 … RO3 and the output for the mains contactor (XSMC:1/2).<br><b>Example</b>: 0000000000000001b = RO1 is energized, RO2 … RO3 are de-energized and XSMC:1/2 is off.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>RO1</td><td>1</td><td>Energized.</td></tr>
<tr><td>1</td><td>RO2</td><td>1</td><td>Energized.</td></tr>
<tr><td>2</td><td>RO3</td><td>1</td><td>Energized.</td></tr>
<tr><td>3 … 14</td><td>reserved</td><td></td><td></td></tr>
<tr><td>15</td><td>XSMC:1/2</td><td>1</td><td>On.</td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>10.24</b></td><td colspan="7"><b>RO1 source</b></td></tr>
<tr><td colspan="7">Source for relay output RO1.<br>Selects a signal/parameter bit to be connected to RO1.<br><b>Other [bit]</b>; source selection.<br>0: <b>Not energized</b>; output is not energized.<br>1: <b>Energized</b>; output is energized.<br>2: <b>Ready run</b>; 06.15.b01 Main status word.<br>3: <b>Ready on</b>; 06.15.b00 Main status word.<br>4: <b>Enabled</b>; 06.16.b02 Drive status word 1.<br>8: <b>Ready reference</b>; 06.15.b02 Main status word.<br>9: <b>At setpoint</b>; 06.15.b08 Main status word.<br>10: <b>Reverse</b>; 06.21.b02 Speed control status word.<br>11: <b>Zero speed</b>; 06.21.b00 Speed control status word.<br>12: <b>Above limit</b>; 06.17.b10 Drive status word 2.<br>13: <b>Warning</b>; 06.15.b07 Main status word.<br>14: <b>Tripped</b>; 06.15.b03 Main status word.<br>15: <b>Tripped (-1)</b>; 06.15.b03 Main status word inverted.<br>22: <b>Brake open command</b>; 44.01.b00 Brake control status (mechanical brake).<br>24: <b>Remote</b>; 06.11.b09 Main status word.<br>25: <b>Tripped or warning</b>; 06.18.b12 Drive status word 3.<br>30: <b>Fans on</b>; 06.24.b00 Current controller status word 1.<br>31: <b>Field exciter on</b>; 06.24.b05 Current controller status word 1.<br>32: <b>Close dynamic braking contactor</b>; 06.24.b08 Current controller status word 1.<br>33: <b>Close US style DC contactor</b>; 06.24.b10 Current controller status word 1.<br>34: <b>Trip DC-breaker (pulse)</b>; 06.24.b15 Current controller status word 1.<br>40: <b>RO/DIO control word bit 0</b>; 10.99.b00 RO/DIO control word.<br>41: <b>RO/DIO control word bit 1</b>; 10.99.b01 RO/DIO control word.<br>42: <b>RO/DIO control word bit 2</b>; 10.99.b02 RO/DIO control word.<br>43: <b>RO/DIO control word bit 8</b>; 10.99.b08 RO/DIO control word.<br>44: <b>RO/DIO control word bit 9</b>; 10.99.b09 RO/DIO control word.<br>50: <b>STO reset indication</b>; 31.91.b07 STO Reset Indication. Reset of safety relay permitted.</td></tr>
<tr><td>0 … 50</td><td>STO reset indication</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>10.25</b></td><td colspan="7"><b>RO1 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for relay output RO1.<br>Defines the activation delay for RO1.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| |  <br>$t_{On}$ = 10.25 RO1 ON delay<br>$t_{Off}$ = 10.26 RO1 OFF delay | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.26** | **RO1 OFF delay** | | | | | | |
| | Deactivation delay for relay output RO1.<br>Defines the deactivation delay for RO1.<br>See 10.25 RO1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.27** | **RO2 source** | | | | | | |
| | Source for relay output RO2.<br>Selects a signal/parameter bit to be connected to RO2.<br>See 10.24 RO1 source. | | | | | | |
| | 0 … 50 | Ready on | - | 1 = 1 | n | y | Parameter |
| **10.28** | **RO2 ON delay** | | | | | | |
| | Activation delay for relay output RO2.<br>Defines the activation delay for RO2.<br>See 10.25 RO1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.29** | **RO2 OFF delay** | | | | | | |
| | Deactivation delay for relay output RO2.<br>Defines the deactivation delay for RO2.<br>See 10.25 RO1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.30** | **RO3 source** | | | | | | |
| | Source for relay output RO3.<br>Selects a signal/parameter bit to be connected to RO3.<br>See 10.24 RO1 source. | | | | | | |
| | 0 … 50 | Ready reference | - | 1 = 1 | n | y | Parameter |
| **10.31** | **RO3 ON delay** | | | | | | |
| | Activation delay for relay output RO3.<br>Defines the activation delay for RO3<br>See 10.25 RO1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.32** | **RO3 OFF delay** | | | | | | |
| | Deactivation delay for relay output RO3.<br>Defines the deactivation delay for RO3.<br>See 10.25 RO1 ON delay. | | | | | | |
| | 0.0 … 3000.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **10.51** | **DI filter time** | | | | | | |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Filter time constant for 10.01 DI status.<br>Defines a filter time constant for 10.01 DI status. | | | | | | |
| | 0.3 … 100.0 | 10.0 | ms | 10 = 1 ms | n | y | Parameter |
| **10.61** | **DI1 inversion** | | | | | | |
| | Inverts digital input DI1.<br>Inversion selection for digital input DI1.<br><br> <br>0: **Direct**; digital input DI1 is not inverted.<br>1: **Inverted**; digital input DI1 is not inverted. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.62** | **DI2 inversion** | | | | | | |
| | Inverts digital input DI2.<br>Inversion selection for digital input DI2.<br>See 10.61 DI1 inversion. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.63** | **DI3 inversion** | | | | | | |
| | Inverts digital input DI3.<br>Inversion selection for digital input DI3.<br>See 10.61 DI1 inversion. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.64** | **DI4 inversion** | | | | | | |
| | Inverts digital input DI4.<br>Inversion selection for digital input DI4.<br>See 10.61 DI1 inversion. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.65** | **DI5 inversion** | | | | | | |
| | Inverts digital input DI5.<br>Inversion selection for digital input DI5.<br>See 10.61 DI1 inversion. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.66** | **DI6 inversion** | | | | | | |
| | Inverts digital input DI6.<br>Inversion selection for digital input DI6.<br>See 10.61 DI1 inversion. | | | | | | |
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.67** | **DIL inversion** | | | | | | |
| | Inverts digital input DIL.<br>Inversion selection for digital input DIL.<br>See 10.61 DI1 inversion. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 1 | Direct | - | 1 = 1 | n | y | Parameter |
| **10.99** | **RO/DIO control word** | | | | | | |
| | Control word for relay outputs (RO) and digital inputs/outputs (DIO).<br>Storage parameter to control relay outputs and digital inputs/outputs via e.g. a fieldbus.<br>To control the relay outputs and the digital inputs/outputs of the drive, send a control word with the bit assignments shown below e.g. as Modbus I/O data (see 58.101 Data I/O 1 … 58.124 Data I/O 24).<br>Example for relay output RO1:<br>58.101 Data I/O 1 = RO/DIO control word and 10.24 RO1 source = RO/DIO control word bit 0.<br>Bit assignment: | | | | | | |

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | RO1 | 1 | Energized. Bit for relay output RO1. See 10.24 RO1 source. |
| 1 | RO2 | 1 | Energized. Bit for relay output RO2. See 10.27 RO2 source. |
| 2 | RO3 | 1 | Energized. Bit for relay output RO3. See 10.30 RO3 source. |
| 3 | reserved | | |
| 4 | reserved | | |
| 5 | reserved | | |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | DIO1 | 1 | Energized. Bit for digital input/output DIO1. See 11.06 DIO1 output source. |
| 9 | DIO2 | 1 | Energized. Bit for digital input/output DIO2. See 11.10 DIO2 output source. |
| 10 … 15 | reserved | | |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | n | y | Parameter |

## 11 Standard DIO, FI, FO

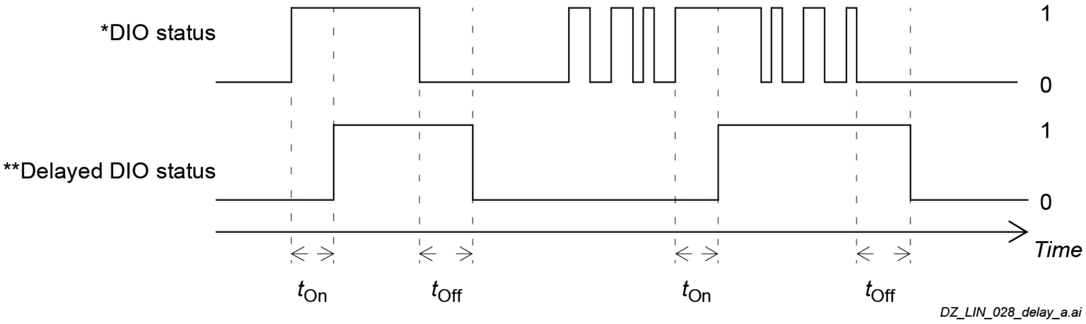
Configuration of digital input/outputs and frequency inputs/outputs.

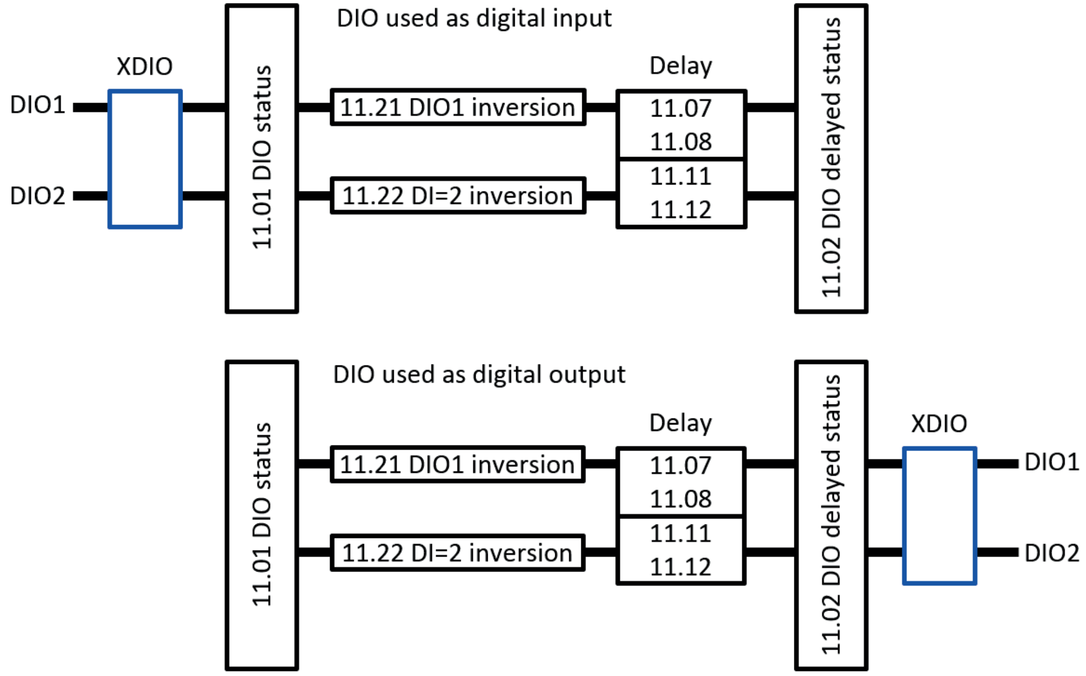
| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **11.01** | **DIO status** | | | | | | |
| | Status of digital inputs/outputs.<br>Displays the status of DIO1 … DIO2. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) is defined by 11.81 DIO filter time.<br>Bits 0 … 1 reflect the status of DIO1 … DIO2.<br>**Example**: 0000000000000010b = DIO2 is on, DIO1 is off.<br>Bit assignment: | | | | | | |

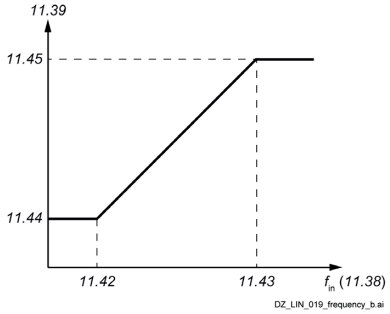
| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DIO1 | 1 | On. |
| 1 | DIO2 | 1 | On. |
| 2 … 15 | reserved | | |

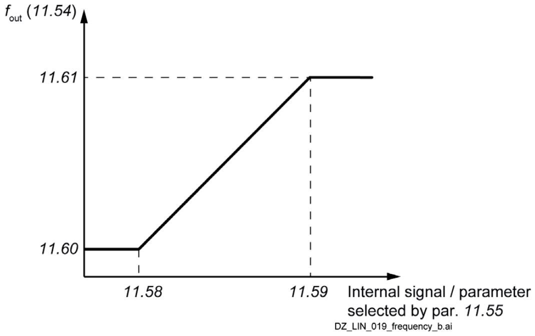
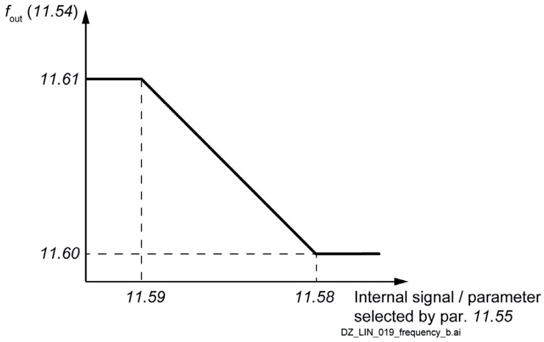
| Index | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **11.02** | **DIO delayed status** | | | | | | |
| | Delayed status of digital inputs/outputs. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Displays the delayed status of DIO1 … DIO2. This word is updated only after activation/deactivation delays (if any are specified).<br>Bits 0 … 1 reflect the status of DIO1 … DIO2.<br><b>Example</b>: 000000000000010b = DIO2 is on, DIO1 is off.<br>Bit assignment:<br><table><tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr><tr><td>0</td><td>DIO1</td><td>1</td><td>On.</td></tr><tr><td>1</td><td>DIO2</td><td>1</td><td>On.</td></tr><tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr></table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>11.05</b></td><td colspan="7"><b>DIO1 function</b></td></tr>
<tr><td></td><td colspan="7">Function of digital input/output DIO1.<br>Selects whether DIO1 is used as a digital output or input, or a frequency input.<br>0: <b>Output</b>; DIO1 is used as a digital output.<br>1: <b>Input</b>; DIO1 is used as a digital input.<br>2: <b>Frequency</b>; DIO1 is used as a <b>frequency input</b>.</td></tr>
<tr><td></td><td>0 … 2</td><td>Output</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>11.06</b></td><td colspan="7"><b>DIO1 output source</b></td></tr>
<tr><td></td><td colspan="7">Source for digital input/output DIO1.<br>Selects a signal/parameter bit to be connected to DIO1 when parameter 11.05 DIO1 function = Output.<br><b>Other [bit]</b>; source selection.<br>0: <b>Not energized</b>; output is not energized.<br>1: <b>Energized</b>; output is energized.<br>2: <b>Ready run</b>; 06.15.b01 Main status word.<br>3: <b>Ready on</b>; 06.15.b00 Main status word.<br>4: <b>Enabled</b>; 06.16.b02 Drive status word 1.<br>8: <b>Ready reference</b>; 06.15.b02 Main status word.<br>9: <b>At setpoint</b>; 06.15.b08 Main status word.<br>10: <b>Reverse</b>; 06.21.b02 Speed control status word.<br>11: <b>Zero speed</b>; 06.21.b00 Speed control status word.<br>12: <b>Above limit</b>; 06.17.b10 Drive status word 2.<br>13: <b>Warning</b>; 06.15.b07 Main status word.<br>14: <b>Tripped</b>; 06.15.b03 Main status word.<br>15: <b>Tripped (-1)</b>; 06.15.b03 Main status word inverted.<br>22: <b>Brake open command</b>; 44.01.b00 Brake control status (mechanical brake).<br>24: <b>Remote</b>; 06.11.b09 Main status word.<br>25: <b>Tripped or warning</b>; 06.18.b12 Drive status word 3.<br>30: <b>Fans on</b>; 06.24.b00 Current controller status word 1.<br>31: <b>Field exciter on</b>; 06.24.b05 Current controller status word 1.<br>32: <b>Close dynamic braking contactor</b>; 06.24.b08 Current controller status word 1.<br>33: <b>Close US style DC contactor</b>; 06.24.b10 Current controller status word 1.<br>34: <b>Trip DC-breaker (pulse)</b>; 06.24.b15 Current controller status word 1.<br>40: <b>RO/DIO control word bit 0</b>; 10.99.b00 RO/DIO control word.<br>41: <b>RO/DIO control word bit 1</b>; 10.99.b01 RO/DIO control word.<br>42: <b>RO/DIO control word bit 2</b>; 10.99.b02 RO/DIO control word.<br>43: <b>RO/DIO control word bit 8</b>; 10.99.b08 RO/DIO control word.<br>44: <b>RO/DIO control word bit 9</b>; 10.99.b09 RO/DIO control word.<br>50: <b>STO reset indication</b>; 31.91.b07 STO Reset Indication. Reset of safety relay permitted.</td></tr>
<tr><td></td><td>0 … 50</td><td>Tripped (-1)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>11.07</b></td><td colspan="7"><b>DIO1 ON delay</b></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Activation delay for digital input/output DIO1.<br>Defines the activation delay for DIO1 (when used as a digital output or digital input).<br> <br>$t_{On}$ = 11.07 DIO1 ON delay<br>$t_{Off}$ = 11.08 DIO1 OFF delay<br>*Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 11.01 DIO status.<br>**Indicated by 11.02 DIO delayed status.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**11.08**</td><td colspan="7">**DIO1 OFF delay**</td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO1.<br>Defines the deactivation delay for DIO1 (when used as a digital output or digital input).<br>See 11.07 DIO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**11.09**</td><td colspan="7">**DIO2 function**</td></tr>
<tr><td colspan="7">Function of digital input/output DIO2.<br>Selects whether DIO2 is used as a digital output or input, or a frequency output.<br>0: **Output**; DIO2 is used as a digital output.<br>1: **Input**; DIO2 is used as a digital input.<br>2: **Frequency**; DIO2 is used as a **frequency output**.</td></tr>
<tr><td>0 … 2</td><td>Output</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**11.10**</td><td colspan="7">**DIO2 output source**</td></tr>
<tr><td colspan="7">Source for digital input/output DIO2.<br>Selects a signal/parameter bit to be connected to DIO2 when 11.09 DIO2 function = Output.<br>See 11.06 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Warning</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**11.11**</td><td colspan="7">**DIO2 ON delay**</td></tr>
<tr><td colspan="7">Activation delay for digital input/output DIO2.<br>Defines the activation delay for DIO2 (when used as a digital output or digital input).<br>See 11.07 DIO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**11.12**</td><td colspan="7">**DIO2 OFF delay**</td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO2.<br>Defines the deactivation delay for DIO2 (when used as a digital output or digital input).<br>See 11.07 DIO1 ON delay.</td></tr>
<tr><td>0.0 … 3000.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**11.21**</td><td colspan="7">**DIO1 inversion**</td></tr>
<tr><td colspan="7">Inverts digital input/output DIO1.<br>Inversion selection for digital input/output DIO1.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<br>0: <b>Direct</b>; digital input DI1 is not inverted.<br>1: <b>Inverted</b>; digital input DI1 is not inverted.</td></tr>
<tr><td>0 … 1</td><td>Direct</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>11.22</b></td><td colspan="7"><b>DIO2 inversion</b></td></tr>
<tr><td colspan="7">Inverts digital input/output DIO2.<br>Inversion selection for digital input/output DIO2.<br>See 11.21 DIO1 inversion.</td></tr>
<tr><td>0 … 1</td><td>Direct</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>11.38</b></td><td colspan="7"><b>Freq in 1 actual value</b></td></tr>
<tr><td colspan="7">Unscaled value of frequency input 1.<br>Displays the value of frequency input 1 in Hz (via DIO1 when it is used as a frequency input) before scaling.<br>See 11.42 Freq in 1 min.</td></tr>
<tr><td>0 … 16000</td><td>-</td><td>Hz</td><td>1 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>11.39</b></td><td colspan="7"><b>Freq in 1 scaled</b></td></tr>
<tr><td colspan="7">Scaled value of frequency input 1.<br>Displays the value of frequency input 1 (via DIO1 when it is used as a frequency input) after scaling.<br>See 11.42 Freq in 1 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>11.42</b></td><td colspan="7"><b>Freq in 1 min</b></td></tr>
<tr><td colspan="7">Minimum frequency of frequency input 1 (DIO 1).<br>Defines the minimum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input).<br>Parameters 11.42 and 11.43 set the low and high limit of the frequency input signal in Hz. Scaling parameters 11.44 and 11.45 define the internal values that correspond to these limits as follows:</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| |  | | | | | | |
| | 0 … 16000 | 0 | Hz | 1 = 1 Hz | n | y | Parameter |
| **11.43** | **Freq in 1 max** | | | | | | |
| | Maximum frequency for frequency input 1 (DIO 1).<br>Defines the maximum input frequency for frequency input 1 in Hz (via DIO1 when it is used as a frequency input).<br>See 11.42 Freq in 1 min. | | | | | | |
| | 0 … 16000 | 16000 | Hz | 1 = 1 Hz | n | y | Parameter |
| **11.44** | **Freq in 1 at scaled min** | | | | | | |
| | Internal value corresponding to the minimum value of frequency input 1 (DIO 1).<br>Defines the value that corresponds internally to the minimum input frequency defined by 11.42 Freq in 1 min (via DIO1 when it is used as a frequency input).<br>See 11.42 Freq in 1 min. | | | | | | |
| | -32768.000 … 32767.000 | 0.000 | - | 1 = 1 | n | y | Parameter |
| **11.45** | **Freq in 1 at scaled max** | | | | | | |
| | Internal value corresponding to the maximum value of frequency input 1 (DIO 1).<br>Defines the value that corresponds internally to the maximum input frequency defined by 11.43 Freq in 1 max (via DIO1 when it is used as a frequency input).<br>See 11.42 Freq in 1 min. | | | | | | |
| | -32768.000 … 32767.000 | 1500.000 | - | 1 = 1 | n | y | Parameter |
| **11.54** | **Freq out 1 actual value** | | | | | | |
| | Value of frequency output 1 (DIO 2).<br>Displays the value of frequency output 1 after scaling in Hz (via DIO2 when it is used as a frequency output).<br>See 11.58 Freq out 1 src min. | | | | | | |
| | 0 … 16000 | - | Hz | 1 = 1 Hz | y | n | Signal |
| **11.55** | **Freq out 1 source** | | | | | | |
| | Source for frequency output 1 (DIO 2).<br>Selects a signal/parameter to be connected to frequency output 1 (via DIO2 when it is used as a frequency output).<br>**Other**; source selection.<br>0: **Zero**; not in use.<br>1: **Used motor speed**; 01.01 Used motor speed filtered.<br>4: **Motor current**; 01.10 Motor current in A.<br>6: **Motor torque**; 01.17 Motor torque filtered.<br>8: **Output power**; 01.24 Output power in kW.<br>10: **Speed reference ramp input**; 23.01 Speed reference ramp input.<br>11: **Speed reference ramp output**; 23.02 Speed reference ramp output.<br>12: **Used speed reference**; 24.01 Used speed reference.<br>13: **Torque reference used**; 26.02 Torque reference used.<br>16: **Process PID output actual**; 40.01 Process PID output actual. | | | | | | |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 17: **Process PID feedback actual**; 40.02 Process PID feedback actual.<br>18: **Process PID setpoint actual**; 40.03 Process PID setpoint actual.<br>19: **Process PID deviation actual**; 40.04 Process PID deviation actual. | | | | | | |
| | 0 … 19 | Zero | - | 1 = 1 | n | y | Parameter |
| **11.58** | **Freq out 1 src min** | | | | | | |
| | Internal value corresponding to minimum value of frequency output 1 (DIO 2).<br>Defines the internal value that corresponds to the minimum frequency of frequency output 1 (via DIO2 when it is used as a frequency output).<br>Scaling parameters 11.58 and 11.59 set the low and high internal limits that corresponds to the frequency output values in Hz defined by parameters 11.60 and 11.61:<br><br> <br>Setting parameter 11.58 as maximum value and parameter 11.59 as minimum value inverts the output:<br><br> | | | | | | |
| | -32768.000 … 32767.000 | 0.000 | - | 1 = 1 | n | y | Parameter |
| **11.59** | **Freq out 1 src max** | | | | | | |
| | Internal value corresponding to maximum value of frequency output 1 (DIO 2).<br>Defines the internal value that corresponds to the maximum frequency of frequency output 1 (via DIO2 when it is used as a frequency output).<br>See 11.58 Freq out 1 src min. | | | | | | |
| | -32768.000 … 32767.000 | 1500.000 | - | 1 = 1 | n | y | Parameter |
| **11.60** | **Freq out 1 at src min** | | | | | | |
| | Minimum value of frequency output 1 (DIO 2).<br>Defines the minimum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output).<br>See 11.58 Freq out 1 src min. | | | | | | |
| | 0 … 16000 | 0 | Hz | 1 = 1 Hz | n | y | Parameter |
| **11.61** | **Freq out 1 at src max** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Maximum value of frequency output 1 (DIO 2).<br>Defines the maximum frequency of frequency output 1 in Hz (via DIO2 when it is used as a frequency output).<br>See 11.58 Freq out 1 src min. | | | | | | |
| | 0 … 16000 | 16000 | Hz | 1 = 1 Hz | n | y | Parameter |
| 11.81 | **DIO filter time** | | | | | | |
| | Filter time constant for 11.01 DIO status.<br>Defines a filter time constant for 11.01 DIO status. | | | | | | |
| | 0.3 … 100.0 | 10.0 | ms | 10 = 1 ms | n | y | Parameter |

## 12 Standard AI

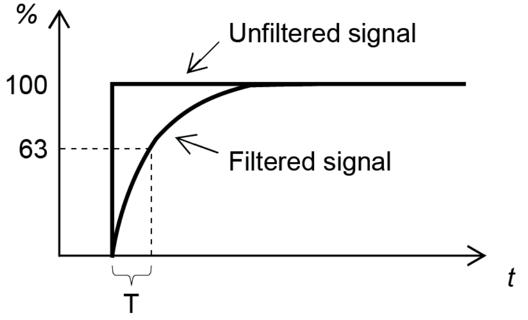
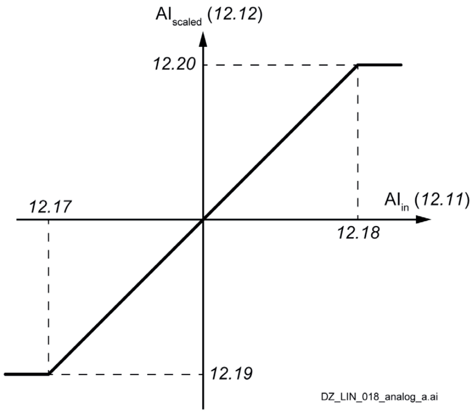
Configuration of standard analog inputs.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 12.03 | **AI supervision function** | | | | | | |
| | Supervision function analog inputs.<br>Selects how the drive reacts when AI1 … AI3 signals move out of the minimum and/or maximum limits specified for the input.<br>The inputs and the limits to be observed are selected by 12.04 AI supervision selection.<br>The analog input signal supervision is activated when the analog input is used. E.g. set 22.11 Speed reference 1 = AI1 scaled, AI2 scaled or AI3 scaled.<br>0: **No action**; none, disable AI supervision function.<br>1: **Fault**; the event generates fault 80A0 AI supervision.<br>2: **Warning**; the event generates warning A8A0 AI supervision.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>3: **Last speed**; the evet generates warning A8A0 AI supervision and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>4: **Speed reference safe**; the event generates warning A8A0 AI supervision and sets the speed to the value defined in 22.46 Speed reference safe.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break. | | | | | | |
| | 0 … 4 | No action | - | 1 = 1 | n | y | Parameter |
| 12.04 | **AI supervision selection** | | | | | | |
| | Activation of analog input supervision.<br>Specifies which limits of AI1 … AI3 are supervised by12.03 AI supervision function.<br>Bit assignment: | | | | | | |

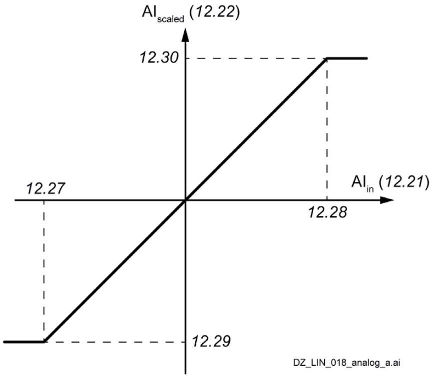
| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | AI1 < MIN | 1 | Minimum limit supervision of AI1 active. See12.17 AI1 min. |
| 1 | AI1 > MAX | 1 | Maximum limit supervision of AI1 active. See 12.18 AI1 max. |
| 2 | AI2 < MIN | 1 | Minimum limit supervision of AI2 active. See12.27 AI2 min. |
| 3 | AI2 > MAX | 1 | Maximum limit supervision of AI2 active. See 12.28 AI2 max. |
| 4 | AI3 < MIN | 1 | Minimum limit supervision of AI3 active. See12.37 AI3 min. |
| 5 | AI3 > MAX | 1 | Maximum limit supervision of AI3 active. See 12.38 AI3 max. |
| 6 … 15 | reserved | | |

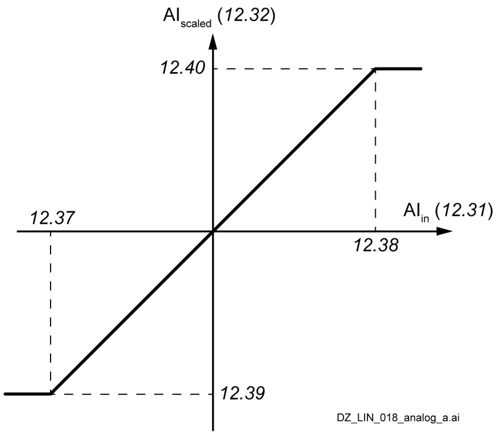
The supervision applies a margin of 0.5 V or 1.0 mA, see12.15 AI1 unit selection, to the limits.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"><b>Examples</b>:<br>– 12.17 AI1 min = 4.000 V. The minimum limit supervision activates at values lower than 3.500 V. The limit supervision clears at values greater than 4.000 V.<br>– 12.18 AI1 max = 7.000 V. The maximum limit supervision activates at values greater than 7.500 V. The limit supervision clears at values lower than 7.000 V.<br>– 12.17 AI1 min = 4.000 mA. The minimum limit supervision activates at values lower than 3.000 mA. The limit supervision clears at values greater than 4.000 mA.<br>– 12.18 AI1 max = 7.000 mA. The maximum limit supervision activates at values greater than 8.000 mA. The limit supervision clears at values lower than 7.000 mA.</td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.11</b></td><td colspan="7"><b>AI1 actual value</b></td></tr>
<tr><td colspan="7">Value of analog input AI1.<br>Displays the value of AI1 in mA or V corresponding to the setting of jumper J1 (see chapter <i>Jumpers and switches</i> of this manual).</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>12.12</b></td><td colspan="7"><b>AI1 scaled value</b></td></tr>
<tr><td colspan="7">Scaled value of analog input AI1.<br>Displays the value of AI1 after scaling.<br>See 12.19 AI1 scaled at AI1 min and 12.20 AI1 scaled at AI1 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>12.14</b></td><td colspan="7"><b>AI1 offset</b></td></tr>
<tr><td colspan="7">Offset for analog input AI1.<br>Adds an offset to 12.11 AI1 actual value.</td></tr>
<tr><td>-0.100 … 0.100</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.15</b></td><td colspan="7"><b>AI1 unit selection</b></td></tr>
<tr><td colspan="7">Unit selection of analog input AI1.<br>Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of jumper J1 (see chapter <i>Jumpers and switches</i> of this manual).<br>2: V; volts.<br>10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>V</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>12.16</b></td><td colspan="7"><b>AI1 filter time</b></td></tr>
<tr><td colspan="7">Filter time constant of analog input AI1.<br>Defines the filter time constant for AI1.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | <br> <br>$O = I \times (1 - e^{-t/T})$<br>I = filter input (step)<br>O = filter output<br>*t* = time<br>T = filter time constant<br> <br>The signal is also filtered due to the analog input hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter. | | | | | | |
| | 0.000 … 30.000 | 0.100 | s | 1000 = 1 s | n | y | Parameter |
| **12.17** | **AI1 min** | | | | | | |
| | Minimum value of analog input AI1.<br>Defines the minimum input value for AI1 in mA or V.<br>Parameters 12.17 and 12.18 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.19 and 12.20 define the internal values that correspond to these limits as follows:<br><br> | | | | | | |
| | -22.000 … 22.000 or<br>-11.000 … 11.000 | -20.000 or<br>-10.000 | mA or V | 1000 = 1 mA or V | n | y | Parameter |
| **12.18** | **AI1 max** | | | | | | |
| | Maximum value of analog input AI1.<br>Defines the maximum input value for AI1 in mA or V.<br>See 12.17 AI1 min. | | | | | | |
| | -22.000 … 22.000 or<br>-11.000 … 11.000 | 20.000 or<br>10.000 | mA or V | 1000 = 1 mA or V | n | y | Parameter |
| **12.19** | **AI1 scaled at AI1 min** | | | | | | |
| | Internal value corresponding to minimum analog input AI1 value.<br>Defines the internal value that corresponds to the minimum AI1 value defined by 12.17 AI1 min.<br>Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input. | | | | | | |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | See 12.17 AI1 min. | | | | | | |
| | -32768.000 … 32767.000 | -1500.000 | - | 1 = 1 | n | y | Parameter |
| **12.20** | **AI1 scaled at AI1 max** | | | | | | |
| | Internal value corresponding to maximum analog input AI1 value.<br>Defines the internal value that corresponds to the maximum AI1 value defined by 12.18 AI1 max.<br>See 12.17 AI1 min. | | | | | | |
| | -32768.000 … 32767.000 | 1500.000 | - | 1 = 1 | n | y | Parameter |
| **12.21** | **AI2 actual value** | | | | | | |
| | Value of analog input AI2.<br>Displays the value of AI2 in mA or V corresponding to the setting of jumper J2 (see chapter *Jumpers and switches* of this manual). | | | | | | |
| | -22.000 … 22.000 or -11,000 … 11,000 | - | mA or V | 1000 = 1 mA or V | y | n | Signal |
| **12.22** | **AI2 scaled value** | | | | | | |
| | Scaled value of analog input AI2.<br>Displays the value of analog input AI2 after scaling.<br>See 12.29 AI2 scaled at AI2 min and 12.30 AI2 scaled at AI2 max. | | | | | | |
| | -32768.000 … 32767.000 | - | - | 1 = 1 | y | n | Signal |
| **12.24** | **AI2 offset** | | | | | | |
| | Offset for analog input AI2.<br>Adds an offset to 12.21 AI2 actual value. | | | | | | |
| | -0.100 … 0.100 | 0.000 | mA or V | 1000 = 1 mA or V | n | y | Parameter |
| **12.25** | **AI2 unit selection** | | | | | | |
| | Unit selection of analog input AI2.<br>Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of jumper J2 (see chapter *Jumpers and switches* of this manual).<br>2: V; volts.<br>10: mA; milli amperes. | | | | | | |
| | 2 … 10 | V | - | 1 = 1 | n | y | Parameter |
| **12.26** | **AI2 filter time** | | | | | | |
| | Filter time constant of analog input AI2.<br>Defines the filter time constant for AI2.<br>See 12.16 AI1 filter time. | | | | | | |
| | 0.000 … 30.000 | 0.100 | s | 1000 = 1 s | n | y | Parameter |
| **12.27** | **AI2 min** | | | | | | |
| | Minimum value of analog input AI2.<br>Defines the minimum input value for analog input AI2 in mA or V.<br>Parameters 12.27 and 12.28 set the low and high limit of the analog input signal in mA or V. Scaling parameters 12.29 and 12.30 define the internal values that correspond to these limits as follows: | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11,000 … 11,000</td><td>-20.000 or<br>-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.28</b></td><td colspan="7"><b>AI2 max</b></td></tr>
<tr><td colspan="7">Maximum value of analog input AI2.<br>Defines the maximum input value for AI2 in mA or V.<br>See 12.27 AI2 min.</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11,000 … 11,000</td><td>20.000 or<br>10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.29</b></td><td colspan="7"><b>AI2 scaled at AI2 min</b></td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog input AI2 value.<br>Defines the internal value that corresponds to the minimum AI2 value defined by 12.27 AI2 min.<br>Changing the polarity settings of 12.29 and 12.30 can effectively invert the analog input.<br>See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.30</b></td><td colspan="7"><b>AI2 scaled at AI2 max</b></td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI2 value.<br>Defines the internal value that corresponds to the maximum AI2 value defined by 12.28 AI2 max.<br>See 12.27 AI2 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>12.31</b></td><td colspan="7"><b>AI3 actual value</b></td></tr>
<tr><td colspan="7">Value of analog input AI3.<br>Displays the value of AI3 in V.</td></tr>
<tr><td>-11.000 … 11.000</td><td>-</td><td>V</td><td>1000 = 1 V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>12.32</b></td><td colspan="7"><b>AI3 scaled value</b></td></tr>
<tr><td colspan="7">Scaled value of analog input AI3.<br>Displays the value of AI3 after scaling.<br>See 12.39 AI3 scaled at AI3 min and 12.40 AI3 scaled at AI3 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>12.34</b></td><td colspan="7"><b>AI3 offset</b></td></tr>
<tr><td colspan="7">Offset for analog input AI3.<br>Adds an offset to 12.31 AI3 actual value.</td></tr>
<tr><td>-0.100 … 0.100</td><td>0.000</td><td>V</td><td>1000 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>12.36</b></td><td colspan="7"><b>AI3 filter time</b></td></tr>
<tr><td colspan="7">Filter time constant of analog input AI3.</td></tr>
</table>

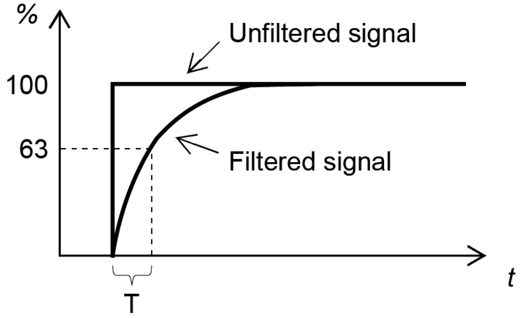
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Defines the filter time constant for analog input AI3.<br>See 12.16 AI1 filter time. | | | | | | |
| | 0.000 … 30.000 | 0.100 | s | 1000 = 1 s | n | y | Parameter |
| **12.37** | **AI3 min** | | | | | | |
| | Minimum value of analog input AI3.<br>Defines the minimum input value for AI3 in V.<br>Parameters 12.37 and 12.38 set the low and high limit of the analog input signal in V. Scaling parameters 12.39 and 12.40 define the internal values that correspond to these limits as follows:<br><br> | | | | | | |
| | -11.000 … 11.000 | -10.000 | V | 1000 = 1 V | n | y | Parameter |
| **12.38** | **AI3 max** | | | | | | |
| | Maximum value of analog input AI3.<br>Defines the maximum input value for AI3 in V.<br>See 12.37 AI3 min. | | | | | | |
| | -11.000 … 11.000 | 10.000 | V | 1000 = 1 V | n | y | Parameter |
| **12.39** | **AI3 scaled at AI3 min** | | | | | | |
| | Internal value corresponding to minimum analog input AI3 value.<br>Defines the internal value that corresponds to the minimum AI3 value defined by 12.37 AI3 min.<br>Changing the polarity settings of 12.39 and 12.40 can effectively invert the analog input.<br>See 12.37 AI3 min. | | | | | | |
| | -32768.000 … 32767.000 | -100.000 | - | 1 = 1 | n | y | Parameter |
| **12.40** | **AI3 scaled at AI3 max** | | | | | | |
| | Internal value corresponding to maximum analog input AI3 value.<br>Defines the internal value that corresponds to the maximum AI3 value defined by 12.38 AI3 max.<br>See 12.37 AI3 min. | | | | | | |
| | -32768.000 … 32767.000 | 100.000 | - | 1 = 1 | n | y | Parameter |

## 13 Standard AO

Configuration of standard analog outputs.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **13.11** | **AO1 actual value** | | | | | | |
| | Value of analog output AO1. | | | | | | |

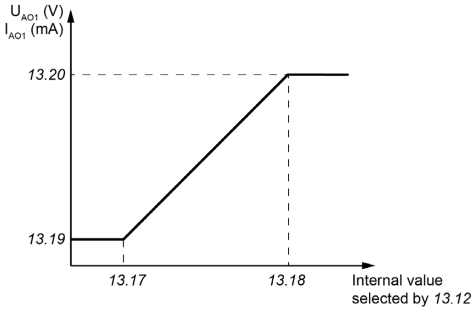
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the value of AO1 in mA or V corresponding to the setting of jumper J5 (see chapter <i>Jumpers and switches</i> of this manual).</td></tr>
<tr><td>0.000 … 22.000 or -10,000 … 10,000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>13.12</b></td><td colspan="7"><b>AO1 source</b></td></tr>
<tr><td colspan="7">Source for analog output AO1.<br>Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; not in use.<br>1: <b>Used motor speed</b>; 01.01 Used motor speed filtered.<br>4: <b>Motor current</b>; 01.10 Motor current in A.<br>6: <b>Motor torque</b>; 01.17 Motor torque filtered.<br>7: <b>Armature voltage</b>; 28.05 Armature voltage.<br>8: <b>Output power</b>; 01.24 Output power in kW.<br>10: <b>Speed reference ramp input</b>; 23.01 Speed reference ramp input.<br>11: <b>Speed reference ramp output</b>; 23.02 Speed reference ramp output.<br>12: <b>Used speed reference</b>; 24.01 Used speed reference.<br>13: <b>Torque reference used</b>; 26.02 Torque reference used.<br>16: <b>Process PID output actual</b>; 40.01 Process PID output actual.<br>17: <b>Process PID feedback actual</b>; 40.02 Process PID feedback actual.<br>18: <b>Process PID setpoint actual</b>; 40.03 Process PID setpoint actual.<br>19: <b>Process PID deviation actual</b>; 40.04 Process PID deviation actual.<br>20: <b>Force PT100 excitation</b>; AO1 is used to feed an excitation current to 1 … 3 PT100 sensors. See chapter <i>Motor thermal protection</i> of this manual.<br>21: <b>Force KTY84 excitation</b>; AO1 is used to feed an excitation current to a KTY84 sensor. See chapter <i>Motor thermal protection</i> of this manual.<br>22: <b>Force PTC excitation</b>; AO1 is used to feed an excitation current to 1 … 3 PTC sensors. See chapter <i>Motor thermal protection</i> of this manual.<br>23: <b>Force PT1000 excitation</b>; AO1 is used to feed an excitation current to 1 … 3 PT1000 sensors. See chapter <i>Motor thermal protection</i> of this manual.<br>37: <b>AO1 data storage</b>; see 13.91 AO1 data storage.<br>38: <b>AO2 data storage</b>; see 13.92 AO2 data storage.</td></tr>
<tr><td>0 … 38</td><td>Used motor speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>13.15</b></td><td colspan="7"><b>AO1 unit selection</b></td></tr>
<tr><td colspan="7">Unit selection of analog output AO1.<br>Selects the unit for readings and settings related to AO1. Set to either mA or V corresponding to the setting of jumper J5 (see chapter <i>Jumpers and switches</i> of this manual).<br>2: V; volts.<br>10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>V</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>13.16</b></td><td colspan="7"><b>AO1 filter time</b></td></tr>
<tr><td colspan="7">Filter time constant of analog output AO1.<br>Defines the filter time constant for AO1.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">


$O = I \times (1 - e^{-t/T})$

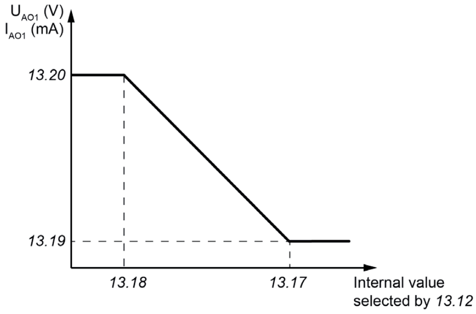
I = filter input (step)
O = filter output
*t* = time
T = filter time constant

SF_880_024_DCS_filter_a.ai
</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>13.17</b></td><td colspan="7"><b>AO1 source min</b></td></tr>
<tr><td></td><td colspan="7">
Internal value corresponding to minimum analog output AO1 value.
Defines the internal value that corresponds to the minimum required AO1 value.
Scaling parameters 13.17 and 13.18 set the low and high internal limits that corresponds to the analog output values in mA or V defined by parameters 13.19 and 13.20:



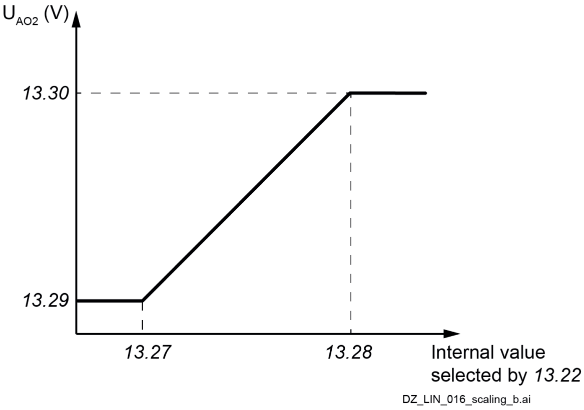
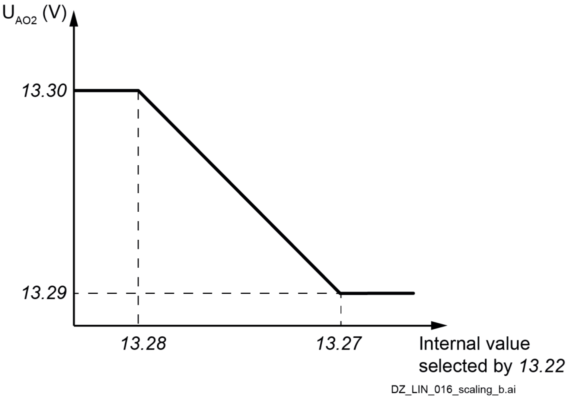
DZ_LIN_016_scaling_b.ai

Setting parameter 13.17 as maximum value and parameter 13.18 as minimum value inverts the output:



DZ_LIN_016_scaling_b.ai
</td></tr>
<tr><td></td><td>-32768.0 … 32767.0</td><td>-1500.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>13.18</b></td><td colspan="7"><b>AO1 source max</b></td></tr>
<tr><td></td><td colspan="7">
Internal value corresponding to maximum analog output AO1 value.
Defines the internal value that corresponds to the maximum required AO1 value.
</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">See 13.17 AO1 source min.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>1500.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>13.19</b></td><td colspan="7"><b>AO1 out at AO1 src min</b></td></tr>
<tr><td colspan="7">Minimum analog output AO1 value.<br>Defines the minimum output value for AO1 in mA or V.<br>See 13.17 AO1 source min.</td></tr>
<tr><td>0.000 … 22.000 or -10,000 … 10,000</td><td>0.000 or -10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>13.20</b></td><td colspan="7"><b>AO1 out at AO1 src max</b></td></tr>
<tr><td colspan="7">Maximum analog output AO1 value.<br>Defines the maximum output value for AO1 in mA or V.<br>See 13.17 AO1 source min.</td></tr>
<tr><td>0.000 … 22.000 or -10,000 … 10,000</td><td>20.000 or 10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>13.21</b></td><td colspan="7"><b>AO2 actual value</b></td></tr>
<tr><td colspan="7">Value of analog output AO2.<br>Displays the value of AO2 in V.</td></tr>
<tr><td>-10.000 … 10.000</td><td>-</td><td>V</td><td>1000 = 1 V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>13.22</b></td><td colspan="7"><b>AO2 source</b></td></tr>
<tr><td colspan="7">Source for analog output AO2.<br>Selects a signal/parameter to be connected to AO2.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; not in use.<br>1: <b>Used motor speed</b>; 01.01 Used motor speed filtered.<br>4: <b>Motor current</b>; 01.10 Motor current in A.<br>6: <b>Motor torque</b>; 01.17 Motor torque filtered.<br>7: <b>Armature voltage</b>; 28.05 Armature voltage.<br>8: <b>Output power</b>; 01.24 Output power in kW.<br>10: <b>Speed reference ramp input</b>; 23.01 Speed reference ramp input.<br>11: <b>Speed reference ramp output</b>; 23.02 Speed reference ramp output.<br>12: <b>Used speed reference</b>; 24.01 Used speed reference.<br>13: <b>Torque reference used</b>; 26.02 Torque reference used.<br>16: <b>Process PID output actual</b>; 40.01 Process PID output actual.<br>17: <b>Process PID feedback actual</b>; 40.02 Process PID feedback actual.<br>18: <b>Process PID setpoint actual</b>; 40.03 Process PID setpoint actual.<br>19: <b>Process PID deviation actual</b>; 40.04 Process PID deviation actual.<br>37: <b>AO1 data storage</b>; see 13.91 AO1 data storage.<br>38: <b>AO2 data storage</b>; see 13.92 AO2 data storage.</td></tr>
<tr><td>0 … 38</td><td>Armature voltage</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>13.26</b></td><td colspan="7"><b>AO2 filter time</b></td></tr>
<tr><td colspan="7">Filter time constant of analog output AO2.<br>Defines the filter time constant for AO2.<br>See 13.16 AO1 filter time.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>13.27</b></td><td colspan="7"><b>AO2 source min</b></td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog output AO2 value.<br>Defines the internal value that corresponds to the minimum required AO2 value.<br>Scaling parameters 13.27 and 13.28 set the low and high internal limits that corresponds to the analog output values in V defined by parameters 13.29 and 13.30:</td></tr>
</table>

| **Index** | **Name**<br>**Text**<br>**Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
|---|---|---|---|---|---|---|---|
| |  <br>Setting parameter 13.27 as maximum value and 13.28 as minimum value inverts the output:<br> | | | | | | |
| | -32768.0 … 32767.0 | -100.0 | - | 1 = 1 | n | y | Parameter |
| **13.28** | **AO2 source max** | | | | | | |
| | Internal value corresponding to maximum analog output AO2 value.<br>Defines the internal value that corresponds to the maximum required AO2 value.<br>See 13.27 AO2 source min. | | | | | | |
| | -32768.0 … 32767.0 | 100.0 | - | 1 = 1 | n | y | Parameter |
| **13.29** | **AO2 out at AO2 src min** | | | | | | |
| | Minimum analog output AO2 value.<br>Defines the minimum output value for AO2 in V.<br>See 13.27 AO2 source min. | | | | | | |
| | -10.000 … 10.000 | -10.000 | V | 1000 = 1 V | n | y | Parameter |
| **13.30** | **AO2 out at AO2 src max** | | | | | | |
| | Maximum analog output AO2 value.<br>Defines the maximum output value for AO2 in V.<br>See 13.27 AO2 source min. | | | | | | |
| | -10.000 … 10.000 | 10.000 | V | 1000 = 1 V | n | y | Parameter |
| **13.80** | **Scaling of fixed current output** | | | | | | |
| | Scaling of fixed armature current output (IACT).<br>Displays the scaling of the analog output for the armature current in amperes/10 V output voltage. This output is used to measure the armature current using an oscilloscope. See terminals SDCS-CON-H01 XAO:4 and XAO:5 for units size H1 … H6 or SDCS-OPL-H01 X4:1 and X4:4 for units size H7 and H8. | | | | | | |
| | -32500 … 32500 | - | A | 1 = 1 A | y | n | Signal |
| **13.91** | **AO1 data storage** | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | Storage parameter for analog output AO1.<br>Storage parameter to set analog output AO1 via e.g. a fieldbus.<br>To set analog output AO1 send a value e.g. via embedded fieldbus (see 58.101 Data I/O 1 … 58.124 Data I/O 24).<br>**Example**: Set 58.101 Data I/O 1 = AO1 data storage and 13.12 AO1 source = AO1 data storage. | | | | | | |
| | -327.68 … 327.67 | 0.00 | - | 100 = 1 | n | y | Parameter |
| **13.92** | **AO2 data storage** | | | | | | |
| | Storage parameter for analog output AO2.<br>Storage parameter to set analog output AO2 via e.g. a fieldbus.<br>To set analog output AO2 send a value e.g. via embedded fieldbus (see 58.101 Data I/O 1 … 58.124 Data I/O 24).<br>**Example**: Set 58.101 Data I/O 1 = AO2 data storage and 13.22 AO2 source = AO2 data storage. | | | | | | |
| | -327.68 … 327.67 | 0.00 | - | 100 = 1 | n | y | Parameter |

## 14 I/O extension module 1

Configuration of I/O extension module 1.
The contents of the parameter group varies according to the selected I/O extension module type.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| **14.01** | **Module 1 type** | | | | | | |
| | First I/O extension module.<br>Activates (and specifies the type of) I/O extension module 1.<br>0: **None**; inactive.<br>1: **FIO-01**; adds 4 DIO and 2 RO.<br>2: **FIO-11**; adds 2 DIO, 3 AI and 1 AO.<br>3: **FDIO-01**; adds 3 DI and 2 RO.<br>4: **FAIO-01**; adds 2 AI and 2 AO. | | | | | | |
| | 0 … 4 | None | - | 1 = 1 | n | n | Parameter |
| **14.02** | **Module 1 location** | | | | | | |
| | First I/O extension module location.<br>Activates and specifies the slot (1 … 3) on the drive’s control board into which the I/O extension module 1 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module.<br>1: **Slot 1**; I/O extension module 1 is located in slot 1.<br>2: **Slot 2**; I/O extension module 1 is located in slot 2.<br>3: **Slot 3**; I/O extension module 1 is located in slot 3.<br>**04 … 254**: Node ID of the slot on the FEA-03 extension module.<br>**Note:** The node ID of the slot on the FEA-03 extension module can be typed in. This is only possible with Drive composer. | | | | | | |
| | 1 … 254 | Slot 1 | - | 1 = 1 | n | n | Parameter |
| **14.03** | **Module 1 status** | | | | | | |
| | First I/O extension module status.<br>0: **No option**; no module detected in the specified slot.<br>1: **No communication**; a module has been detected but cannot be communicated with.<br>2: **Unknown**; the module type is unknown.<br>15: **FIO-01**; a FIO-01 has been detected and is active.<br>20: **FIO-11**; a FIO-11 has been detected and is active.<br>23: **FDIO-01**; a FDIO-01 has been detected and is active.<br>24: **FAIO-01**; a FAIO-01 has been detected and is active. | | | | | | |
| | 0 … 24 | - | - | 1 = 1 | y | n | Signal |
| **14.05** | **DI status** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

Status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the electrical status of DI1 … DI3. The activation/deactivation delays of the inputs (if any are specified) are ignored. A filtering time is defined by 14.08 DI filter time.
Bits 0 … 2 reflect the status of DI1 … DI3.
**Example:** 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DI1 | 1 | On. |
| 1 | DI2 | 1 | On. |
| 2 | DI3 | 1 | On. |
| 3 … 15 | reserved | | |

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**14.05** **DIO status**

Status of digital input/outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Displays the status of DIO1 … DIO2/DIO4 on the extension module. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) is defined by 14.08 DIO filter time.
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
**Example**: 0000000000001001b = DIO1 and DIO4 are on, remainder are off.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DIO1 | 1 | On. |
| 1 | DIO2 | 1 | On. |
| 2 | DIO3 | 1 | On. |
| 3 | DIO4 | 1 | On. |
| 4 … 15 | reserved | | |

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 14.05 | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**14.06** **DI delayed status**

Delayed status of digital inputs.
(Visible when 14.01 Module 1 type = FDIO-01)
Displays the delayed status of DI1 … DI3. This word is updated only after activation/deactivation delays (if any are specified).
Bits 0 … 2 reflect the status of DI1 … DI3.
**Example**: 0000000000000011b = DI2 and DI1 are on, DI3 is off.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DI1 | 1 | On. |
| 1 | DI2 | 1 | On. |
| 2 | DI3 | 1 | On. |
| 3 … 15 | reserved | | |

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 14.06 | 0000h … FFFFh | 0000h | - | 1 = 1 | y | n | Signal |

**14.06** **DIO delayed status**

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

Delayed status of digital input/outputs.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Displays the delayed status of DIO1 … DIO2/DIO4 on the extension module. This word is updated only after activation/deactivation delays (if any are specified).
Bit 0 … 3 reflect the status of DIO1 … DIO4.
The number of active bits in this parameter depends on the number of digital input/outputs on the extension module.
**Example**: 0000000000001001b = DIO1 and DIO4 are on, remainder are off.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | DIO1 | 1 | On. |
| 1 | DIO2 | 1 | On. |
| 2 | DIO3 | 1 | On. |
| 3 | DIO4 | 1 | On. |
| 4 … 15 | reserved | | |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**14.08** **DI filter time**

Filter time constant for 14.05 DI status.
(Visible when 14.01 Module 1 type = FDIO-01)
Defines a filter time constant for 14.05 DI status.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0.8 … 100.0 | 10.0 | ms | 10 = 1 ms | n | y | Parameter |

**14.08** **DIO filter time**

Filter time constant for 14.05 DIO status.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Defines a filter time constant for 14.05 DIO status.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0.8 … 100.0 | 10.0 | ms | 10 = 1 ms | n | y | Parameter |

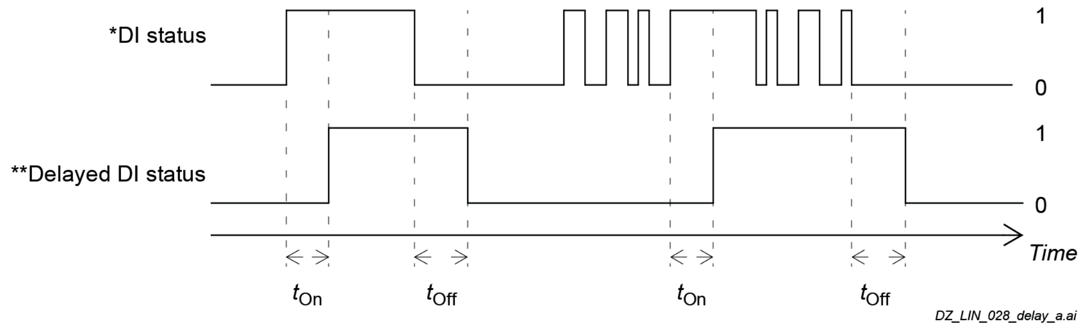
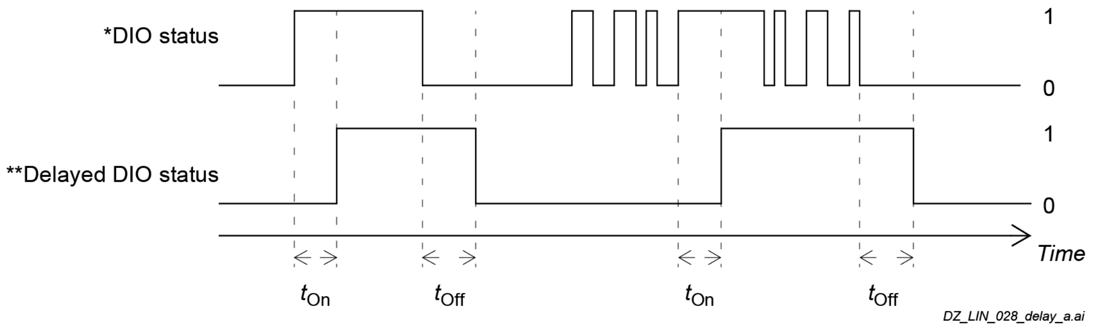
**14.09** **DIO1 function**

Function of digital input/output DIO1.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Selects whether DIO1 of the extension module is used as a digital input or output.
0: Output; DIO1 is used as a digital output.
1: Input; DIO1 is used as a digital input.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 1 | Input | - | 1 = 1 | n | y | Parameter |

**14.11** **DIO1 output source**

Source for digital input/output DIO1.
(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)
Selects a signal/parameter bit to be connected to DIO1 of the extension module when parameter 14.09 DIO1 function = Output.
**Other [bit]**; source selection.
0: **Not energized**; output is not energized.
1: **Energized**; output is energized.
2: **Ready run**; 06.15.b01 Main status word.
3: **Ready on**; 06.15.b00 Main status word.
4: **Enabled**; 06.16.b02 Drive status word 1.
8: **Ready reference**; 06.15.b02 Main status word.
9: **At setpoint**; 06.15.b08 Main status word.
10: **Reverse**; 06.21.b02 Speed control status word.
11: **Zero speed**; 06.21.b00 Speed control status word.
12: **Above limit**; 06.17.b10 Drive status word 2.
13: **Warning**; 06.15.b07 Main status word.
14: **Tripped**; 06.15.b03 Main status word.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">15: <b>Tripped (-1)</b>; 06.15.b03 Main status word inverted.<br>22: <b>Brake open command</b>; 44.01.b00 Brake control status (mechanical brake).<br>24: <b>Remote</b>; 06.11.b09 Main status word.<br>25: <b>Tripped or warning</b>; 06.18.b12 Drive status word 3.<br>30: <b>Fans on</b>; 06.24.b00 Current controller status word 1.<br>31: <b>Field exciter on</b>; 06.24.b05 Current controller status word 1.<br>32: <b>Close dynamic braking contactor</b>; 06.24.b08 Current controller status word 1.<br>33: <b>Close US style DC contactor</b>; 06.24.b10 Current controller status word 1.<br>34: <b>Trip DC-breaker (pulse)</b>; 06.24.b15 Current controller status word 1.<br>40: <b>RO/DIO control word bit 0</b>; 10.99.b00 RO/DIO control word.<br>41: <b>RO/DIO control word bit 1</b>; 10.99.b01 RO/DIO control word.<br>42: <b>RO/DIO control word bit 2</b>; 10.99.b02 RO/DIO control word.<br>43: <b>RO/DIO control word bit 8</b>; 10.99.b08 RO/DIO control word.<br>44: <b>RO/DIO control word bit 9</b>; 10.99.b09 RO/DIO control word.<br>50: <b>STO reset indication</b>; 31.91.b07 STO Reset Indication. Reset of safety relay permitted.</td></tr>
<tr><td></td><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>14.12</b></td><td colspan="7"><b>DI1 ON delay</b></td></tr>
<tr><td></td><td colspan="7">Activation delay for digital input DI1.<br>(Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the activation delay for DI1.<br> <br>$t_{On}$ = 14.12 DI1 ON delay<br>$t_{Off}$ = 14.13 DI1 OFF delay<br>*Electrical status of digital input. Indicated by 14.05 DI status.<br>**Indicated by 14.06 DI delayed status.</td></tr>
<tr><td></td><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>14.12</b></td><td colspan="7"><b>DIO1 ON delay</b></td></tr>
<tr><td></td><td colspan="7">Activation delay for digital input/output DIO1.<br>(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Defines the activation delay for DIO1.<br> <br>$t_{On}$ = 14.12 DIO1 ON delay<br>$t_{Off}$ = 14.13 DIO1 OFF delay</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">*Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 14.05 DIO status.<br>**Indicated by 14.06 DIO delayed status.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.13</b></td><td colspan="7"><b>DI1 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI1.<br>(Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the deactivation delay for DI1.<br>See 14.12 DI1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.13</b></td><td colspan="7"><b>DIO1 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO1.<br>(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Defines the deactivation delay for DIO1 (when used as a digital output or digital input).<br>See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.14</b></td><td colspan="7"><b>DIO2 function</b></td></tr>
<tr><td colspan="7">Function of digital input/output DIO2.<br>(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Selects whether DIO2 of the extension module is used as a digital input or output.<br>0: <b>Output</b>; DIO2 is used as a digital output.<br>1: <b>Input</b>; DIO2 is used as a digital input.</td></tr>
<tr><td>0 … 1</td><td>Input</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.16</b></td><td colspan="7"><b>DIO2 output source</b></td></tr>
<tr><td colspan="7">Source for digital input/output DIO2.<br>(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Selects a signal/parameter bit to be connected to DIO2 when parameter 14.14 DIO2 function = Output.<br>See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.17</b></td><td colspan="7"><b>DI2 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for digital input DI2.<br>(Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the activation delay for DI2.<br>See 14.12 DI1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.17</b></td><td colspan="7"><b>DIO2 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for digital input/output DIO2.<br>(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Defines the activation delay for DIO2.<br>See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.18</b></td><td colspan="7"><b>DI2 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for digital input DI2.<br>(Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the deactivation delay for DI2.<br>See 14.12 DI1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>14.18</b></td><td colspan="7"><b>DIO2 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for digital input/output DIO2.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 14.01 Module 1 type = FIO-01 or FIO-11)<br>Defines the deactivation delay for DIO2.<br>See 14.12 DIO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.19</b></td><td colspan="7"><b>DIO3 function</b></td></tr>
<tr><td colspan="7">Function of digital input/output DIO3.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Selects whether DIO3 of the extension module is used as a digital input or output.<br>0: <b>Output</b>; DIO3 is used as a digital output.<br>1: <b>Input</b>; DIO3 is used as a digital input.</td></tr>
<tr><td>0 … 1</td><td>Input</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.19</b></td><td colspan="7"><b>AI supervision function</b></td></tr>
<tr><td colspan="7">Supervision function analog inputs.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects how the unit reacts when AI1 … AI2/AI3 signals move out of the minimum and/or maximum limits specified for the input.<br>The inputs and the limits to be observed are selected by parameter 14.20 AI supervision selection.<br>The analog input signal supervision is activated when the analog input is used. E.g. set 22.11 Speed reference 1 = AI1 scaled, AI2 scaled or AI3 scaled.<br>0: <b>No action</b>; none, disable AI supervision function.<br>1: <b>Fault</b>; the event generates fault 80A0 AI supervision.<br>2: <b>Warning</b>; the event generates warning A8A0 AI supervision.<br><b>WARNING!</b><br>Make sure that it is safe to continue operation in case of a communication break.<br>3: <b>Last speed</b>; the event generates warning A8A0 AI supervision and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br><b>WARNING!</b><br>Make sure that it is safe to continue operation in case of a communication break.<br>4: <b>Speed reference safe</b>; the event generates warning A8A0 AI supervision and sets the speed to the value defined in 22.46 Speed reference safe.<br><b>WARNING!</b><br>Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 4</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.20</b></td><td colspan="7"><b>AI supervision selection</b></td></tr>
<tr><td colspan="7">Activation of analog input supervision.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Specifies which limits of AI1 … AI2/AI3 are supervised by 14.19 AI supervision function.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>AI1 < MIN</td><td>1</td><td>Minimum limit supervision of AI1 active. See 14.33 AI1 min.</td></tr>
<tr><td>1</td><td>AI1 > MAX</td><td>1</td><td>Maximum limit supervision of AI1 active. See 14.34 AI1 max.</td></tr>
<tr><td>2</td><td>AI2 < MIN</td><td>1</td><td>Minimum limit supervision of AI2 active. See 14.48 AI2 min.</td></tr>
<tr><td>3</td><td>AI2 > MAX</td><td>1</td><td>Maximum limit supervision of AI2 active. See 14.49 AI2 max.</td></tr>
<tr><td>4</td><td>AI3 < MIN</td><td>1</td><td>Minimum limit supervision of AI3 active. See 14.63 AI3 min.</td></tr>
<tr><td>5</td><td>AI3 > MAX</td><td>1</td><td>Maximum limit supervision of AI3 active. See 14.64 AI3 max.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>14.21</b></td><td colspan="7"><b>DIO3 output source</b></td></tr>
<tr><td colspan="7">Source for digital input/output DIO3.<br>(Visible when 14.01 Module 1 type = FIO-01)</td></tr>
</table>

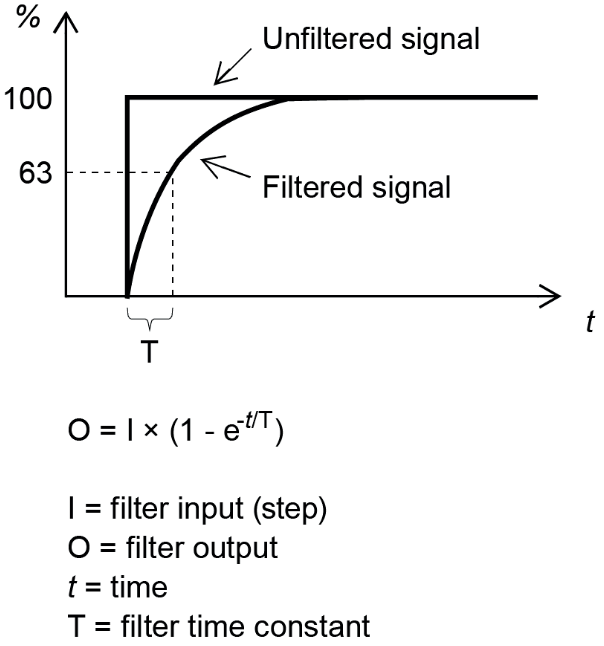
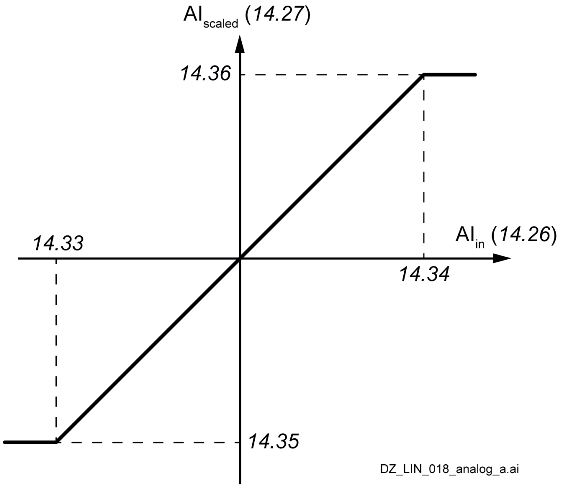
| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Selects a signal/parameter bit to be connected to DIO3 when 14.19 DIO3 function = Output.<br>See 14.11 DIO1 output source. | | | | | | |
| | 0 … 50 | Not energized | - | 1 = 1 | n | y | Parameter |
| **14.21** | **AI tune** | | | | | | |
| | Tuning of minimum and maximum analog input values.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Triggers the analog input tuning function, which uses the actual measurement of minimum and maximum input values instead of potentially inaccurate estimated values.<br>Apply the minimum or maximum signal to the analog input and select the appropriate tuning function. See drawing at 14.33 AI1 min.<br>0: **No action**; tuning action completed or no action has been requested. The parameter automatically reverts to this value after any tuning action.<br>1: **AI1 min tune**; the measured value at AI1 is written as minimum value of AI1 into 14.33 AI1 min.<br>2: **AI1 max tune**; the measured value at AI1 is written as maximum value of AI1 into 14.34 AI1 max.<br>3: **AI2 min tune**; the measured value at AI2 is written as minimum value of AI2 into 14.48 AI2 min.<br>4: **AI2 max tune**; the measured value at AI2 is written as maximum value of AI2 into 14.49 AI2 max.<br>5: **AI3 min tune**; the measured value at AI3 is written as minimum value of AI3 into 14.63 AI3 min. (Visible when 14.01 Module 1 type = FIO-11)<br>6: **AI3 max tune**; the measured value at AI3 is written as maximum value of AI3 into 14.64 AI3 max. (Visible when 14.01 Module 1 type = FIO-11) | | | | | | |
| | 0 … 6 | No action | - | 1 = 1 | y | y | Parameter |
| **14.22** | **DI3 ON delay** | | | | | | |
| | Activation delay for digital input DI3.<br>(Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the activation delay for DI3.<br>See 14.12 DI1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.22** | **DIO3 ON delay** | | | | | | |
| | Activation delay for digital input/output DIO3.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Defines the activation delay for DIO3.<br>See 14.12 DIO1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.22** | **AI force selection** | | | | | | |
| | Forced values selector for analog inputs.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>The true readings of AI1 … AI2/AI3 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog input and its value is applied whenever the corresponding bit in 14.22 AI force selection is 1.<br>Bit assignment: | | | | | | |

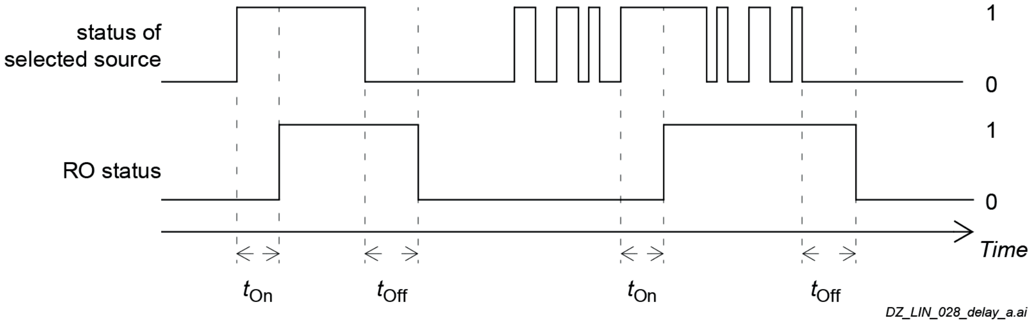
| **Bit** | **Name** | **Value** | **Remarks** |
|---|---|---|---|
| 0 | AI1 | 1 | Force mode: Force AI1 to value of 14.28 AI1 force data. |
| 1 | AI2 | 1 | Force mode: Force AI2 to value of 14.43 AI2 force data. |
| 2 | AI3 | 1 | Force mode: Force AI3 to value of 14.58 AI3 force data (FIO-11 only). |
| 3 … 15 | reserved | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | 0000h | - | 1 = 1 | y | y | Parameter |
| **14.23** | **DI3 OFF delay** | | | | | | |
| | Deactivation delay for digital input DI3. | | | | | | |

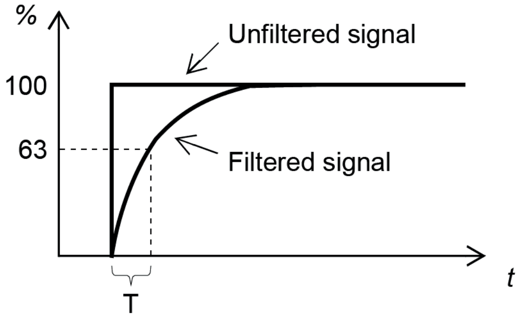
| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | (Visible when 14.01 Module 1 type = FDIO-01)<br>Defines the deactivation delay for DI3.<br>See 14.12 DI1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.23** | **DIO3 OFF delay** | | | | | | |
| | Deactivation delay for digital input/output DIO3.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Defines the deactivation delay for DIO3.<br>See 14.12 DIO1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.24** | **DIO4 function** | | | | | | |
| | Function of digital input/output DIO4.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Selects whether DIO4 of the extension module is used as a digital input or output.<br>0: **Output**; DIO4 is used as a digital output.<br>1: **Input**; DIO4 is used as a digital input. | | | | | | |
| | 0 … 1 | Input | - | 1 = 1 | n | y | Parameter |
| **14.26** | **DIO4 output source** | | | | | | |
| | Source for digital input/output DIO4.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Selects a signal/parameter bit to be connected to DIO4 when 14.24 DIO4 function = Output.<br>See 14.11 DIO1 output source. | | | | | | |
| | 0 … 50 | Not energized | - | 1 = 1 | n | y | Parameter |
| **14.26** | **AI1 actual value** | | | | | | |
| | Value of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the value of AI1 in mA or V, depending on whether the input is set to current or voltage. | | | | | | |
| | -22.000 … 22.000 or -11.000 … 11.000 | - | mA or V | 1000 = 1 mA or V | y | n | Signal |
| **14.27** | **DIO4 ON delay** | | | | | | |
| | Activation delay for digital input/output DIO4.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Defines the activation delay for DIO4.<br>See 14.12 DIO1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.27** | **AI1 scaled value** | | | | | | |
| | Scaled value of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the value of AI1 after scaling.<br>See 14.35 AI1 scaled at AI1 min and 14.36 AI1 scaled at AI1 max. | | | | | | |
| | -32768.000 … 32767.000 | - | - | 1 = 1 | y | n | Signal |
| **14.28** | **DIO4 OFF delay** | | | | | | |
| | Deactivation delay for digital input/output DIO4.<br>(Visible when 14.01 Module 1 type = FIO-01)<br>Defines the deactivation delay for DIO4.<br>See 14.12 DIO1 ON delay. | | | | | | |
| | 0.00 … 3000.00 | 0.00 | s | 10 = 1 s | n | y | Parameter |
| **14.28** | **AI1 force data** | | | | | | |
| | Forced value of analog input AI1. | | | | | | |

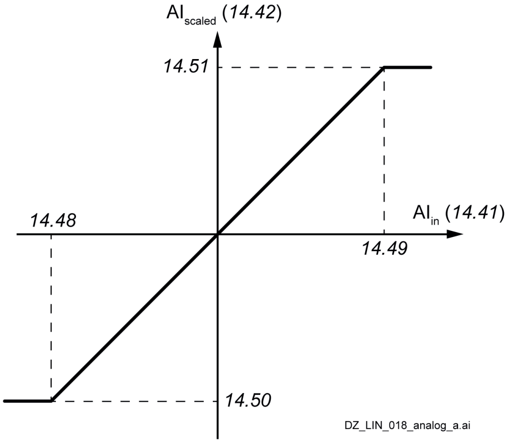
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Forced value that can be used instead of the true input value.<br>See 14.22 AI force selection.</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.29</b></td><td colspan="7"><b>AI1 HW switch position</b></td></tr>
<tr><td colspan="7">Unit selection switch of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the position of the hardware current/voltage selector on the I/O extension module.<br>The setting of the current/voltage selector must match the unit selection made in 14.30 AI1 unit selection.<br>2: V; volts.<br>10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>14.30</b></td><td colspan="7"><b>AI1 unit selection</b></td></tr>
<tr><td colspan="7">Unit selection of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects the unit for readings and settings related to AI1. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.29 AI1 HW switch position.<br>2: V; volts.<br>10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>mA</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.31</b></td><td colspan="7"><b>RO status</b></td></tr>
<tr><td colspan="7">Status of relay outputs.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)<br>Displays the status of RO1 … RO2 on the I/O extension module.<br><b>Example</b>: 0000000000000001b = RO1 is energized, RO2 is de-energized.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>RO1</td><td>1</td><td>Energized.</td></tr>
<tr><td>1</td><td>RO2</td><td>1</td><td>Energized.</td></tr>
<tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>14.31</b></td><td colspan="7"><b>AI1 filter gain</b></td></tr>
<tr><td colspan="7">Hardware filter time constant of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects a hardware filter time constant for AI1.<br>See 14.32 AI1 filter time.<br>0: <b>No filtering</b>; no filtering.<br>1: <b>125 µs</b>; 125 microseconds.<br>2: <b>250 µs</b>; 250 microseconds.<br>3: <b>500 µs</b>; 500 microseconds.<br>4: <b>1 ms</b>; 1 millisecond.<br>5: <b>2 ms</b>; 2 milliseconds.<br>6: <b>4 ms</b>; 4 milliseconds.<br>7: <b>7.9375 ms</b>; 7.9375 milliseconds.</td></tr>
<tr><td>0 … 7</td><td>1 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>14.32</b></td><td colspan="7"><b>AI1 filter time</b></td></tr>
<tr><td colspan="7">Filter time constant of analog input AI1.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the filter time constant for AI1.<br>
<br>SF_880_024_DCS_filter_a.ai<br>The signal is also filtered due to the analog input hardware. See 14.31 AI1 filter gain.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.33</b></td><td colspan="7"><b>AI1 min</b></td></tr>
<tr><td colspan="7">Minimum value of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the minimum value for AI1 in mA or V. See 14.21 AI tune.<br>Parameters 14.33 and 14.34 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.35 and 14.36 define the internal values that correspond to these limits as follows:<br>
</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>-20.000 or<br>-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>14.34</b></td><td colspan="7"><b>RO1 source</b></td></tr>
<tr><td colspan="7">Source for relay output RO1.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)</td></tr>
</table>

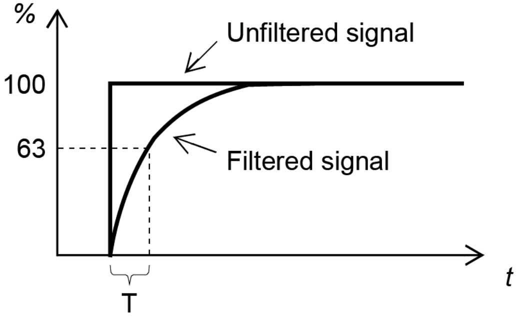
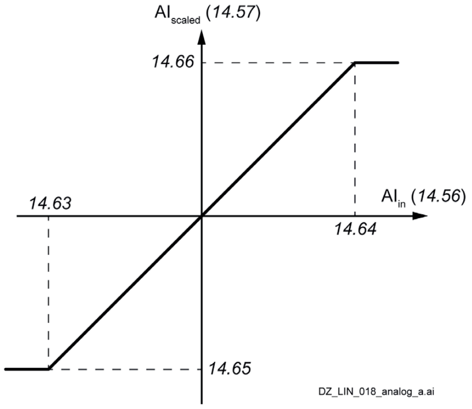
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects a signal/parameter bit to be connected to RO1.<br>See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.34</b></td><td colspan="7"><b>AI1 max</b></td></tr>
<tr><td colspan="7">Maximum value of analog input AI1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the maximum value for AI1 in mA or V. See 14.21 AI tune.<br>See 14.33 AI1 min.</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>20.000 or<br>10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.35</b></td><td colspan="7"><b>RO1 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for relay output RO1.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)<br>Defines the activation delay for RO1.<br><br> <br>$t_{On}$ = 14.35 RO1 ON delay<br>$t_{Off}$ = 14.36 RO1 OFF delay</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.35</b></td><td colspan="7"><b>AI1 scaled at AI1 min</b></td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog input AI1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the minimum AI1 value defined by 14.33 AI1 min.<br>See 14.33 AI1 min.</td></tr>
<tr><td>-32768.000 …<br>32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.36</b></td><td colspan="7"><b>RO1 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for relay output RO1.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)<br>Defines the deactivation delay for RO1.<br>See 14.35 RO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.36</b></td><td colspan="7"><b>AI1 scaled at AI1 max</b></td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the maximum AI1 value defined by 14.34 AI1 max.<br>See 14.33 AI1 min.</td></tr>
<tr><td>-32768.000 …<br>32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>14.37</b></td><td colspan="7"><b>RO2 source</b></td></tr>
<tr><td colspan="7">Source for relay output RO2.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects a signal/parameter bit to be connected to RO2.<br>See 14.11 DIO1 output source.</td></tr>
<tr><td>0 … 50</td><td>Not energized</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.38</b></td><td colspan="7"><b>RO2 ON delay</b></td></tr>
<tr><td colspan="7">Activation delay for relay output RO2.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)<br>Defines the activation delay for RO2.<br>See 14.35 RO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.39</b></td><td colspan="7"><b>RO2 OFF delay</b></td></tr>
<tr><td colspan="7">Deactivation delay for relay output RO2.<br>(Visible when 14.01 Module 1 type = FIO-01or FDIO-01)<br>Defines the deactivation delay for RO2.<br>See 14.35 RO1 ON delay.</td></tr>
<tr><td>0.00 … 3000.00</td><td>0.00</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.41</b></td><td colspan="7"><b>AI2 actual value</b></td></tr>
<tr><td colspan="7">Value of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the value of AI2 in mA or V, depending on whether the input is set to current or voltage.</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>-</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>14.42</b></td><td colspan="7"><b>AI2 scaled value</b></td></tr>
<tr><td colspan="7">Scaled value of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the value of AI2 after scaling.<br>See 14.50 AI2 scaled at AI2 min and 14.51 AI2 scaled at AI2 max.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>14.43</b></td><td colspan="7"><b>AI2 force data</b></td></tr>
<tr><td colspan="7">Forced value of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Forced value that can be used instead of the true input value.<br>See 14.22 AI force selection.</td></tr>
<tr><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>0.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.44</b></td><td colspan="7"><b>AI2 HW switch position</b></td></tr>
<tr><td colspan="7">Unit selection switch of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the position of the hardware current/voltage selector on the I/O extension module.<br>The setting of the current/voltage selector must match the unit selection made in 14.45 AI2 unit selection.<br>2: V; volts.<br>10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>14.45</b></td><td colspan="7"><b>AI2 unit selection</b></td></tr>
<tr><td colspan="7">Unit selection of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects the unit for readings and settings related to AI2. Set to either mA or V corresponding to the setting of the I/O extension module (see the manual of the I/O extension module). The hardware setting is also shown in 14.44 AI2 HW switch position.<br>2: V; volts.</td></tr>
</table>

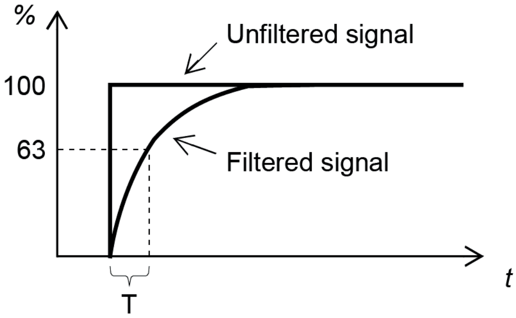
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">10: mA; milli amperes.</td></tr>
<tr><td>2 … 10</td><td>mA</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.46**</td><td colspan="7">**AI2 filter gain**</td></tr>
<tr><td colspan="7">Hardware filter time constant of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects a hardware filter time constant for AI2.<br>See 14.47 AI2 filter time.<br>0: **No filtering**; no filtering.<br>1: **125 µs**; 125 microseconds.<br>2: **250 µs**; 250 microseconds.<br>3: **500 µs**; 500 microseconds.<br>4: **1 ms**; 1 millisecond.<br>5: **2 ms**; 2 milliseconds.<br>6: **4 ms**; 4 milliseconds.<br>7: **7.9375 ms**; 7.9375 milliseconds.</td></tr>
<tr><td>0 … 7</td><td>1 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.47**</td><td colspan="7">**AI2 filter time**</td></tr>
<tr><td colspan="7">Filter time constant of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the filter time constant for AI2.<br> <br>$O = I \times (1 - e^{-t/T})$<br>I = filter input (step)<br>O = filter output<br>$t$ = time<br>T = filter time constant<br>SF_880_024_DCS_filter_a.ai<br>The signal is also filtered due to the analog input hardware. See 14.46 AI2 filter gain.</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**14.48**</td><td colspan="7">**AI2 min**</td></tr>
<tr><td colspan="7">Minimum value of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the minimum value for AI2 in mA or V. See 14.21 AI tune.<br>Parameters 14.48 and 14.49 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.50 and 14.51 define the internal values that correspond to these limits as follows:</td></tr>
</table>

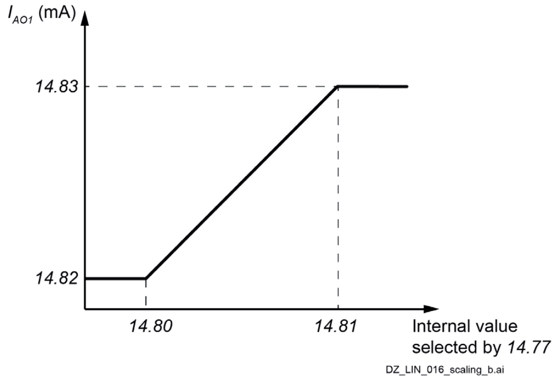
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| |  | | | | | | |
| | -22.000 … 22.000 or<br>-11.000 … 11.000 | -20.000 or<br>-10.000 | mA or V | 1000 = 1 mA or V | n | y | Parameter |
| **14.49** | **AI2 max** | | | | | | |
| | Maximum value of analog input AI2.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the maximum value for AI2 in mA or V. See 14.21 AI tune.<br>See 14.48 AI2 min. | | | | | | |
| | -22.000 … 22.000 or<br>-11.000 … 11.000 | 20.000 or<br>10.000 | mA or V | 1000 = 1 mA or V | n | y | Parameter |
| **14.50** | **AI2 scaled at AI2 min** | | | | | | |
| | Internal value corresponding to minimum analog input AI2 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the minimum AI2 value defined by 14.48 AI2 min.<br>See 14.48 AI2 min. | | | | | | |
| | -32768.000 … 32767.000 | -100.000 | - | 1 = 1 | n | y | Parameter |
| **14.51** | **AI2 scaled at AI2 max** | | | | | | |
| | Internal value corresponding to maximum analog input AI2 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the maximum AI2 value defined by 14.49 AI2 max.<br>See 14.48 AI2 min. | | | | | | |
| | -32768.000 … 32767.000 | 100.000 | - | 1 = 1 | n | y | Parameter |
| **14.56** | **AI3 actual value** | | | | | | |
| | Value of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Displays the value of AI3 in mA or V, depending on whether the input is set to current or voltage. | | | | | | |
| | -22.000 … 22.000 or<br>-11.000 … 11.000 | - | mA or V | 1000 = 1 mA or V | y | n | Signal |
| **14.57** | **AI3 scaled value** | | | | | | |
| | Scaled value of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Displays the value of AI3 after scaling.<br>See 14.65 AI3 scaled at AI3 min and 14.66 AI3 scaled at AI3 max. | | | | | | |
| | -32768.000 … 32767.000 | - | - | 1 = 1 | y | n | Signal |
| **14.58** | **AI3 force data** | | | | | | |

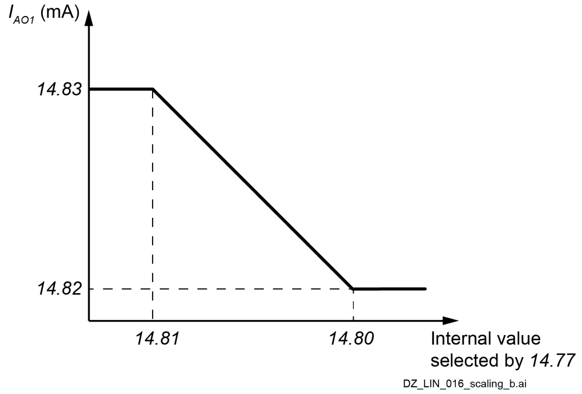
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Forced value of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Forced value that can be used instead of the true input value.<br>See 14.22 AI force selection. | | | | | | |
| | -22.000 … 22.000 or -11.000 … 11.000 | 0.000 | mA or V | 1000 = 1 mA or V | y | y | Parameter |
| **14.59** | **AI3 HW switch position** | | | | | | |
| | Unit selection switch of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Displays the position of the hardware current/voltage selector on the I/O extension module.<br>The setting of the current/voltage selector must match the unit selection made in 14.60 AI3 unit selection.<br>2: V; volts.<br>10: mA; milli amperes. | | | | | | |
| | 2 … 10 | - | - | 1 = 1 | y | n | Signal |
| **14.60** | **AI3 unit selection** | | | | | | |
| | Unit selection of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Selects the unit for readings and settings related to AI3. Set to either mA or V corresponding to the setting of the I/O extension module (see manual of the I/O extension module). The hardware setting is also shown in 14.59 AI3 HW switch position.<br>2: V; volts.<br>10: mA; milli amperes. | | | | | | |
| | 2 … 10 | mA | - | 1 = 1 | n | y | Parameter |
| **14.61** | **AI3 filter gain** | | | | | | |
| | Hardware filter time constant of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Selects a hardware filter time constant for AI3.<br>See 14.62 AI3 filter time.<br>0: **No filtering**; no filtering.<br>1: **125 µs**; 125 microseconds.<br>2: **250 µs**; 250 microseconds.<br>3: **500 µs**; 500 microseconds.<br>4: **1 ms**; 1 millisecond.<br>5: **2 ms**; 2 milliseconds.<br>6: **4 ms**; 4 milliseconds.<br>7: **7.9375 ms**; 7.9375 milliseconds. | | | | | | |
| | 0 … 7 | 1 ms | - | 1 = 1 | n | y | Parameter |
| **14.62** | **AI3 filter time** | | | | | | |
| | Filter time constant of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Defines the filter time constant for AI3. | | | | | | |

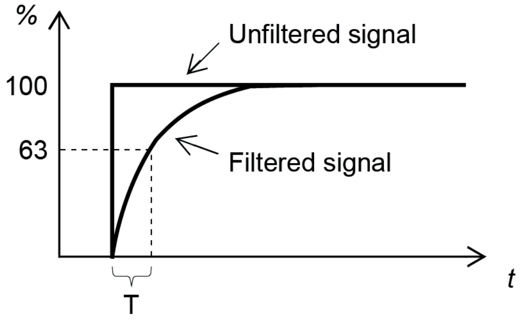
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"> <br>$O = I \times (1 - e^{-t/T})$<br>I = filter input (step)<br>O = filter output<br>$t$ = time<br>T = filter time constant<br>SF_880_024_DCS_filter_a.ai<br>The signal is also filtered due to the analog input hardware. See 14.61 AI3 filter gain.</td></tr>
<tr><td></td><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>14.63</b></td><td colspan="7"><b>AI3 min</b></td></tr>
<tr><td></td><td colspan="7">Minimum value of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Defines the minimum value for AI3 mA or V. See 14.21 AI tune.<br>Parameters 14.63 and 14.64 set the low and high limit of the analog input signal in mA or V. Scaling parameters 14.65 and 14.66 define the internal values that correspond to these limits as follows:<br> </td></tr>
<tr><td></td><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>-20.000 or<br>-10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>14.64</b></td><td colspan="7"><b>AI3 max</b></td></tr>
<tr><td></td><td colspan="7">Maximum value of analog input AI3.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Defines the maximum value for AI3 in mA or V. See 14.21 AI tune.<br>See 14.63 AI3 min.</td></tr>
<tr><td></td><td>-22.000 … 22.000 or<br>-11.000 … 11.000</td><td>20.000 or<br>10.000</td><td>mA or V</td><td>1000 = 1 mA or V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>14.65</b></td><td colspan="7"><b>AI3 scaled at AI3 min</b></td></tr>
<tr><td></td><td colspan="7">Internal value corresponding to minimum analog input AI3 value.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Defines the internal value that corresponds to the minimum AI3 value defined by 14.63 AI3 min.</td></tr>
</table>

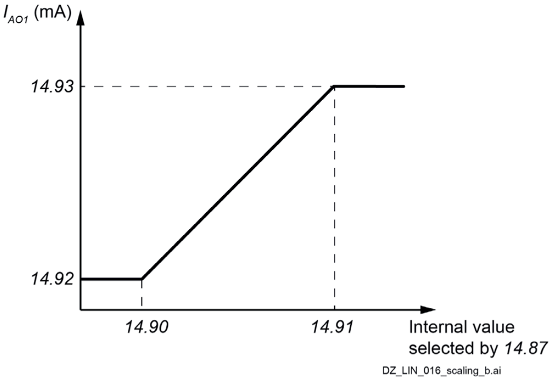
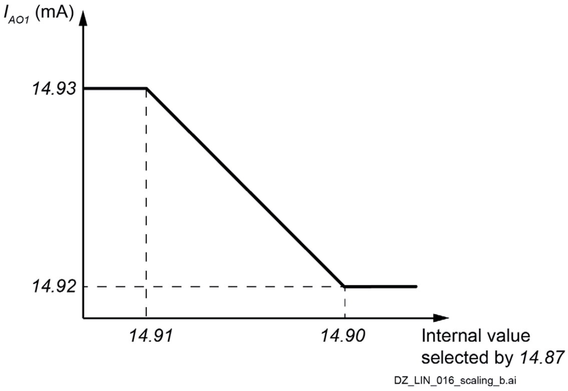
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">See 14.63 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>-100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.66</b></td><td colspan="7"><b>AI3 scaled at AI3 max</b></td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog input AI3 value.<br>(Visible when 14.01 Module 1 type = FIO-11)<br>Defines the internal value that corresponds to the maximum AI3 value defined by 14.64 AI3 max. See 14.63 AI3 min.</td></tr>
<tr><td>-32768.000 … 32767.000</td><td>100.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.71</b></td><td colspan="7"><b>AO force selection</b></td></tr>
<tr><td colspan="7">Forced values selector for analog outputs.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>The value of AO1 … AO1/AO2 can be overridden for e.g. testing purposes. A forced value parameter (see table below) is provided for each analog output and its value is applied whenever the corresponding bit in 14.71 AO fore selection is 1.<br>Bit assignment:<br><table><tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr><tr><td>0</td><td>AO1</td><td>1</td><td>Force mode: Force AO1 to value of 14.78 AO1 force data.</td></tr><tr><td>1</td><td>AO2</td><td>1</td><td>Force mode: Force AO2 to value of 14.88 AO2 force data (FAIO-01 only).</td></tr><tr><td>2 … 15</td><td>reserved</td><td></td><td></td></tr></table></td></tr>
<tr><td>0000h … FFFFh</td><td>0000h</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.76</b></td><td colspan="7"><b>AO1 actual value</b></td></tr>
<tr><td colspan="7">Value of analog output AO1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Displays the value of AO1 in mA.</td></tr>
<tr><td>0.000 … 22.000</td><td>-</td><td>mA</td><td>1000 = 1 mA</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>14.77</b></td><td colspan="7"><b>AO1 source</b></td></tr>
<tr><td colspan="7">Source for analog output AO1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Selects a signal/parameter to be connected to AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; not in use.<br>1: <b>Used motor speed</b>; 01.01 Used motor speed filtered.<br>4: <b>Motor current</b>; 01.10 Motor current in A.<br>6: <b>Motor torque</b>; 01.17 Motor torque filtered.<br>7: <b>Armature voltage</b>; 28.05 Armature voltage.<br>8: <b>Output power</b>; 01.24 Output power in kW.<br>10: <b>Speed reference ramp input</b>; 23.01 Speed reference ramp input.<br>11: <b>Speed reference ramp output</b>; 23.02 Speed reference ramp output.<br>12: <b>Used speed reference</b>; 24.01 Used speed reference.<br>13: <b>Torque reference used</b>; 26.02 Torque reference used.<br>16: <b>Process PID output actual</b>; 40.01 Process PID output actual.<br>17: <b>Process PID feedback actual</b>; 40.02 Process PID feedback actual.<br>18: <b>Process PID setpoint actual</b>; 40.03 Process PID setpoint actual.<br>19: <b>Process PID deviation actual</b>; 40.04 Process PID deviation actual.<br>20: <b>Force PT100 excitation</b>; AO1 is used to feed an excitation current to 1 … 3 PT100 sensors. See chapter <i>Motor thermal protection</i> of this manual.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">21: **Force KTY84 excitation**; AO1 is used to feed an excitation current to a KTY84 sensor. See chapter *Motor thermal protection* of this manual.<br>22: **Force PTC excitation**; AO1 is used to feed an excitation current to 1 … 3 PTC sensors. See chapter *Motor thermal protection* of this manual.<br>23: **Force PT1000 excitation**; AO1 is used to feed an excitation current to 1 … 3 PT1000 sensors. See chapter *Motor thermal protection* of this manual.<br>37: **AO1 data storage**; see 13.91 AO1 data storage.<br>38: **AO2 data storage**; see 13.92 AO2 data storage.</td></tr>
<tr><td>0 … 38</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.78**</td><td colspan="7">**AO1 force data**</td></tr>
<tr><td colspan="7">Forced value of analog output AO1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Forced value that can be used instead of the selected output signal.<br>See 14.71 AO force selection.</td></tr>
<tr><td>0.000 … 22.000</td><td>0.000</td><td>mA</td><td>1000 = 1 mA</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**14.79**</td><td colspan="7">**AO1 filter time**</td></tr>
<tr><td colspan="7">Filter time constant of analog output AO1.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the filter time constant for AO1.<br> <br>$O = I \times (1 - e^{-t/T})$<br>I = filter input (step)<br>O = filter output<br>*t* = time<br>T = filter time constant<br>SF_880_024_DCS_filter_a.ai</td></tr>
<tr><td>0.000 … 30.000</td><td>0.100</td><td>s</td><td>1000 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**14.80**</td><td colspan="7">**AO1 source min**</td></tr>
<tr><td colspan="7">Internal value corresponding to minimum analog output AO1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the minimum required AO1 value.<br>Scaling parameters 14.80 and 14.81 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.82 and 14.83:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">

Setting parameter 14.82 as maximum value and 14.83 as minimum value inverts the output:

</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>0.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><strong>14.81</strong></td><td colspan="7"><strong>AO1 source max</strong></td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog output AO1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the internal value that corresponds to the maximum required AO1 value.<br>See 14.80 AO1 source min.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><strong>14.82</strong></td><td colspan="7"><strong>AO1 out at AO1 src min</strong></td></tr>
<tr><td colspan="7">Minimum analog output AO1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the minimum output value for AO1 in mA.<br>See 14.80 AO1 source min.</td></tr>
<tr><td>0.000 … 22.000</td><td>0.000</td><td>mA</td><td>1000 = 1 mA</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><strong>14.83</strong></td><td colspan="7"><strong>AO1 out at AO1 src max</strong></td></tr>
<tr><td colspan="7">Maximum analog output AO1 value.<br>(Visible when 14.01 Module 1 type = FIO-11 or FAIO-01)<br>Defines the maximum output value for AO1 in mA.<br>See 14.80 AO1 source min.</td></tr>
<tr><td>0.000 … 22.000</td><td>20.000</td><td>mA</td><td>1000 = 1 mA</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><strong>14.86</strong></td><td colspan="7"><strong>AO2 actual</strong></td></tr>
<tr><td colspan="7">Value of analog output AO2.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Displays the value of AO2 in mA.</td></tr>
<tr><td>0.000 … 22.000</td><td>-</td><td>mA</td><td>1000 = 1 mA</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><strong>14.87</strong></td><td colspan="7"><strong>AO2 source</strong></td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Source for analog output AO2.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Selects a signal/parameter to be connected to AO2. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor.<br>See 14.77 AO1 source. | | | | | | |
| | 0 … 38 | Zero | - | 1 = 1 | n | y | Parameter |
| **14.88** | **AO2 force data** | | | | | | |
| | Forced value of analog output AO2.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Forced value that can be used instead of the selected output signal.<br>See 14.71 AO force selection. | | | | | | |
| | 0.000 … 22.000 | 0.000 | mA | 1000 = 1 mA | y | y | Parameter |
| **14.89** | **AO2 filter time** | | | | | | |
| | Filter time constant of analog output AO2.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Defines the filter time constant for AO2.<br> <br>$O = I \times (1 - e^{-t/T})$<br>I = filter input (step)<br>O = filter output<br>*t* = time<br>T = filter time constant<br>SF_880_024_DCS_filter_a.ai | | | | | | |
| | 0.000 … 30.000 | 0.100 | s | 1000 = 1 s | n | y | Parameter |
| **14.90** | **AO2 source min** | | | | | | |
| | Internal signal value corresponding to minimum analog output AO2 value.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Defines the internal value that corresponds to the minimum required AO2 value.<br>Scaling parameters 14.90 and 14.91 set the low and high internal limits that corresponds to the analog output values in mA defined by parameters 14.92 and 14.93: | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<br>Setting parameter 14.92 as maximum value and 14.93 as minimum value inverts the output:<br>
</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>0.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.91</b></td><td colspan="7"><b>AO2 source max</b></td></tr>
<tr><td colspan="7">Internal value corresponding to maximum analog output AO2 value.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Defines the internal value that corresponds to the maximum required AO2 value.<br>See 14.90 AO2 source min.</td></tr>
<tr><td>-32768.0 … 32767.0</td><td>100.0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.92</b></td><td colspan="7"><b>AO2 out at AO2 src min</b></td></tr>
<tr><td colspan="7">Minimum analog output AO2 value.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Defines the minimum output value for AO2.<br>See 14.90 AO2 source min.</td></tr>
<tr><td>0.000 … 22.000</td><td>0.000</td><td>mA</td><td>1000 = 1 mA</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>14.93</b></td><td colspan="7"><b>AO2 out at AO2 src max</b></td></tr>
<tr><td colspan="7">Maximum analog output AO2 value.<br>(Visible when 14.01 Module 1 type = FAIO-01)<br>Defines the maximum output value for AO2.<br>See 14.90 AO2 source min.</td></tr>
<tr><td>0.000 … 22.000</td><td>20.000</td><td>mA</td><td>1000 = 1 mA</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 15 I/O extension module 2

Description see group 14 I/O extension module 1.
Configuration of I/O extension module 2.
The contents of the parameter group varies according to the selected I/O extension module type.

## 16 I/O extension module 3

Description see group 14 I/O extension module 1.
Configuration of I/O extension module 3.
The contents of the parameter group varies according to the selected I/O extension module type.

## 19 Operation mode

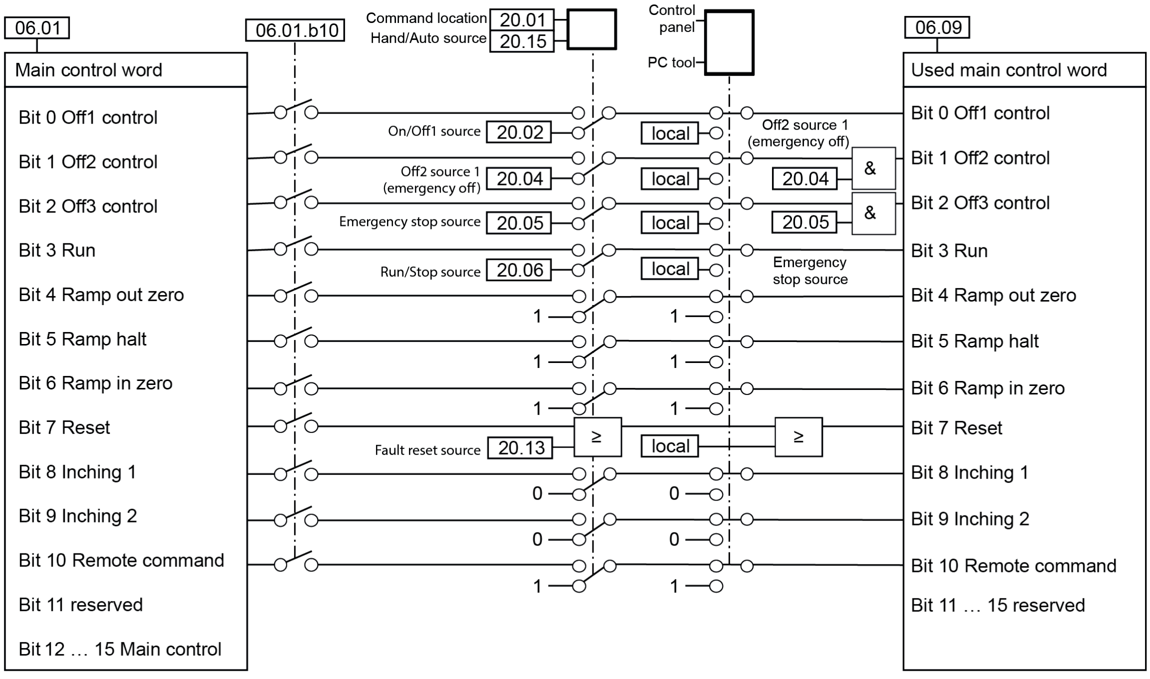
Selection of local and external control locations and operating modes.

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **19.01** | **Actual operation mode** | | | | | | |
| | Currently used operating mode.<br>Displays the operating mode currently used.<br>See parameters 19.11 … 19.14.<br>1: **Zero**; output of the torque selector has been set to zero.<br>2: **Speed**; speed control, torque reference taken from 25.01 Torque reference speed control.<br>3: **Torque**; torque control, torque reference taken from 26.74 Torque reference ramp output.<br>4: **Min**; minimum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output. The smaller of the two is used.<br>5: **Max**; maximum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output. The greater of the two is used.<br>6: **Add**; sum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output is used.<br>7: **Limitation**; limitation control, 26.74 Torque reference ramp output is limited by 25.01 Torque reference speed control.<br>**Example**: If 26.74 Torque reference ramp output = 50 %, then 25.01 Torque reference speed control is limited to ±50 %.<br>8: **Current**; current control, current reference taken from 27.22 Current reference source. | | | | | | |
| | 1 … 8 | - | - | 1 = 1 | y | n | Signal |
| **19.11** | **Ext1/Ext2 selection** | | | | | | |
| | Selection of control location.<br>Selects the source for the control location. Thus, a change of the operating mode is possible.<br>0 = EXT1.<br>1 = EXT2.<br>**Other [bit]**; source selection.<br>0: **EXT1**; 0, select EXT1. Normal operation.<br>1: **EXT2**; 1, select EXT2.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | EXT1 | - | 1 = 1 | n | y | Parameter |
| **19.12** | **Ext1 control mode** | | | | | | |
| | Operating mode of control location EXT1.<br>Selects the operating mode for control location EXT1.<br>1: **Zero**; set the output of the torque selector to zero.<br>2: **Speed**; speed control, set torque reference to 25.01 Torque reference speed control. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: **Torque**; torque control, set torque reference to 26.74 Torque reference ramp output.<br>4: **Min**; combination of selections Speed and Torque. Use the minimum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.<br>If speed error becomes negative, the drive follows the speed controller output until the speed error becomes positive again. This prevents the drive from accelerating uncontrollably if the load is lost in torque control.<br>5: **Max**; combination of selections Speed and Torque. Use the maximum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.<br>If speed error becomes positive, the drive follows the speed controller output until speed error becomes negative again. This prevents the drive from accelerating uncontrollably if the load is lost in torque control.<br>6: **Add**; combination of selections Speed and Torque. Use the sum of 25.01 Torque reference speed control and 26.74 Torque reference ramp output.<br>7: **Limitation**; limitation control, 26.74 Torque reference ramp output limits 25.01 Torque reference speed control.<br>**Example**: If 26.74 Torque reference ramp output = 50 %, then 25.01 Torque reference speed control is limited to ±50 %.</td></tr>
<tr><td>1 … 7</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**19.14**</td><td colspan="7">**Ext2 control mode**</td></tr>
<tr><td colspan="7">Operating mode of control location EXT1.<br>Selects the operating mode for control location EXT1.<br>See 19.12 Ext1 control mode.</td></tr>
<tr><td>1 … 7</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**19.16**</td><td colspan="7">**Local control mode**</td></tr>
<tr><td colspan="7">Operating mode of local control.<br>Selects the operating mode for local control.<br>0: **Speed**; speed control, set torque reference to 25.01 Torque reference speed control.<br>1: **Torque**; torque control, set torque reference to 26.74 Torque reference ramp output.</td></tr>
<tr><td>0 … 1</td><td>Speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**19.20**</td><td colspan="7">**Follower force ramp stop**</td></tr>
<tr><td colspan="7">Force follower to speed control (follower only).<br>Forces or selects a source that forces a torque-controlled follower drive to switch to speed control upon a ramp stop by an Off1- or Off3 (emergency stop) command. This is required for an independent ramp stop of the follower.<br>0 = Keep control mode.<br>1 = Force speed control.<br>**Other [bit]**; source selection.<br>0: **Keep control mode**; 0, keep the current control mode. Normal operation.<br>1: **Force speed control**; 1, ramp stop forces speed control.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Keep control mode</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 20 Start/Stop/Direction

Start/Stop/Direction and run/start/jog enable signal source selection. Positive/Negative reference enable source selection. Breaker and acknowledge source selection.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><b>Command location:</b><br> <br>SS_880_007_DCS_drive logic_a.ai</td></tr>
<tr><td rowspan="3"><b>20.01</b></td><td colspan="7"><b>Command location</b></td></tr>
<tr><td colspan="7">Command location.<br>Selector for 06.09 Used main control word.<br>0: <b>Local I/O</b>; drive is controlled via local I/O:<br>– 20.02 On/Off1 source = DI1.<br>– 20.04 Off2 source 1 (emergency off) = DIL.<br>– 20.05 Emergency stop source = Off3 inactive.<br>– 20.06 Run/Stop source = DI2.<br>– 20.08 Off2 source 2 (emergency off) = Off2 inactive.<br>– 20.13 Fault reset source = DI3.<br>1: <b>Main control word</b>; drive is controlled via 06.01 Main control word.<br>2: <b>Key</b>; automatic switchover from Main control word to Local I/O in case of 6681 EFB communication, 7510 FBA A communication or 7520 FBA B communication. It is still possible to control the drive via Local I/O. The used speed reference is set by means of 22.32 Constant speed 7.<br>3: <b>12-pulse link</b>; the drive is controlled from the 12-pulse master, Off1 control, Off2 control, Run and Reset. Only available when 99.06 Operation mode = 12-pulse parallel slave or 12-pulse serial slave.<br>4: <b>Field exciter link</b>; The drive is controlled from the master of the field exciter, Off1 control, Off2 control, Run and Reset. Only available when 99.06 Operation mode = Field exciter.<br><b>Notes</b>:<br>– Local control mode has higher priority than the selection made with 20.01 Command location.<br>– Commands from 20.04 Off2 source 1 (emergency off), 20.05 Emergency stop source and 20.13 Fault reset source are always valid, if activated. This is regardless of 20.01 Command location setting.</td></tr>
<tr><td>0 … 4</td><td>Local I/O</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>20.02</b></td><td colspan="7"><b>On/Off1 source</b></td></tr>
<tr><td colspan="7">On/Off1 command source.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Binary signal for Off1 control. See 06.09.b00 Used main control word. The state transition is edge-triggered.<br>0 = Off1 command.<br>0 → 1 = On command, edge-triggered.<br>**Note**: To give On- and Run command at the same time set 20.02 On/Off1 source = 20.06 Run/Stop source.<br>**Other [bit]**; source selection.<br>0: **Off1 command**; 0.<br>1: **On command**; 1.<br>2: **None**; inactive. Off1 command is forced.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>20: **DI1 and DI2**; 3 wire control.<br>– On- and Run command by rising edge (0 → 1) of DI1. DI2 must be high.<br>– Stop- and Off1 command by falling edge (1 → 0) of DI2. Setting of DI1 does not matter.<br>– Following settings apply: 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2.<br>– See 20.28 3 wire jogging off delay time.<br>**Note:** DI2 = 0 stops the drive. Additionally it overrides the On- and Run command of DI1.</td></tr>
<tr><td>0 … 20</td><td>DI1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**20.04**</td><td colspan="7">**Off2 source 1 (emergency off)**</td></tr>
<tr><td colspan="7">1st Off2 command source.<br>1st binary signal for Off2 control (emergency off/fast current off). See 06.09.b01 Used main control word. Via an AND with 20.08 Off2 source 2 (emergency off).<br>0 = Off2 command.<br>1 = Off2 inactive.<br>**Other [bit]**; source selection.<br>0: **Off2 command**; 0, emergency off/fast current off.<br>1: **Off2 inactive**; 1, normal operation.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>DIL</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">**20.05**</td><td colspan="7">**Emergency stop source**</td></tr>
<tr><td colspan="7">Off3 (emergency stop) command source.<br>Binary signal for Off3 control (emergency stop). See 06.09.b02 Used main control word. The stop mode is selected by 21.03 Emergency stop mode.<br>0 = Off3 command.<br>1 = Off3 inactive.<br>**Other [bit]**; source selection.<br>0: **Off3 command**; 0, emergency stop.<br>1: **Off3 inactive**; 1, normal operation.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Off3 inactive | - | 1 = 1 | n | n | Parameter |
| **20.06** | **Run/Stop source** | | | | | | |
| | Run/Stop command source.<br>Binary signal for Run. See 06.09.b03 Used main control word. The state transition is edge-triggered.<br>0 = Stop command.<br>0 → 1 = Run command, edge-triggered.<br>**Note**: To give On- and Run command at the same time set 20.02 On/Off1 source = 20.06 Run/Stop source.<br>**Other [bit]**; source selection.<br>0: **Stop command**; 0.<br>1: **Run command**; 1.<br>2: **None**; inactive. Stop command is forced.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>20: **DI1 and DI2**; 3 wire control.<br>– On- and Run command by rising edge (0 → 1) of DI1. DI2 must be high.<br>– Stop- and Off1 command by falling edge (1 → 0) of DI2. Setting of DI1 does not matter.<br>– Following settings apply: 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2.<br>– See 20.28 3 wire jogging off delay time.<br>**Note:** DI2 = 0 stops the drive. Additionally it overrides the On- and Run command of DI1. | | | | | | |
| | 0 … 20 | DI2 | - | 1 = 1 | n | n | Parameter |
| **20.08** | **Off2 source 2 (emergency off)** | | | | | | |
| | 2nd Off2 command source.<br>2nd binary signal for Off2 control (emergency off/fast current off). See 06.09.b01 Used main control word. Via an AND with 20.04 Off2 source 1 (emergency off).<br>0 = Off2 command.<br>1 = Off2 inactive.<br>**Other [bit]**; source selection.<br>0: **Off2 command**; 0, emergency off/fast current off.<br>1: **Off2 inactive**; 1, normal operation.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

19: **DIL**; 10.02.b15 DI delayed status.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 19 | Off2 inactive | - | 1 = 1 | n | n | Parameter |

**20.13** **Fault reset source**

Reset source.
Binary signal for Reset. See 06.09.b07 Used main control word. The signal resets the drive after a fault trip if the cause of the fault no longer exists. The state transition is edge-triggered.
0 = Not selected.
0 → 1 = Reset.
**Other [bit]**; source selection.
0: **No Reset**; 0.
1: **Reset**; 1.
2: **None**; inactive. No Reset is forced.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.
30: **FBA A MCW bit 7**; 06.03.b07 FBA A transparent control word.
31: **FBA B MCW bit 7**; 06.04.b07 FBA B transparent control word.
32: **EFB MCW bit 7**; 06.05.b07 EFB transparent control word.

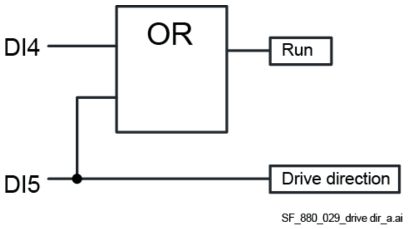
| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 32 | DI3 | - | 1 = 1 | n | y | Parameter |

**20.14** **Direction of rotation source**

Direction source.
Binary signal for Direction. 20.14 Direction of rotation source allows changing the direction of rotation by negating the speed reference in remote operation.
**Example 1:** Typically used for a standard interface. 20.06 Run/Stop source = DI4 and 20.14 Direction of rotation source = DI5:

| DI4 | DI5 | 06.09.b03 Used main control word = Run | Direction of rotation |
|---|---|---|---|
| 0 | 0 | 0 = Stop command | - |
| 0 | 1 | 0 = Stop command | - |
| 1 | 0 | 1 = Run command | Forward |
| 1 | 1 | 1 = Run command | Reverse |

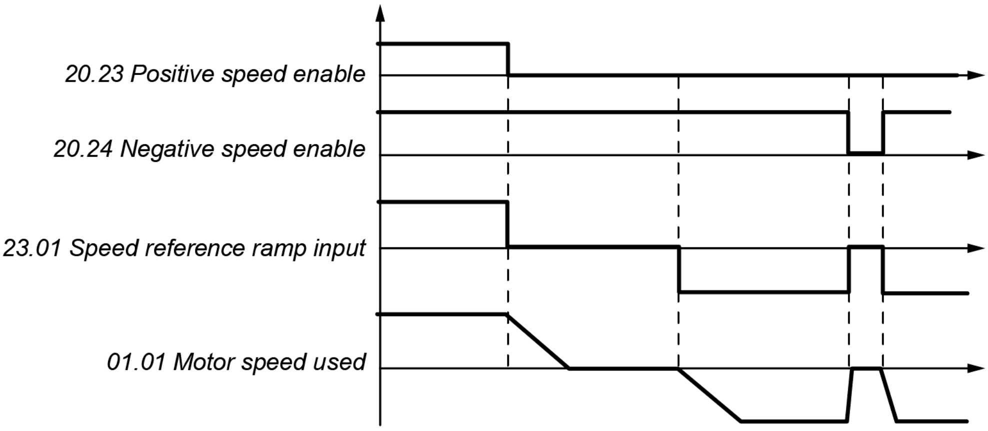
**Example 2:** Typically used for a joystick interface. 20.06 Run/Stop source = DI4 and 20.14 Direction of rotation source = DI5 set Run:



SF_880_029_drive dir_a.ai

| DI4 | DI5 | 06.09.b03 Used main control word = Run | Direction of rotation |
|---|---|---|---|
| 0 | 0 | 0 = Stop command | - |
| 0 | 1 | 1 = Run command | Reverse |
| 1 | 0 | 1 = Run command | Forward |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table><tr><td>1</td><td>1</td><td>Not used by joystick (1 = Run command)</td><td>Not used by joystick (reverse)</td></tr></table><br>0 = Forward.<br>1 = Reverse.<br><b>Other [bit]</b>; source selection.<br>0: <b>Forward</b>; 0, normal operation.<br>1: <b>Reverse</b>; 1.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.<br>40: <b>DI1 set Run</b>; 10.02.b00 DI delayed status. DI1 = 1: Direction reverse and set Run command. DI1 = 0: normal operation, see 20.06 Run/Stop source.<br>41: <b>DI2 set Run</b>; 10.02.b01 DI delayed status. DI2 = 1: Direction reverse and set Run command. DI2 = 0: normal operation, see 20.06 Run/Stop source.<br>42: <b>DI3 set Run</b>; 10.02.b02 DI delayed status. DI3 = 1: Direction reverse and set Run command. DI3 = 0: normal operation, see 20.06 Run/Stop source.<br>43: <b>DI4 set Run</b>; 10.02.b03 DI delayed status. DI4 = 1: Direction reverse and set Run command. DI4 = 0: normal operation, see 20.06 Run/Stop source.<br>44: <b>DI5 set Run</b>; 10.02.b04 DI delayed status. DI5 = 1: Direction reverse and set Run command. DI5 = 0: normal operation, see 20.06 Run/Stop source.<br>45: <b>DI6 set Run</b>; 10.02.b05 DI delayed status. DI6 = 1: Direction reverse and set Run command. DI6 = 0: normal operation, see 20.06 Run/Stop source.<br>46: <b>DIO1 set Run</b>; 11.02.b00 DIO delayed status. DIO1 = 1: Direction reverse and set Run command. DIO1 = 0: normal operation, see 20.06 Run/Stop source.<br>47: <b>DIO2 set Run</b>; 11.02.b01 DIO delayed status. DIO2 = 1: Direction reverse and set Run command. DIO2 = 0: normal operation, see 20.06 Run/Stop source.<br>48: <b>DIL set Run</b>; 10.02.b15 DI delayed status. DIL = 1: Direction reverse and set Run command. DIL = 0: normal operation, see 20.06 Run/Stop source.</td></tr>
<tr><td></td><td>0 … 48</td><td>Forward</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>20.15</b></td><td colspan="7"><b>Hand/Auto source</b></td></tr>
<tr><td colspan="7">Hand/Auto source.<br>Binary signal to switch between Hand (Local I/O) and Auto (Main control word) control. The selection made by 20.01 Command location is overwritten.<br>0 = Hand.<br>1 = Auto.<br><b>Other [bit]</b>; source selection.<br>0: <b>Hand</b>; 0.<br>1: <b>Auto</b>; 1.<br>2: <b>None</b>; inactive. 20.01 Command location is valid.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | 0 … 19 | None | - | 1 = 1 | n | y | Parameter |
| **20.23** | **Positive speed enable** | | | | | | |
| | Enable positive speed source.<br>Binary signal to enable positive speed.<br>0 = Disable positive speed.<br>1 = Enable positive speed.<br>In the figure below, positive speed reference is set to zero after the positive speed enable signal has been cleared. Actions:<br>If in speed control, the speed reference is set to zero and the motor is stopped along the currently active deceleration ramp.<br>If in torque control, the rotation direction of the motor is monitored.<br><br> <br>DZ_LIN_035_speed_a.ai<br>**Example**: The motor is rotating in the forward direction. To stop the motor, the positive speed enable signal is cleared by a hardware limit switch (e.g. via digital input).<br>If the positive speed enable signal remains deactivated and the negative speed enable signal is active, only reverse rotation of the motor is allowed.<br>**Other [bit]**; source selection.<br>0: **Disable positive speed**; 0; positive speed reference is set to zero.<br>1: **Enable positive speed**; 1; normal operation.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Enable positive speed | - | 1 = 1 | n | y | Parameter |
| **20.24** | **Negative speed enable** | | | | | | |
| | Enable negative speed source.<br>Binary signal to enable negative speed.<br>0 = Disable negative speed.<br>1 = Enable negative speed.<br>See 20.23 Positive speed enable. | | | | | | |
| | 0 … 19 | Enable negative speed | - | 1 = 1 | n | y | Parameter |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **20.25** | **Jog function enable** | | | | | | |
| | Enable jog function source.<br>Binary signal for the jog function. Jogging itself is selected by 20.26 Jogging 1 start source or 20.27 Jogging 2 start source.<br>0 = Disable jog function.<br>1 = Enable jog function.<br>**Note**: As long as a start command is on, 20.25 Jog function enable is ignored. As long as 20.25 Jog function enable is on, all start commands are ignored, apart from jogging and inching. See 06.02.b08/b09 Main control word.<br>**Other [bit]**; source selection.<br>0: **Disable jog function**; 0, normal operation.<br>1: **Enable jog function**; 1.<br>2: **Enable by jog commands**; jog function is directly enabled by jogging 1 start or jogging 2 start. See 20.26 Jogging 1 start source and 20.27 Jogging 2 start source.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Disable jog function | - | 1 = 1 | n | y | Parameter |
| **20.26** | **Jogging 1 start source** | | | | | | |
| | Enable jogging 1 start source.<br>Binary signal for jogging 1 start. If enabled by 20.25 Jog function enable, selects the source for the activation of jogging 1.<br>0 = Disable jogging 1.<br>1 = Enable jogging 1.<br>**Notes**:<br>– 20.01 Command location = Local I/O:<br>    – The drive has to be in state Ready run. Mark, that only the On command has been given. When jogging 1 start is given the drives sets automatically the Run command and Ramp out zero = Ramp halt = Ramp in zero = 0. The motor accelerates to the speed set in 22.42 Jogging 1 reference.<br>    – Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.<br>    – If both jogging 1 and 2 are activated, the one that was activated first has priority.<br>    – Inching is not possible.<br>– 20.01 Command location = Main control word:<br>    – Use Inching 1. See 06.02.b08 Main control word.<br>    – Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.<br>    – If both inching 1 and 2 are activated, the one that was activated first has priority.<br>    – Jogging is not possible.<br>**Other [bit]**; source selection.<br>0: **Disable jogging 1**; 0, normal operation.<br>1: **Enable jogging 1**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>40: **DI1 plus direction**; 10.02.b00 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>41: **DI2 plus direction**; 10.02.b01 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>42: **DI3 plus direction**; 10.02.b02 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>43: **DI4 plus direction**; 10.02.b03 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>44: **DI5 plus direction**; 10.02.b04 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>45: **DI6 plus direction**; 10.02.b05 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>46: **DIO1 plus direction**; 11.02.b00 DIO delayed status. 20.14 Direction of rotation source is taken into account.<br>47: **DIO2 plus direction**; 11.02.b01 DIO delayed status. 20.14 Direction of rotation source is taken into account.<br>48: **DIL plus direction**; 10.02.b15 DI delayed status. 20.14 Direction of rotation source is taken into account.</td></tr>
<tr><td></td><td>0 … 48</td><td>Disable jogging 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**20.27**</td><td colspan="7">**Jogging 2 start source**</td></tr>
<tr><td></td><td colspan="7">Enable jogging 2 start source.<br>Binary signal for jogging 2 start. If enabled by 20.25 Jog function enable, selects the source for the activation of jogging 2.<br>0 = Disable jogging 2.<br>1 = Enable jogging 2.<br>**Notes**:<br>– 20.01 Command location = Local I/O:<br>– The drive has to be in state Ready run. Mark, that only the On command has been given. When jogging 1 start is given the drives sets automatically the Run command and Ramp out zero = Ramp halt = Ramp in zero = 0. The motor accelerates to the speed set in 22.43 Jogging 2 reference.<br>– Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.<br>– If both jogging 1 and 2 are activated, the one that was activated first has priority.<br>– Inching is not possible.<br>– 20.01 Command location = Main control word:<br>– Use Inching 2. See 06.02.b09 Main control word.<br>– Acceleration and deceleration time for jogging is selected by 23.20 Acceleration time jogging and 23.21 Deceleration time jogging.<br>– If both inching 1 and 2 are activated, the one that was activated first has priority.<br>– Jogging is not possible.<br>**Other [bit]**; source selection.<br>0: **Disable jogging 2**; 0, normal operation.<br>1: **Enable jogging 2**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>40: **DI1 plus direction**; 10.02.b00 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>41: **DI2 plus direction**; 10.02.b01 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>42: **DI3 plus direction**; 10.02.b02 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>43: **DI4 plus direction**; 10.02.b03 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>44: **DI5 plus direction**; 10.02.b04 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>45: **DI6 plus direction**; 10.02.b05 DI delayed status. 20.14 Direction of rotation source is taken into account.<br>46: **DIO1 plus direction**; 11.02.b00 DIO delayed status. 20.14 Direction of rotation source is taken into account.<br>47: **DIO2 plus direction**; 11.02.b01 DIO delayed status. 20.14 Direction of rotation source is taken into account.<br>48: **DIL plus direction**; 10.02.b15 DI delayed status. 20.14 Direction of rotation source is taken into account.</td></tr>
<tr><td></td><td>0 … 48</td><td>Disable jogging 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="4">**20.28**</td><td colspan="7">**3 wire jogging off delay time**</td></tr>
<tr><td colspan="7">Delay time for 3 wire jogging.<br>Mains contactor off delay when 20.02 On/Off1 source = 20.06 Run/Stop source = DI1 and DI2. After jogging is taken away the opening of the mains contactor is delayed by 20.28 3 wire jogging off delay time. That means the mains contactor is held during cyclic jogging.</td></tr>
<tr><td>0.0 … 3250.0</td><td>5.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td colspan="7"><table><tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr></table></td></tr>
<tr><td rowspan="2">**20.33**</td><td colspan="7">**Mains contactor control mode**</td></tr>
<tr><td colspan="7">Control mode for mains contactor or DC breaker.<br>20.33 Mains contactor control mode determines the reaction to On- and Run command. See 06.09.b03 Used main control word.<br>**Notes**:<br>– If the DC voltage measurement is located at the motor terminals use 20.33 Mains contactor control mode = On (modified H6 … H8 drives).<br>– The DC contactor (US style) K1.1 is a special designed DC contactor with one normally closed contact for the dynamic braking resistor $R_B$ and two normally open contacts for C1 and D1. The DC contactor should be controlled by 06.24.b10 Current controller status word 1. The acknowledge signal can be connected to either 20.34 Mains contactor acknowledge source or 20.35 DC breaker acknowledge source. Use 20.33 Mains contactor control mode = DC contactor.<br>0: **On**; mains contactor or DC breaker closes with the On command.<br>1: **On and Run**; mains contactor or DC breaker closes with On- and Run command.<br>3: **DC contactor**; if a DC breaker or a DC contactor (US style) is used as a mains contactor, it will be closed with the On command:<br>– Use manual voltage balancing. Thus, set 95.37 DC voltage measurement mode = DC contactor and balance 01.21 Armature voltage by means of 95.35 DC voltage measurement offset.<br>– The armature voltage measurements are adapted to an open DC breaker by clamping 01.21 Armature voltage in V, 28.05 Armature voltage, 28.06 EMF voltage and 94.01 EMF speed to zero when the drive is Off. The clamping is released either 100 ms after an On command is given in case 20.35 DC breaker acknowledge source = None or when using the DC breaker acknowledge</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | with 20.35 DC breaker acknowledge source = DIxx until the acknowledge signal indicates that the DC breaker is closed. | | | | | | |
| | 0 … 3 | On | - | 1 = 1 | n | y | Parameter |
| **20.34** | **Mains contactor acknowledge source** | | | | | | |
| | Mains contactor acknowledge source.<br>The event generates fault F524 Main contactor acknowledge:<br>– Immediately, when the acknowledge signal is selected and the feedback is lost during operation.<br>– After 10 seconds, when the drive is being switched on, the acknowledge is selected and the feedback is missing for longer than 10 seconds.<br>The mains contactor acknowledge is also dependent on the setting of 20.33 Mains contactor control mode.<br>0 = No acknowledge.<br>1 = Acknowledge.<br>**Other [bit]**; source selection.<br>0: **No acknowledge**; 0.<br>1: **Acknowledge**; 1.<br>2: **None**; inactive. Mains contactor acknowledge is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status | | | | | | |
| | 0 … 19 | None | - | 1 = 1 | n | y | Parameter |
| **20.35** | **DC breaker acknowledge source** | | | | | | |
| | DC breaker acknowledge source.<br>The event generates warning A103 DC-breaker acknowledge, if the DC breaker acknowledge is selected and the feedback is missing.<br>The motor will coast if the warning is set.<br>0 = No acknowledge.<br>1 = Acknowledge.<br>**Other [bit]**; source selection.<br>0: **No acknowledge**; 0.<br>1: **Acknowledge**; 1.<br>2: **None**; inactive. DC breaker acknowledge is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status | | | | | | |
| | 0 … 19 | None | - | 1 = 1 | n | y | Parameter |
| **20.38** | **Drive fan acknowledge source** | | | | | | |
| | Drive fan acknowledge source.<br>31.41 Drive fan fault function = Warning:<br>– At start the event generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing for longer than 6 seconds. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– During running the event immediately generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing.<br>– The warning is reset if the drive fan acknowledge is coming back.<br>31.41 Drive fan fault function = Fault:<br>– At start the event generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing for longer than 6 seconds.<br>If the feedback is missing for longer than 10 seconds the event generates fault 5080 Drive fan acknowledge.<br>– During running the event immediately generates warning A581 Drive fan acknowledge, if the drive fan acknowledge is selected and the feedback is missing.<br>If the feedback is missing for longer than 10 seconds the event generates fault 5080 Drive fan acknowledge.<br>– The warning is reset automatically if the drive fan acknowledge is coming back before 10 seconds are elapsed.<br>0 = No acknowledge.<br>1 = Acknowledge.<br>**Other [bit]**; source selection.<br>0: **No acknowledge**; 0.<br>1: **Acknowledge**; 1.<br>2: **None**; inactive. Drive fan acknowledge is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**20.39**</td><td colspan="7">**Motor fan acknowledge source**</td></tr>
<tr><td colspan="7">Motor/External fan acknowledge source.<br>– At start the event generates warning A781 Motor fan acknowledge, if the motor/external fan acknowledge is selected and the feedback is missing for longer than 6 seconds.<br>If the feedback is missing for longer than 10 seconds the event generates fault 71B1 Motor fan acknowledge.<br>– During running the event immediately generates warning A781 Motor fan acknowledge, if the motor/external fan acknowledge is selected and the feedback is missing.<br>If the feedback is missing for longer than 10 seconds the event generates fault 71B1 Motor fan acknowledge.<br>– The warning is reset automatically if the motor/external fan acknowledge is coming back before 10 seconds are elapsed.<br>0 = No acknowledge.<br>1 = Acknowledge.<br>**Other [bit]**; source selection.<br>0: **No acknowledge**; 0.<br>1: **Acknowledge**; 1.<br>2: **None**; inactive. Motor fan acknowledge is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>20.40</b></td><td colspan="7"><b>Drive/Motor fan delay time</b></td></tr>
<tr><td colspan="7">Delay time for drive/motor fan.<br>After the drive has given an Off command all fans, drive and motor, continue to run until 20.40 Drive/Motor fan delay time elapses. If drive or motor overtemperature is pending, the delay starts after the temperature has dropped below the overtemperature level.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>20.43</b></td><td colspan="7"><b>Dynamic braking acknowledge source</b></td></tr>
<tr><td colspan="7">Dynamic braking acknowledge source.<br>The event generates warning A103 DC-breaker acknowledge, if dynamic braking acknowledge is selected and the feedback dynamic braking active is still present when an On command is given. This prevents the drive from starting, while dynamic braking is active.<br>0 = Dynamic braking inactive.<br>1 = Dynamic braking active.<br><b>Other [bit]</b>; source selection.<br>0: <b>Dynamic braking inactive</b>; 0, normal operation.<br>1: <b>Dynamic braking active</b>; 1.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status</td></tr>
<tr><td>0 … 19</td><td>Dynamic braking inactive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>20.44</b></td><td colspan="7"><b>Dynamic braking delay</b></td></tr>
<tr><td colspan="7">Delay time for Dynamic braking.<br>In case of dynamic braking with EMF speed feedback, see 90.41 M1 feedback selection, or a speed feedback fault and the motor voltage is not measured directly at the motor terminals, e.g. due to a DC contactor (US style), there is no valid information about the motor speed and no zero speed information. Thus, dynamic braking and excitation is active until 20.44 Dynamic braking delay is elapsed.<br><b>≤ -0.1 s</b>; the motor voltage is measured directly at the motor terminals and is valid during dynamic braking.<br><b>= 0.0 s</b>; during dynamic braking, no zero speed signal is generated.<br><b>≥ 0.1 s</b>; during dynamic braking, a zero speed signal is generated after the programmed time is elapsed.</td></tr>
<tr><td>-1.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>20.47</b></td><td colspan="7"><b>Overvoltage protection trigger source</b></td></tr>
<tr><td colspan="7">Overvoltage protection trigger source.<br>The event generates warning A120 Overvoltage protection active and blocks the current controller, if the overvoltage protection trigger is selected and triggered. The drive has to be in field exciter mode. See 99.06 Operation mode.<br><b>Note:</b> The DO of the DCF506 must be connected to a DI of the large field exciter.<br>0 = No trigger command.<br>1 = Trigger.<br><b>Other [bit]</b>; source selection.</td></tr>
</table>

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 0: **No trigger command**; 0, normal operation.<br>1: **Trigger**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status | | | | | | |
| | 0 … 19 | No trigger command | - | 1 = 1 | n | y | Parameter |

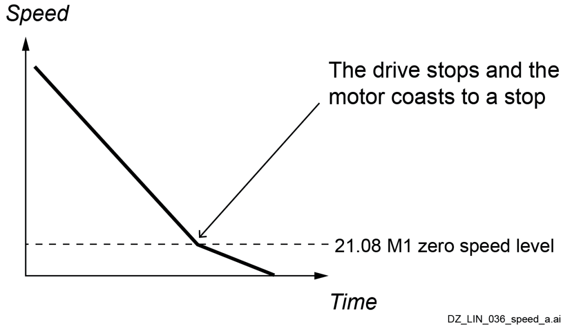
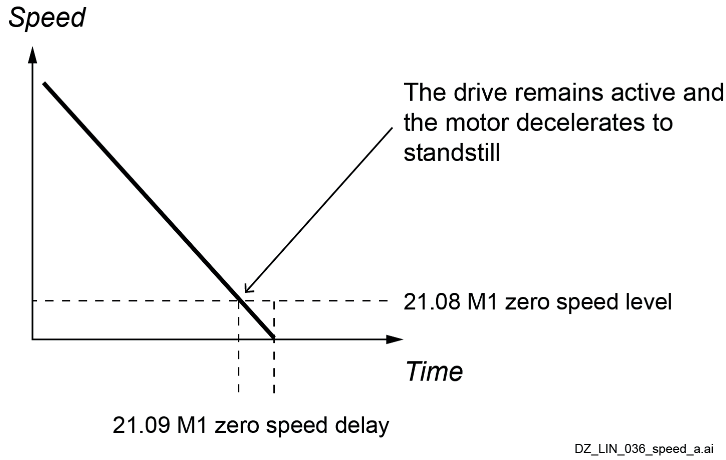
## 21 Start/Stop mode

Start and stop modes, emergency stop mode and zero speed.

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| **21.01** | **Start mode** | | | | | | |
| | Start mode of the drive.<br>Selects the motor start function in response to a Run command. See 06.09.b03 Used main control word.<br>0: **Start from zero**; wait until the motor has reached zero speed, then restart. See 21.08 M1 zero speed level. In case the restart command comes before zero speed is reached, A137 Start condition conflict is generated.<br>1: **Flying start**; start the drive into a rotating motor, when stopping via Coast stop, Ramp stop or Torque limit. Stop via Dynamic braking, Off2 (emergency off/electrical disconnect/fast current off) or Off3 (emergency stop) is not interrupted. Wait until zero speed is reached.<br>2: **Flying start dynamic braking**; start the drive into a rotating motor, when stopping via Coast stop, Ramp stop, Torque limit or Dynamic braking. Dynamic braking is interrupted.<br>Make sure, that the hardware, e.g. the switch disconnecting the braking resistor, is able to disconnect the current. | | | | | | |
| | 0 … 2 | Flying start | - | 1 = 1 | n | y | Parameter |
| **21.02** | **Off1 mode** | | | | | | |
| | Mode for Off1 control.<br>Selects the way the motor is stopped when an Off1 command is given. See 06.09.b00 Used main control word.<br>In case Off1 command and Stop command are given at the same time or nearly contemporary 21.02 Off1 mode and 21.04 Stop mode must have the same setting.<br>Priority list:<br>0. 06.09.b01 Off2 control.<br>1. 21.03 Emergency stop mode.<br>2. 21.02 Off1 mode.<br>3. 21.04 Stop mode.<br>0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/Fbeq16** | **Volatile** | **Change running** | **Type** |
| | In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>3: **Torque limit**; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>4: **Dynamic braking**; the motor stops by means of dynamic braking. | | | | | | |
| | 0 … 4 | Ramp stop | - | 1 = 1 | n | y | Parameter |
| **21.03** | **Emergency stop mode** | | | | | | |
| | Mode for Off3 control (emergency stop).<br>Selects the way the motor is stopped when an Off3 (emergency stop) command is given. See 06.09.b02 Used main control word.<br>Priority list:<br>0. 06.09.b01 Off2 control.<br>1. 21.03 Emergency stop mode.<br>2. 21.02 Off1 mode.<br>3. 21.04 Stop mode.<br>0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>See Off3 stop mode 0 in 06.20.b10 Run inhibit status word.<br>1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>See Off3 stop mode 1 in 06.20.b11 Run inhibit status word.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>2: **Emergency ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>See Off3 stop mode 2 in 06.20.b12 Run inhibit status word.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>3: **Torque limit**; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>See Off3 stop mode 3 in 06.20.b13 Run inhibit status word.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>4: **Dynamic braking**; the motor stops by means of dynamic braking.<br>See Off3 stop mode 4 in 06.20.b14 Run inhibit status word. | | | | | | |
| | 0 … 4 | Emergency ramp stop | - | 1 = 1 | n | y | Parameter |
| **21.04** | **Stop mode** | | | | | | |
| | Mode for Run.<br>Selects the way the motor is stopped when a Stop command is given. See 06.09.b03 Used main control word. | | | | | | |

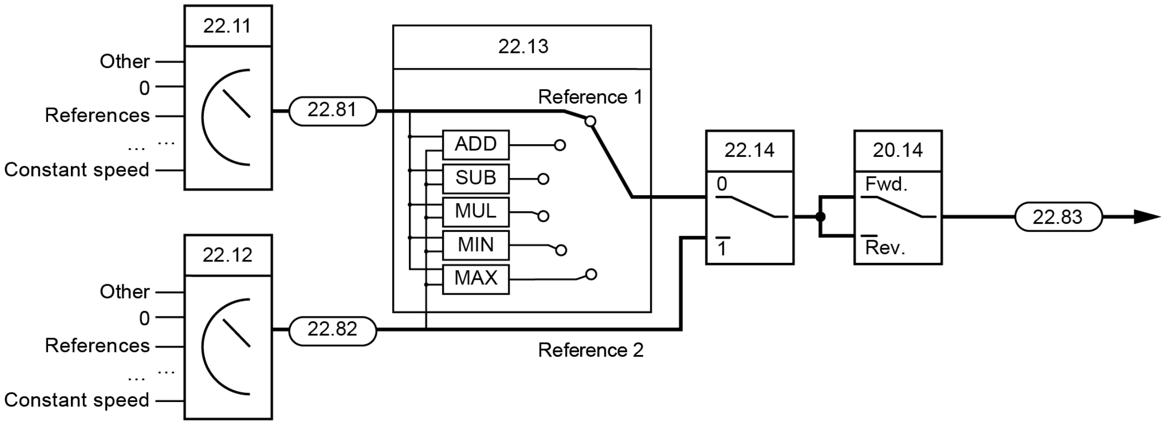
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | In case Off1 command and Stop command are given at the same time or nearly contemporary 21.02 Off1 mode and 21.04 Stop mode must have the same setting.<br>Priority list:<br>0. 06.09.b01 Off2 control.<br>1. 21.03 Emergency stop mode.<br>2. 21.02 Off1 mode.<br>3. 21.04 Stop mode.<br>0: **Coast stop**; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked.<br>1: **Ramp stop**; the input of the drive ramp is set to zero. Thus, the motor stops along the active deceleration ramp. See 23.11 Ramp set selection. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>3: **Torque limit**; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>4: **Dynamic braking**; the motor stops by means of dynamic braking. | | | | | | |
| | 0 … 4 | Ramp stop | - | 1 = 1 | n | y | Parameter |
| **21.08** | **M1 zero speed level** | | | | | | |
| | Motor 1 zero speed level.<br>When a Stop command is given, the motor decelerates along a speed ramp or at torque limit until the zero speed level is reached and 21.09 M1 zero speed delay is elapsed. See 21.04 Stop mode. Afterwards the motor will coast. At that moment, existing brakes are closed (applied).<br>While the speed feedback is in the level, Zero speed is set high. See 06.21.b00 Speed control status word.<br>**Notes**:<br>– In case 21.01 Start mode = Start from zero and in case the restart command comes before zero speed is reached, A137 Start condition conflict is generated.<br>– Setting 21.08 M1 zero speed level = 30000.00 rpm disables the zero speed supervision. | | | | | | |
| | 0.00 … 30000.00 | 75.00 | rpm | See 46.02 | n | y | Parameter |
| **21.09** | **M1 zero speed delay** | | | | | | |
| | Motor 1 zero speed delay.<br>The zero speed delay compensates for the time the motor needs to decelerate from 21.08.M1 zero speed level to standstill. Until 21.09 M1 zero speed delay elapses the brake is kept open (lifted).<br>Without zero speed delay:<br>The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 21.08 M1 zero speed level, the drive stops and the motor coasts to standstill. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
| | <br> <br>With zero speed delay:<br>The drive receives a Stop command and decelerates along a speed ramp or at torque limit. When the motor speed feedback falls below 21.08 M1 zero speed level the zero speed delay is activated. Until the zero delay elapses, the drive keeps on working and thus the motor can decelerate to standstill.<br><br> | | | | | | |
| | 0.0 … 3250.0 | 0.1 | s | 10 = 1 s | n | y | Parameter |

## 22 Speed reference selection

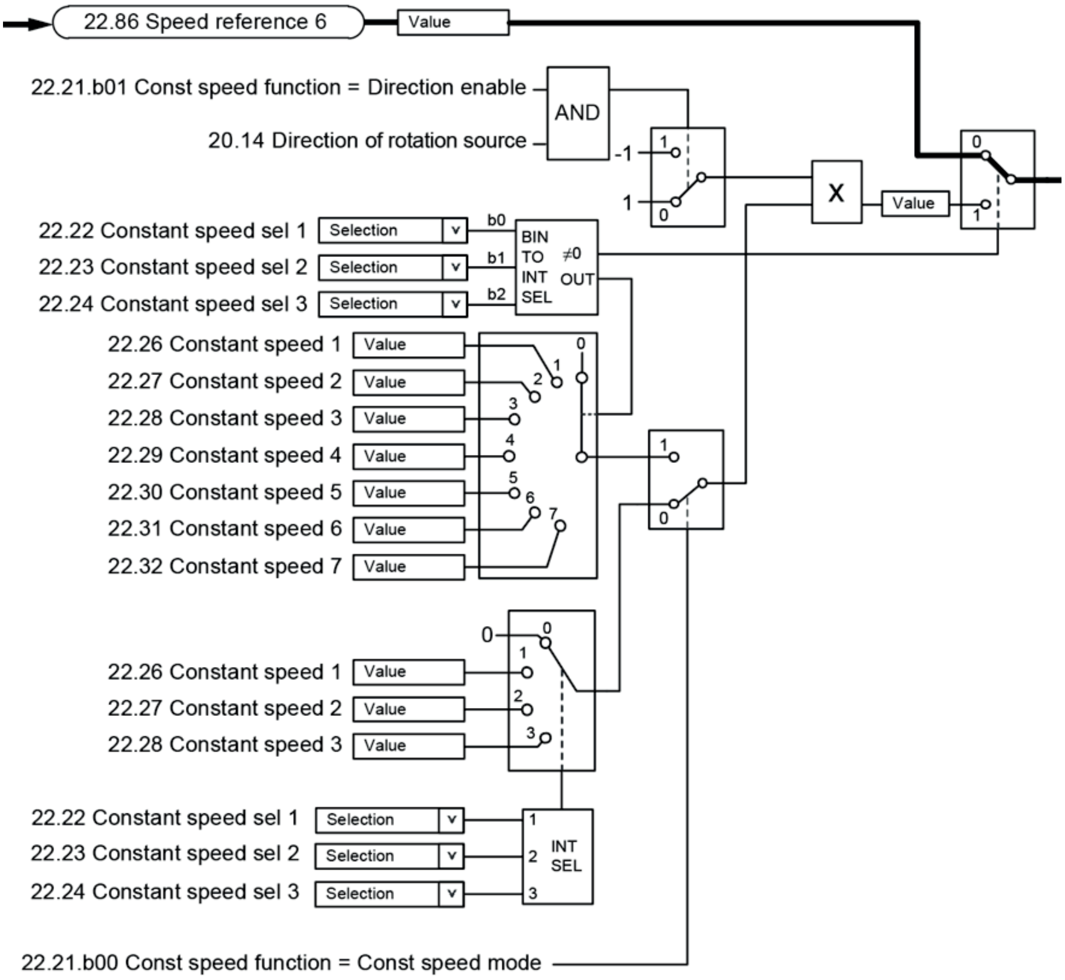
Speed reference selection and motor potentiometer settings.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **22.01** | **Speed reference unlimited** | | | | | | |
| | Speed reference after selections.<br>Displays the speed reference after selections like constant speeds, jogging, local control from control panel and safe speed. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **22.07** | **Speed reference** | | | | | | |
| | Main speed reference input.<br>Main speed reference input of the drive. Can be connected via 22.11 Speed reference 1 source and/or 22.12 Speed reference 2 source. | | | | | | |
| | -30000.00 … 30000.00 | 0.00 | rpm | See 46.02 | n | y | Parameter |
| **22.08** | **Auxiliary speed reference** | | | | | | |
| | Auxiliary speed reference input.<br>Auxiliary speed reference input of the drive. Can be connected via 22.11 Speed reference 1 source and/or 22.12 Speed reference 2 source. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | -30000.00 … 30000.00 | 0.00 | rpm | See 46.02 | n | y | Parameter |
| **22.11** | **Speed reference 1 source** | | | | | | |
| | Selects speed reference source 1.<br>Two signal sources can be defined. See 22.11 Speed reference 1 source and 22.12 Speed reference 2 source. 22.14 Speed reference 1/2 selection switches between the two sources or a mathematical function. The mathematical function depends on 22.13 Speed reference function. Direction on rotation depends on 20.14 Direction of rotation source.<br> <br>SF_880_025_DCS_speed reference_a.ai<br>**Other**; source selection.<br>0: **Zero**; 0 rpm, speed reference is set to zero.<br>1: **22.07 Speed reference**; 22.07 Speed reference.<br>3: **22.08 Auxiliary speed reference**; 22.08 Auxiliary speed reference.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.<br>9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.<br>14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.<br>17: **Motor potentiometer reference**; 22.80 Motor potentiometer reference.<br>18: **Process PID output actual**; 40.01 Process PID output actual.<br>19: **Encoder 1 speed**; 90.10 Encoder 1 speed.<br>20: **Encoder 2 speed**; 90.20 Encoder 2 speed.<br>21: **OnBoard encoder**; 94.04 OnBoard encoder speed.<br>26: **Constant speed 6**; 22.31 Constant speed 6.<br>27: **Constant speed 7**; 22.32 Constant speed 7. | | | | | | |
| | 0 … 27 | AI1 scaled | - | 1 = 1 | n | y | Parameter |
| **22.12** | **Speed reference 2 source** | | | | | | |
| | Selects speed reference source 2.<br>For selections and diagram, see 22.11 Speed reference 1 source. | | | | | | |
| | 0 … 27 | Zero | - | 1 = 1 | n | y | Parameter |
| **22.13** | **Speed reference function** | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Speed reference function.<br>Selects a mathematical function between speed reference 1 and speed reference 2. See 22.11 Speed reference 1 source.<br>0: **Ref 1**; speed reference 1 selected by 22.11 Speed reference 1 source is used.<br>1: **Add (ref 1 + ref 2)**; the sum of the two speed references is used.<br>2: **Sub (ref 1 - ref 2)**; the result of speed reference 1 minus speed reference 2 is used.<br>3: **Mul (ref 1 • ref 2)**; the multiplication of the two speed references is used.<br>4: **Min (ref 1, ref 2)**; the smaller of the two speed references is used.<br>5: **Max (ref 1, ref 2)**; the greater of the two speed references is used. | | | | | | |
| | 0 … 5 | Ref 1 | - | 1 = 1 | n | y | Parameter |
| **22.14** | **Speed reference 1/2 selection** | | | | | | |
| | Selection between speed reference 1 and speed reference 2.<br>Configures the selection between speed reference 1 and speed reference 2. See 22.11 Speed reference 1 source.<br>0 = Speed reference 1.<br>1 = Speed reference 2.<br>**Other [bit]**; source selection.<br>0: **Speed reference 1**; 0, normal operation.<br>1: **Speed reference 2**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Speed reference 1 | - | 1 = 1 | n | y | Parameter |
| **22.15** | **Speed additive 1 source** | | | | | | |
| | 1st additive speed reference.<br>Defines a speed reference to be added to 22.83 Speed reference 3. See 22.11 Speed reference 1 source.<br>**Note**: Due to safety reasons, the additive speed reference is not applied when any of the stop functions are active. | | | | | | |
| | 0 … 27 | Zero | - | 1 = 1 | n | y | Parameter |
| **22.16** | **Speed share** | | | | | | |
| | Speed reference scaling factor.<br>Defines a scaling factor between 22.84 Speed reference 4 and 22.85 Speed reference 5. | | | | | | |
| | -8.000 … 8.000 | 1.000 | - | 1000 = 1 | n | y | Parameter |
| **22.17** | **Speed additive 2 source** | | | | | | |
| | 2nd additive speed reference.<br>Defines a speed reference to be added to 22.85 Speed reference 5. See 22.11 Speed reference 1 source.<br>**Note**: Due to safety reasons, the additive speed reference is not applied when any of the stop functions are active. | | | | | | |
| | 0 … 27 | Zero | - | 1 = 1 | n | y | Parameter |
| **22.21** | **Constant speed function** | | | | | | |
| | Constant speed configuration word.<br>Determines how constant speeds are selected and whether 20.14 Direction of rotation source is considered or not when applying a constant speed. | | | | | | |

| Index | Name | | | | | |
|---|---|---|---|---|---|---|
| | **Text** | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |



Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Constant speed mode | 1 | Packed: 7 constant speeds are selectable using the three sources defined by 22.22 Constant speed sel 1, 22.23 Constant speed sel 2 and 22.24 Constant speed sel 3. |
| | | 0 | Separate: Constant speeds 1, 2 and 3 are separately activated by the sources defined by 22.22 Constant speed sel 1, 22.23 Constant speed sel 2 and 22.24 Constant speed sel 3.<br>In case of conflict, the constant speed with the smaller number takes priority. |
| 1 | Direction enable | 1 | Depending on direction: To determine the direction of rotation for a constant speed, the sign of the constant speed setting is multiplied by 20.14 Direction of rotation source. This effectively allows the drive to have 14 (7 forward and 7 reverse) constant speeds.<br>**WARNING!**<br>If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction. |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | | 0 | According to parameter: The running direction for the constant speed is determined by the sign of the constant speed setting parameters. |
| 2 … 15 | reserved | | |

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | n | y | Parameter |

**22.22** **Constant speed sel 1**

Constant speed selector 1.
22.21.b00 Constant speed function = 1 (Packed) activates the constant speeds according to the following table.

| Source defined by. 22.22 Constant speed sel 1 | Source defined by 22.23 Constant speed sel 2 | Source defined by 22.24 Constant speed sel 3 | Active constant speed |
|---|---|---|---|
| 0 | 0 | 0 | None |
| 1 | 0 | 0 | Constant speed 1 |
| 0 | 1 | 0 | Constant speed 2 |
| 1 | 1 | 0 | Constant speed 3 |
| 0 | 0 | 1 | Constant speed 4 |
| 1 | 0 | 1 | Constant speed 5 |
| 0 | 1 | 1 | Constant speed 6 |
| 1 | 1 | 1 | Constant speed 7 |

22.21.b00 Constant speed function = 0 (Separate) activates a source that selects constant speed 1.
0 = Always off.
1 = Always on.
**Other [bit]**; source selection.
0: **Not selected**; 0, normal operation.
1: **Selected**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.
5: **DI3**; 10.02.b02 DI delayed status.
6: **DI4**; 10.02.b03 DI delayed status.
7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 19 or<br>0000h … FFFFh | Not selected or<br>0000h | - | 1 = 1 | n | y | Parameter |

**22.23** **Constant speed sel 2**

Constant speed selector 2.
See 22.22 Constant speed sel 1.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 19 or<br>0000h … FFFFh | Not selected or<br>0000h | - | 1 = 1 | n | y | Parameter |

**22.24** **Constant speed sel 3**

Constant speed selector 3.
See 22.22 Constant speed sel 1.

| Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 19 or<br>0000h … FFFFh | Not selected or<br>0000h | - | 1 = 1 | n | y | Parameter |

**22.26** **Constant speed 1**

Constant speed 1.
Defines constant speed 1, the speed the motor will turn when constant speed 1 is selected.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.27</b></td><td colspan="7"><b>Constant speed 2</b></td></tr>
<tr><td colspan="7">Constant speed 2.<br>Defines constant speed 2, the speed the motor will turn when constant speed 2 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.28</b></td><td colspan="7"><b>Constant speed 3</b></td></tr>
<tr><td colspan="7">Constant speed 3.<br>Defines constant speed 3, the speed the motor will turn when constant speed 3 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.29</b></td><td colspan="7"><b>Constant speed 4</b></td></tr>
<tr><td colspan="7">Constant speed 4.<br>Defines constant speed 4, the speed the motor will turn when constant speed 4 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.30</b></td><td colspan="7"><b>Constant speed 5</b></td></tr>
<tr><td colspan="7">Constant speed 5.<br>Defines constant speed 5, the speed the motor will turn when constant speed 5 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.31</b></td><td colspan="7"><b>Constant speed 6</b></td></tr>
<tr><td colspan="7">Constant speed 6.<br>Defines constant speed 6, the speed the motor will turn when constant speed 6 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.32</b></td><td colspan="7"><b>Constant speed 7</b></td></tr>
<tr><td colspan="7">Constant speed 7.<br>Defines constant speed 7, the speed the motor will turn when constant speed 7 is selected.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.42</b></td><td colspan="7"><b>Jogging 1 reference</b></td></tr>
<tr><td colspan="7">Speed reference for jogging function 1.<br>Defines the speed reference for jogging 1. See 20.26 Jogging 1 start source.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.43</b></td><td colspan="7"><b>Jogging 2 reference</b></td></tr>
<tr><td colspan="7">Speed reference for jogging function 2.<br>Defines the speed reference for jogging 2. See 20.27 Jogging 2 start source.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>22.46</b></td><td colspan="7"><b>Speed reference safe</b></td></tr>
<tr><td colspan="7">Defines a safe speed reference value that is used with supervision functions such as:<br>– 12.03 AI supervision function.<br>– 49.05 Communication loss action.<br>– 50.02 FBA A comm loss func.<br>– 50.32 FBA B comm loss func.<br>– 58.14 Communication loss action.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>22.71</b></td><td colspan="7"><b>Motor potentiometer function</b></td></tr>
<tr><td colspan="7">Motor potentiometer function.<br>Activates and selects the mode of the motor potentiometer.<br>0: <b>Disable</b>; disable the motor potentiometer and set its value to 0.<br>1: <b>Enable (initialization at stop/power-up)</b>; the motor potentiometer first adopts the value defined by 22.72 Motor potentiometer initial value. When the drive is running, the value can be adjusted from the up and down sources defined by 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | A stop or a power cycle will reset the motor potentiometer to the value 22.72 Motor potentiometer initial value.<br>2: **Enable (resume always)**; the motor potentiometer value is retained over a stop or a power cycle. The value can be adjusted from the up and down sources defined by 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source, independent of the drive status. | | | | | | |
| | 0 … 2 | Disable | - | 1 = 1 | n | y | Parameter |
| **22.72** | **Motor potentiometer initial value** | | | | | | |
| | Initial value for motor potentiometer.<br>Defines an initial value (starting point) for the motor potentiometer. See 21.71 Motor potentiometer function. | | | | | | |
| | -30000.00 … 30000.00 | 0.00 | - | 1 = 1 | n | y | Parameter |
| **22.73** | **Motor potentiometer up source** | | | | | | |
| | Source for motor potentiometer up.<br>Selects the source for motor potentiometer up signal.<br>0 = No change.<br>1 = Increase.<br>**Other [bit]**; source selection.<br>0: **No change**; 0, hold the motor potentiometer value.<br>1: **Increase**; 1, increase the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change.<br>2: **None**; inactive. Motor potentiometer up is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | None | - | 1 = 1 | n | y | Parameter |
| **22.74** | **Motor potentiometer down source** | | | | | | |
| | Source for motor potentiometer down.<br>Selects the source for motor potentiometer down signal.<br>0 = No change.<br>1 = Decrease.<br>**Other [bit]**; source selection.<br>0: **No change**; 0, hold the motor potentiometer value. Normal operation.<br>1: **Decrease**; 1, decrease the motor potentiometer value. If both the up and down sources are on, the potentiometer value will not change.<br>2: **None**; inactive. Motor potentiometer down is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status<br>40: **DI1 or stop**; 10.02.b00 DI delayed status plus stop. DI1 = 1 or stop command active → the motor potentiometer value is decreased, DI1 = 0: the motor potentiometer value is held.<br>41: **DI2 or stop**; 10.02.b01 DI delayed status plus stop. DI2 = 1 or stop command active → the motor potentiometer value is decreased, DI2 = 0: the motor potentiometer value is held. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 42: **DI3 or stop**; 10.02.b02 DI delayed status plus stop. DI3 = 1 or stop command active → the motor potentiometer value is decreased, DI3 = 0: the motor potentiometer value is held.<br>43: **DI4 or stop**; 10.02.b03 DI delayed status plus stop. DI4 = 1 or stop command active → the motor potentiometer value is decreased, DI4 = 0: the motor potentiometer value is held.<br>44: **DI5 or stop**; 10.02.b04 DI delayed status plus stop. DI5 = 1 or stop command active → the motor potentiometer value is decreased, DI5 = 0: the motor potentiometer value is held.<br>45: **DI6 or stop**; 10.02.b05 DI delayed status plus stop. DI6 = 1 or stop command active → the motor potentiometer value is decreased, DI6 = 0: the motor potentiometer value is held.<br>46: **DIO1 or stop**; 11.02.b00 DIO delayed status plus stop. DIO1 = 1 or stop command active → the motor potentiometer value is decreased, DIO1 = 0: the motor potentiometer value is held.<br>47: **DIO2 or stop**; 11.02.b01 DIO delayed status plus stop. DIO2 = 1 or stop command active → the motor potentiometer value is decreased, DIO2 = 0: the motor potentiometer value is held.<br>48: **DIL or stop**; 10.02.b15 DI delayed status plus stop. DIL = 1 or stop command active → the motor potentiometer value is decreased, DIL = 0: the motor potentiometer value is held. | | | | | | |
| | 0 … 48 | None | - | 1 = 1 | n | y | Parameter |
| **22.75** | **Motor potentiometer ramp time** | | | | | | |
| | Motor potentiometer change time.<br>Defines the change rate of the motor potentiometer. This is the time required for the motor potentiometer to change from 22.76 Motor potentiometer min value to 22.77 Motor potentiometer max value. The same change rate applies in both directions (up and down). | | | | | | |
| | 0.0 … 3250.0 | 10.0 | s | 10 = 1 s | n | y | Parameter |
| **22.76** | **Motor potentiometer min value** | | | | | | |
| | Motor potentiometer minimum.<br>Defines the minimum value of the motor potentiometer. | | | | | | |
| | -30000.00 … 30000.00 | -1500.00 | - | 1 = 1 | n | y | Parameter |
| **22.77** | **Motor potentiometer max value** | | | | | | |
| | Motor potentiometer maximum.<br>Defines the maximum value of the motor potentiometer. | | | | | | |
| | -30000.00 … 30000.00 | 1500.00 | - | 1 = 1 | n | y | Parameter |
| **22.80** | **Motor potentiometer reference** | | | | | | |
| | Value of the motor potentiometer.<br>Displays the output of the motor potentiometer function. It can directly be set as the source of parameters such as 22.11 Speed reference 1 source. | | | | | | |
| | -30000.00 … 30000.00 | - | - | 1 = 1 | y | n | Signal |
| **22.81** | **Speed reference 1** | | | | | | |
| | Value of speed reference 1 source.<br>Displays the speed reference after speed reference 1 source. See 22.11 Speed reference 1 source. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **22.82** | **Speed reference 2** | | | | | | |
| | Value of speed reference 2 source.<br>Displays the speed reference after speed reference 2 source. See 22.12 Speed reference 2 source. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **22.83** | **Speed reference 3** | | | | | | |
| | Speed reference after source selection.<br>Displays the speed reference after the mathematical function, speed reference 1/2 selection and rotation direction. See 22.13 Speed reference function, 22.14 Speed reference 1/2 selection and 20.14 Direction of rotation source. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **22.84** | **Speed reference 4** | | | | | | |
| | Speed reference after additive 1.<br>Displays the speed reference after 1st additive speed. See 22.15 Speed additive 1 source. | | | | | | |

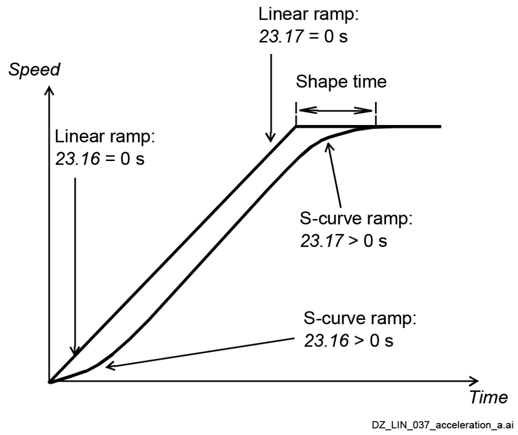
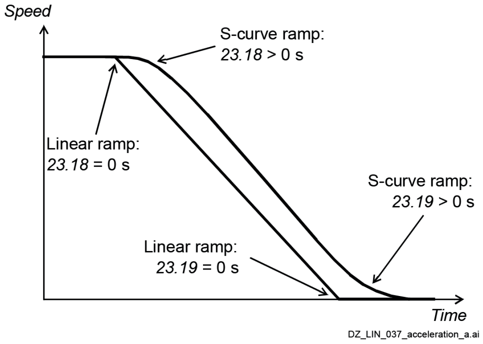
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 22.85 | **Speed reference 5** | | | | | | |
| | Speed reference after speed share.<br>Displays the speed reference after scaling by means of speed share. See 22.16 Speed share. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 22.86 | **Speed reference 6** | | | | | | |
| | Speed reference after additive 2.<br>Displays the speed reference after 2$^{nd}$ additive speed. See 22.17 Speed additive 2 source. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |

## 23 Speed reference ramp

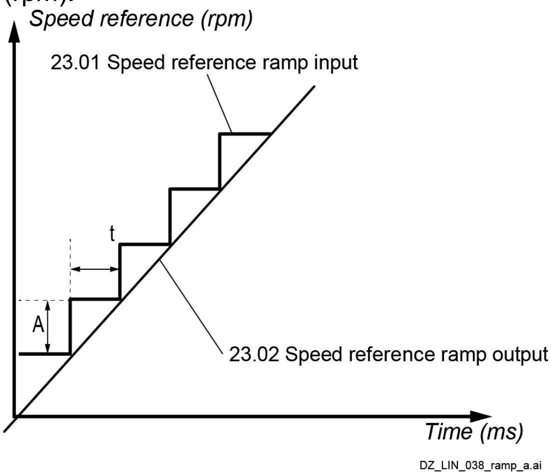
Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive).

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 23.01 | **Speed reference ramp input** | | | | | | |
| | Speed reference at the ramp input.<br>Displays the speed reference after limitation and before ramping and shaping. See 30.11 M1 minimum speed and 30.12 M1 maximum speed. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 23.02 | **Speed reference ramp output** | | | | | | |
| | Speed reference at the ramp output.<br>Displays the ramped and shaped speed reference. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 23.03 | **Speed reference 7** | | | | | | |
| | Speed reference after direct speed reference.<br>Displays the speed reference after direct speed reference. See 23.32 Direct speed reference. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 23.04 | **dv/dt** | | | | | | |
| | Deviation of the speed reference.<br>Displays the acceleration/deceleration (speed reference change) at the output of the speed reference ramp. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm/s | See 46.02 | y | n | Signal |
| 23.11 | **Ramp set selection** | | | | | | |
| | Select active ramp parameters.<br>Selects the source that switches between the two sets of acceleration/deceleration ramp times. See 23.12 Acceleration time 1, 23.13 Deceleration time 1, 23.14 Acceleration time 2 and 23.15 Deceleration time 2.<br>0 = Acc/Dec time 1.<br>1 = Acc/Dec time 2.<br>**Other [bit]**; source selection.<br>0: **Acc/Dec time 1**; 0, acceleration time 1 and deceleration time 1 are active. Normal operation.<br>1: **Acc/Dec time 2**; 1, acceleration time 2 and deceleration time 2 are active.<br>2: **Speed level**; if \|23.03 Speed reference 7\| ≤ \|46.31 Above speed level\|, then Acc/Dec time 1 is active. If \|23.03 Speed reference 7\| > \|46.31 Above speed level\|, then Acc/Dec time 2 is active.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>21: **Motor1/Motor2**; used acceleration/deceleration time depends on setting of 42.01 Motor 1/2 selection. If 42.01 Motor 1/2 selection = Motor 1 use Acc/Dec time 1. If 42.01 Motor 1/2 selection = Motor 2 use Acc/Dec time 2. | | | | | | |
| | 0 … 21 | Acc/Dec time 1 | - | 1 = 1 | n | y | Parameter |
| **23.12** | **Acceleration time 1** | | | | | | |
| | Acceleration time 1.<br>The time within the drive will accelerate from zero speed to 46.02 M1 speed scaling actual.<br>If the speed reference increases faster than the set acceleration time, the motor speed will follow the set acceleration time. If the speed reference increases slower than the set acceleration time, the motor speed will follow the reference.<br>If the set acceleration time is set too short, the drive will accelerate at the active torque limit. | | | | | | |
| | 0.000 … 3250.000 | 20.000 | s | 10 = 1 s | n | y | Parameter |
| **23.13** | **Deceleration time 1** | | | | | | |
| | Deceleration time 1.<br>The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed.<br>If the speed reference decreases faster than the set deceleration time, the motor speed will follow the deceleration time. If the speed reference decreases slower than the set deceleration time, the motor speed will follow the reference.<br>If the set deceleration time is set too short, the drive will decelerate at the active torque limit. | | | | | | |
| | 0.000 … 3250.000 | 20.000 | s | 10 = 1 s | n | y | Parameter |
| **23.14** | **Acceleration time 2** | | | | | | |
| | Acceleration time 1.<br>See 23.12 Acceleration time 1. | | | | | | |
| | 0.000 … 3250.000 | 60.000 | s | 10 = 1 s | n | y | Parameter |
| **23.15** | **Deceleration time 2** | | | | | | |
| | Deceleration time 2.<br>See 23.13 Deceleration time 1. | | | | | | |
| | 0.000 … 3250.000 | 60.000 | s | 10 = 1 s | n | y | Parameter |
| **23.16** | **Shape time acceleration 1** | | | | | | |
| | Ramp shape at acceleration start.<br>Defines the shape of the acceleration ramp at the start of the acceleration.<br>0.0 s: Linear ramp. Suitable for steady acceleration or deceleration and for slow ramps.<br>0.1 … 3250.0 s: S-curve ramp. S-curve ramps are ideal for lifting applications. The S-curve consists of curves at both ends of the ramp and a linear part in between.<br>**Note**: For safety reasons, shape times are not applied during an emergency stop.<br>Acceleration: | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| |  <br>Deceleration:<br> | | | | | | |
| | 0.000 … 3250.000 | 0.000 | s | 10 = 1 s | n | y | Parameter |
| **23.17** | **Shape time acceleration 2** | | | | | | |
| | Ramp shape at acceleration end.<br>Defines the shape of the acceleration ramp at the end of the acceleration. See 23.16 Shape time acceleration 1. | | | | | | |
| | 0.000 … 3250.000 | 0.000 | s | 10 = 1 s | n | y | Parameter |
| **23.18** | **Shape time deceleration 1** | | | | | | |
| | Ramp shape at deceleration start.<br>Defines the shape of the deceleration ramp at the start of the deceleration. See 23.16 Shape time acceleration 1. | | | | | | |
| | 0.000 … 3250.000 | 0.000 | s | 10 = 1 s | n | y | Parameter |
| **23.19** | **Shape time deceleration 2** | | | | | | |
| | Ramp shape at deceleration end.<br>Defines the shape of the deceleration ramp at the end of the deceleration. See 23.16 Shape time acceleration 1. | | | | | | |
| | 0.000 … 3250.000 | 0.000 | s | 10 = 1 s | n | y | Parameter |
| **23.20** | **Acceleration time jogging** | | | | | | |
| | Acceleration time for jogging.<br>The time within the drive will accelerate from zero speed to 46.02 M1 speed scaling actual in case of jogging or inching. | | | | | | |
| | 0.000 … 3250.000 | 60.000 | s | 10 = 1 s | n | y | Parameter |
| **23.21** | **Deceleration time jogging** | | | | | | |
| | Deceleration time for jogging.<br>The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed in case of jogging or inching. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0.000 … 3250.000</td><td>60.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>23.23</b></td><td colspan="7"><b>Emergency stop time</b></td></tr>
<tr><td colspan="7">Deceleration time for Off3 (emergency stop) command.<br>The time within the drive will decelerate from 46.02 M1 speed scaling actual to zero speed. With an Off3 (emergency stop) command and 21.03 Emergency stop mode = Ramp stop or as reaction to a fault of fault level 4 and 31.15 Fault stop mode fault level 4 = Ramp stop.<br>This applies also to torque control, because the drive automatically switches to speed control with an Off3 (emergency stop) command. For followers see 19.20 Follower force ramp stop.</td></tr>
<tr><td>0.000 … 3250.000</td><td>10.000</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>23.24</b></td><td colspan="7"><b>Speed ramp in zero source</b></td></tr>
<tr><td colspan="7">Force speed ramp input to zero.<br>Selects a source that forces the speed ramp input to zero. Via an AND with 06.09.b06 Used main control word.<br>0 = Zero input.<br>1 = Enable input.<br><b>Other [bit]</b>; source selection.<br>0: <b>Zero input</b>; 0, force speed ramp input to zero.<br>1: <b>Enable input</b>; 1, enable speed ramp input. Normal operation.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Enable input</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>23.26</b></td><td colspan="7"><b>Ramp out balancing enable</b></td></tr>
<tr><td colspan="7">Force speed ramp output to 23.27 Ramp out balancing reference.<br>Selects the source to force the speed ramp output balancing.<br>This function is used to generate a smooth, bumpless transfer from a torque- or tension-controlled motor back to being speed controlled. The balancing output is tracking the present (line) speed of the application. When a transfer is required, the speed reference can then be quickly set to the needed (line) speed. Balancing is also possible in the speed controller. See 25.09 Speed balancing enable.<br>0 = Enable output.<br>1 = Balance output.<br><b>Other [bit]</b>; source selection.<br>0: <b>Enable output</b>; 0, enable speed ramp output. Normal operation.<br>1: <b>Balance output</b>; 1, force speed ramp output to 23.27 Ramp out balancing reference.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Enable output</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>23.27</b></td><td colspan="7"><b>Ramp out balancing reference</b></td></tr>
<tr><td colspan="7">Speed ramp output balancing reference.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Defines the reference for speed ramp output balancing. The output of the ramp generator is forced to this value when speed ramp output balancing is enabled. See 23.26 Ramp out balancing enable.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**23.28**</td><td colspan="7">**Variable slope enable**</td></tr>
<tr><td colspan="7">Enable variable slope.<br>Activates the variable slope function, which controls the slope of the speed ramp during a speed reference change from the overriding control system.<br>Variable slope rate and the internal drive ramp are connected in series. Thus, the ramp acceleration and deceleration times have to be faster than the complete variable slope rate time. See 23.12 Acceleration time 1 and 23.13 Deceleration time 1.<br>23.29 Variable slope rate defines the speed ramp time t (ms) for the speed reference change A (rpm).<br><br> <br>t (ms) = cycle time of the speed reference from the overriding control system.<br>A (rpm) = speed reference change during cycle time t (ms).<br>**Note**: If the cycle time t (ms) of the speed reference from the overriding control system and 23.29 Variable slope rate are equal, the shape of 23.02 Speed reference ramp output is a straight line.<br>**Other [bit]**; source selection.<br>0: **Disable**; disable variable slope.<br>1: **Enable**; enable variable slope (not available in local control).</td></tr>
<tr><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**23.29**</td><td colspan="7">**Variable slope rate**</td></tr>
<tr><td colspan="7">Variable slope rate.<br>Defines the rate of the speed reference change when variable slope is enabled. See 23.28 Variable slope enable. For the best results, use the speed reference cycle time.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**23.32**</td><td colspan="7">**Direct speed reference**</td></tr>
<tr><td colspan="7">Direct speed reference.<br>Feeds the speed reference direct into the speed error calculation. Activated by 06.10.B00 Auxiliary control word 1 = 1.<br>**Other**; source selection.<br>0: **Zero**; 0 rpm, speed reference is set to zero.<br>1: **22.07 Speed reference**; 22.07 Speed reference.<br>3: **22.08 Auxiliary speed reference**; 22.08 Auxiliary speed reference.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.</td></tr>
</table>

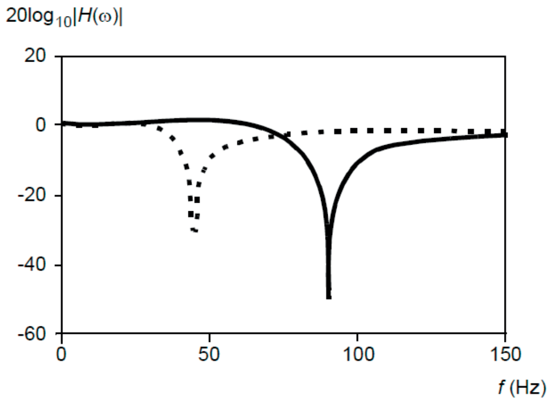
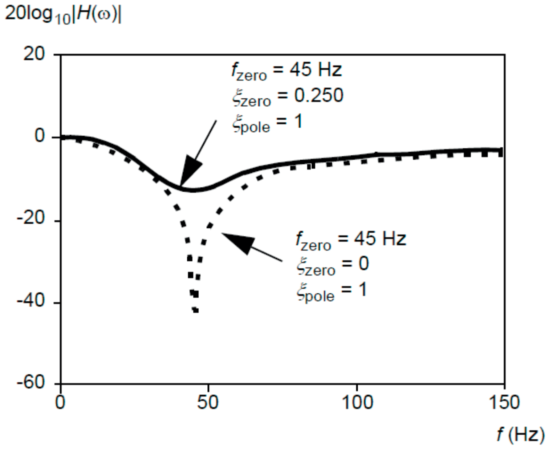
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.<br>14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.<br>17: **Motor potentiometer reference**; 22.80 Motor potentiometer reference.<br>18: **Process PID output actual**; 40.01 Process PID output actual.<br>19: **Encoder 1 speed**; 90.10 Encoder 1 speed.<br>20: **Encoder 2 speed**; 90.20 Encoder 2 speed.<br>21: **OnBoard encoder**; 94.04 OnBoard encoder speed.<br>26: **Constant speed 6**; 22.31 Constant speed 6.<br>27: **Constant speed 7**; 22.32 Constant speed 7. | | | | | | |
| | 0 … 27 | 22.07 Speed reference | - | 1 = 1 | n | y | Parameter |

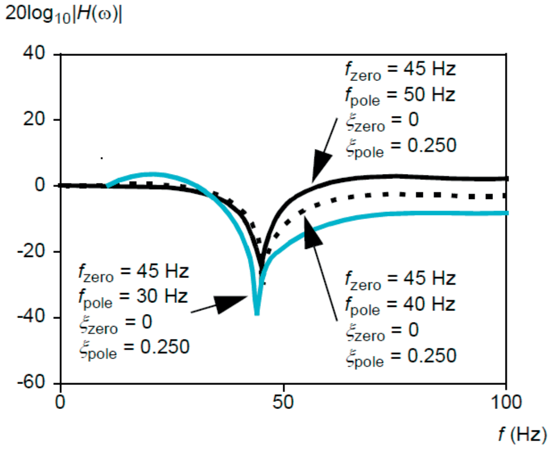
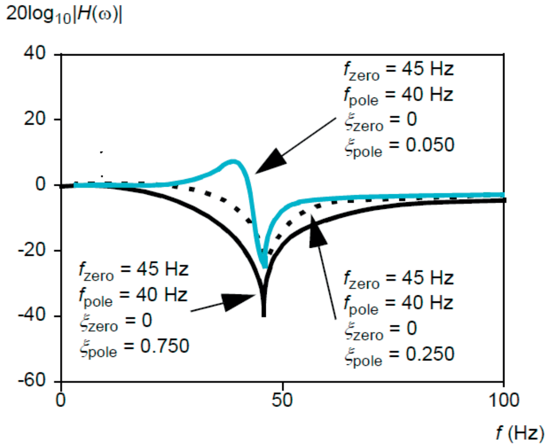
## 24 Speed reference conditioning

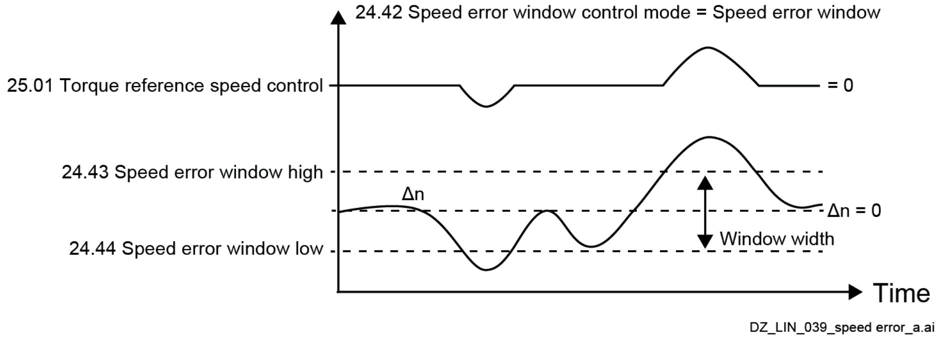
Speed error calculation, speed error window control configuration and speed error (Δn) step.

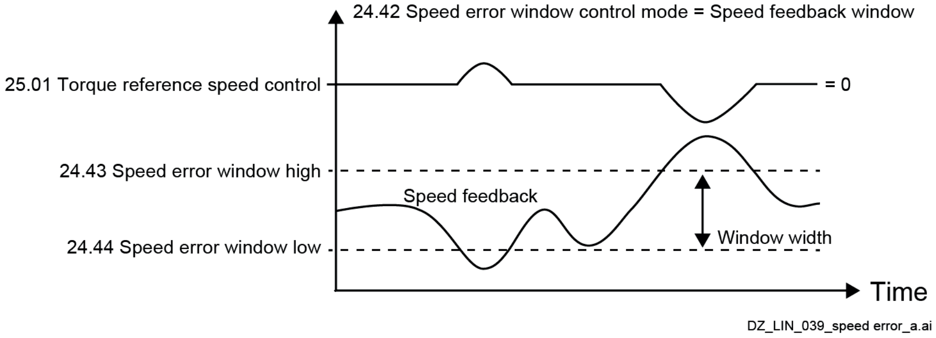
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **24.01** | **Used speed reference** | | | | | | |
| | Speed reference after speed reference scaling.<br>Displays the speed reference after speed correction, limitation and speed reference scaling. See 24.11 Speed correction, 30.11 M1 minimum speed, 30.12 M1 maximum speed and 24.14 Speed reference scaling.<br>Used for speed error calculation. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **24.02** | **Used speed feedback** | | | | | | |
| | Speed feedback after speed feedback scaling.<br>Displays the speed feedback after speed feedback scaling. See 24.15 Speed feedback scaling.<br>Used for speed error calculation. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **24.03** | **Speed error filtered** | | | | | | |
| | Filtered speed error (Δn).<br>Displays the speed error after filters and window control. See 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2.<br>Δn = 24.01 Used speed reference - 24.02 Used speed feedback. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **24.04** | **Speed error inverted** | | | | | | |
| | Inverted speed error (-Δn).<br>Displays the inverted speed error (unfiltered).<br>Δn = 24.01 Used speed reference - 24.02 Used speed feedback. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **24.11** | **Speed correction** | | | | | | |
| | Speed reference correction.<br>The speed reference correction is added to 23.03 Speed reference 7 between ramping and limitation. This is useful to trim the speed if necessary, for example to adjust draw between sections of a paper machine. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"><b>Note</b>: Due to safety reasons, the speed correction is not applied when any of the stop functions are active.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>24.14</b></td><td colspan="7"><b>Speed reference scaling</b></td></tr>
<tr><td colspan="7">Speed reference scaling factor.<br>Defines a scaling factor between 23.03 Speed reference 7 and 24.01 Used speed reference.</td></tr>
<tr><td>-325.00 … 325.00</td><td>1.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>24.15</b></td><td colspan="7"><b>Speed feedback scaling</b></td></tr>
<tr><td colspan="7">Speed feedback scaling factor.<br>Defines a scaling factor between 90.01 Motor speed for control and 24.02 Used speed feedback.</td></tr>
<tr><td>-325.00 … 325.00</td><td>1.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>24.18</b></td><td colspan="7"><b>Speed error filter time 1</b></td></tr>
<tr><td colspan="7">Speed error (Δn) filter time constant 1.<br>Defines the filter time constant of the speed error low-pass filter 1. Reducing the ripple with this filter may cause speed controller tuning problems. A long filter time constant and fast acceleration times contradict one another. A very long filter time constant results in unstable control.<br><b>Note</b>: There are three different filters for speed feedback and speed error:<br>– 90.42 Motor speed filter time is filtering the speed feedback and should be used for filter time constants smaller than 30 ms.<br>– 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2 are filtering the speed error and should be used for filter time constants greater than 30 ms. Set 24.18 Speed error filter time 1 = 24.19 Speed error filter time 2.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>24.19</b></td><td colspan="7"><b>Speed error filter time 2</b></td></tr>
<tr><td colspan="7">Speed error (Δn) filter time constant 2.<br>See 24.18 Speed error filter time 1.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>24.20</b></td><td colspan="7"><b>RFE speed filter</b></td></tr>
<tr><td colspan="7">Source to enable the RFE filter (Resonance FEequency filter).<br>Enables/Disables the RFE filter.<br>The speed error value send to the speed controller is filtered by a common 2nd order band-elimination filter to eliminate the amplification of mechanical resonance frequencies.<br><b>Note:</b> Tuning the resonance frequency filter requires a basic understanding of frequency filters. Incorrect tuning can amplify the mechanical oscillations and damage the drive and the driven machinery. To ensure the stability of the speed controller, stop the drive or disable the filtering before changing the RFE filter settings.<br>0 = Disable RFE filter.<br>1 = Enable RFE filter.<br>0: <b>Disable RFE filter</b>; 0, normal operation.<br>1: <b>Enable RFE filter</b>; 1, enable RFE filter.</td></tr>
<tr><td>0 … 1</td><td>Disable RFE filter</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>24.21</b></td><td colspan="7"><b>RFE filter zero frequency</b></td></tr>
<tr><td colspan="7">RFE filter zero frequency.<br>Defines the zero frequency of the RFE filter. The value must be set near the resonance frequency, which is filtered out before the speed controller.<br>The drawing shows the frequency response:</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| |  | | | | | | |
| | 0.50 … 500.00 | 45.00 | Hz | 1 = 1 Hz | n | y | Parameter |
| **24.22** | **RFE filter zero damping** | | | | | | |
| | RFE filter zero damping coefficient.<br>Defines the damping coefficient for 24.21 RFE filter zero frequency. A value of 0 corresponds to the maximum elimination of the resonance frequency:<br> <br>**Note:** To ensure, that the resonance frequency band is filtered rather than amplified, the value in 24.22 RFE filter zero damping must be smaller than the value in 24.24 RFE filter pole damping. | | | | | | |
| | -1.000 … 1.000 | 0.000 | - | 100 = 1 | n | y | Parameter |
| **24.23** | **RFE filter pole frequency** | | | | | | |
| | RFE filter pole frequency.<br>Defines the pole frequency of the RFE filter: | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| |  <br>**Note:** If the value in 24.23 RFE filter pole frequency is very different from the value in 24.21 RFE filter zero frequency, the frequencies near the pole frequency are amplified. This can damage the driven machinery. | | | | | | |
| | 0.50 … 500.00 | 40.00 | Hz | 1 = 1 Hz | n | y | Parameter |
| **24.24** | **RFE filter pole damping** | | | | | | |
| | RFE filter pole damping coefficient.<br>Defines the damping coefficient for 24.23 RFE filter pole frequency. The coefficient shapes the frequency response of the RFE filter. A narrower bandwidth results in better dynamic properties. By setting 24.24 RFE filter pole damping = 1, the effect of the pole is eliminated.<br> <br>**Note:** To ensure, that the resonance frequency band is filtered rather than amplified, the value in 24.22 RFE filter zero damping must be smaller than the value in 24.24 RFE filter pole damping. | | | | | | |
| | -1.000 … 1.000 | 0.000 | - | 100 = 1 | n | y | Parameter |
| . | **Concept of window control:**<br>The concept of window control is to block the speed controller as long as the speed error (Δn) or the speed feedback remains within the window set by 24.43 Speed error window high and 24.44 Speed error window low. This allows the external torque reference to affect the process directly. See 26.74 Torque reference ramp output.<br>If the speed error or the speed feedback exceeds the programmed window, the speed controller becomes active and influences the process by means of 25.01 Torque reference speed control. The activation is indicated by 06.21.b03 Speed control status word.<br>To release window control use 24.42 Speed error window control mode and set the drive to Add operating mode. See 19.12 Ext1 control mode and 19.14 Ext2 control mode.<br>This function is sometimes also called dead band control or strip break protection. It forms a speed supervision function for a torque-controlled drive, preventing the motor from running away if the material, which is under tension, breaks. | | | | | | |





**Note**: To open a window with a width of 100 rpm set 24.43 Speed error window high = 50 rpm and 24.44 Speed error window low = -50 rpm.

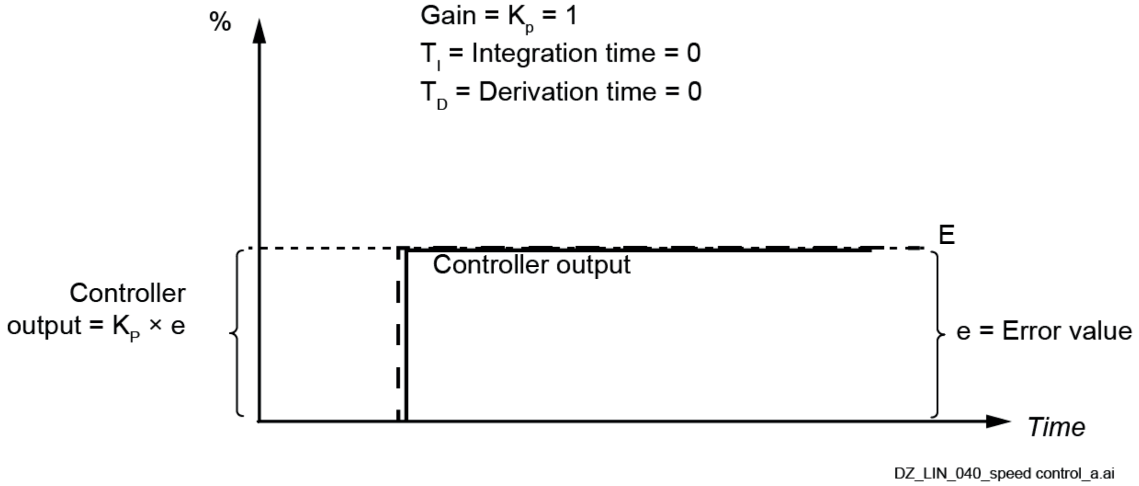
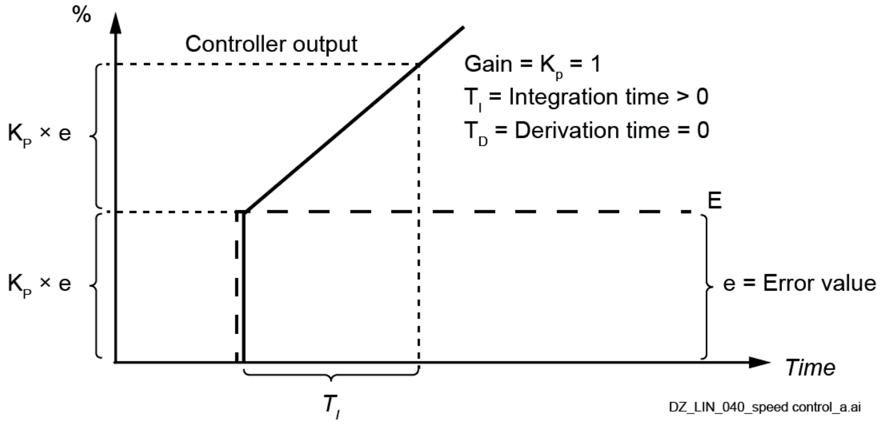
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **24.41** | **Speed error window control enable** | | | | | | |
| | Source to enable window control.<br>Enables/Disables window control.<br>0 = Disable window control.<br>1 = Enable window control.<br>**Other [bit]**; source selection.<br>0: **Disable window control**; 0, normal operation.<br>1: **Enable window control**; 1, enable speed error window control.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Disable window control | - | 1 = 1 | n | y | Parameter |
| **24.42** | **Speed error window control mode** | | | | | | |
| | Mode for window control.<br>Determines the used type of window control. Additionally the integration time of the speed controller can be enabled/disabled.<br>0: **Speed error window + TI = on**; standard window control. The speed error (Δn) has to be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time ($T_I$) of the speed controller is enabled when window control is released. | | | | | | |

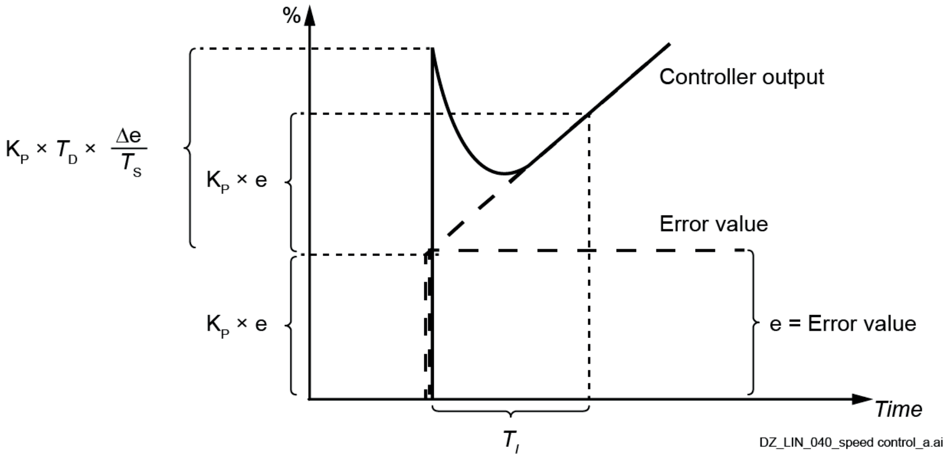
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 1: **Speed error window + TI = off**; standard window control. The speed error has to be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time of the speed controller is disabled when window control is released.<br>Typically used for torque followers to limit differential speed.<br>10: **Speed feedback window**; the speed feedback has to be in a window set by 24.43 Speed error window high and 24.44 Speed error window low. The integration time of the speed controller is disabled when window control is released.<br>Typically used for torque controlled test rigs to limit the no load speed or winders.<br>**Example 1**: To get a window of 10 rpm width around the speed error set:<br>24.42 Speed error window control mode = Speed error window + TI = off.<br>24.43 Speed error window high = 5 rpm.<br>24.44 Speed error window low = -5 rpm<br>**Example 2**: To get a window of 500 … 1000 rpm around the speed feedback set:<br>24.42 Speed error window control mode = Speed feedback window.<br>24.43 Speed error window high = 1000 rpm.<br>24.44 Speed error window low = 500 rpm.<br>**Example 3**: To get a window of -50 … 100 rpm around the speed feedback set:<br>24.42 Speed error window control mode = Speed feedback window.<br>24.43 Speed error window high = 100 rpm.<br>24.44 Speed error window low = -50 rpm. | | | | | | |
| | 0 … 10 | Speed error window + TI = off | - | 1 = 1 | n | y | Parameter |
| **24.43** | **Speed error window high** | | | | | | |
| | Upper boundary of the speed error window.<br>Upper boundary for the window control, when the speed error (Δn = 24.01 Used speed reference - 24.02 Used speed feedback) is positive. | | | | | | |
| | -30000.00 … 30000.00 | 50.00 | rpm | See 46.02 | n | y | Parameter |
| **24.44** | **Speed error window low** | | | | | | |
| | Lower boundary of the speed error window.<br>Lower boundary for the window control, when the speed error (Δn = 24.01 Used speed reference - 24.02 Used speed feedback) is negative. | | | | | | |
| | -30000.00 … 30000.00 | -50.00 | rpm | See 46.02 | n | y | Parameter |
| **24.46** | **Speed error step** | | | | | | |
| | Speed error (Δn) step.<br>Defines an additional speed error step given to the input of the speed controller. The given min/max values are limited by 30.11 M1 minimum speed and 30.12 M1 maximum speed.<br>**Note:** Make sure the speed error step is removed when a stop command is given. | | | | | | |
| | -30000.00 … 30000.00 | 0.00 | rpm | See 46.02 | y | y | Parameter |

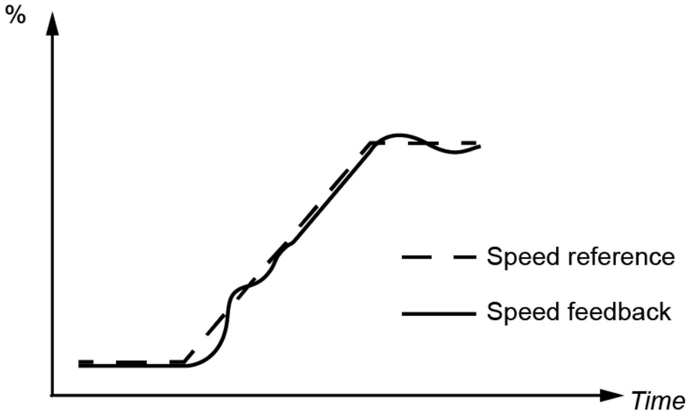
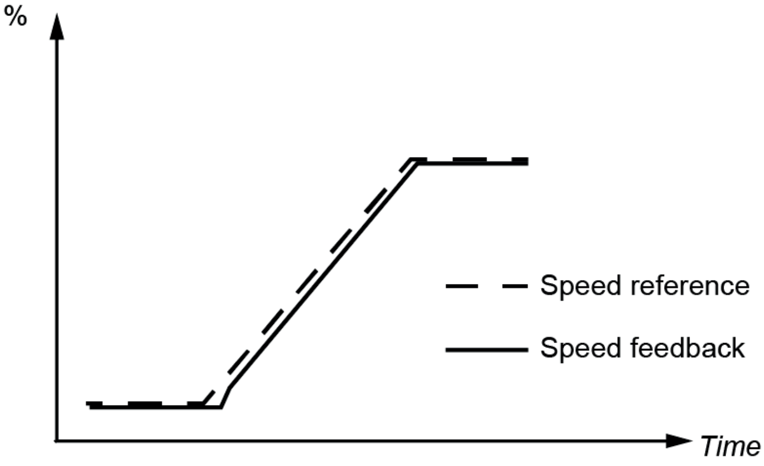
## 25 Speed control

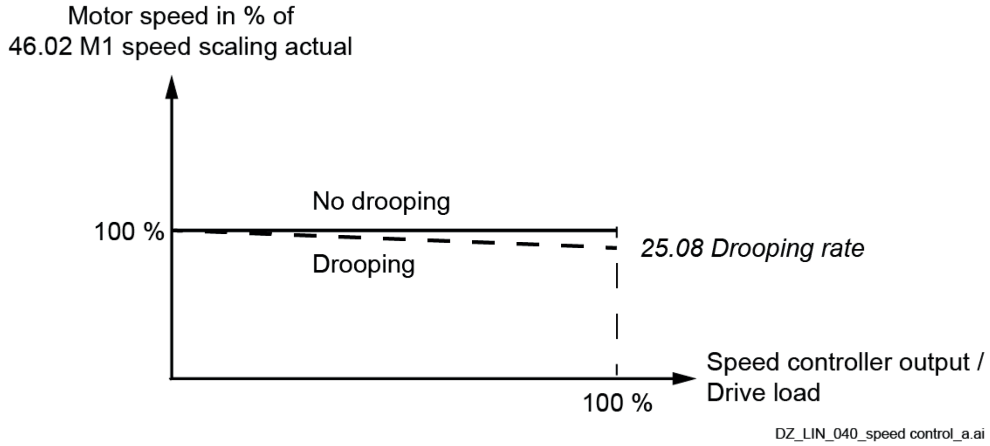
Speed controller settings.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **25.01** | **Torque reference speed control** | | | | | | |
| | Limited speed controller output torque.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after limitation. See 30.13 Speed control min torque and 30.14 Speed control max torque. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **25.02** | **Speed proportional gain 1** | | | | | | |
| | Proportional gain 1 ($K_P$) of the speed controller. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">The proportional gain of the speed controller can be released by means of 25.13 Speed controller set selection.<br>Too high a gain may cause speed oscillation. The figure below shows a controller output after an error step when the error remains constant:<br> <br>**Example**: The speed controller generates 15 % of motor nominal torque with 25.02 Speed proportional gain 1 = 3, if the speed error (Δn) is 5 % of 46.02 M1 speed scaling actual.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>5.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**25.03**</td><td colspan="7">**Speed integration time 1**</td></tr>
<tr><td></td><td colspan="7">Integration time 1 ($T_I$) of the speed controller.<br>The integration time of the speed controller can be released by means of 25.13 Speed controller set selection. Setting the integration time to zero disables the integral part of the speed controller and resets the integrator.<br>The integration time defines the time within the integral part of the speed controller achieves the same value as the proportional part, when the error value is constant.<br>The integrator has anti-windup control for operation at torque or current limit.<br>The figure below shows a controller output after an error step when the error remains constant:<br> <br>**Example**: The speed controller generates 15 % of motor nominal torque with 25.02 Speed proportional gain 1 = 3, if the speed error (Δn) is 5 % of 46.02 M1 speed scaling actual. On that condition and with 25.03 Speed integration time 1 = 300 ms follows:</td></tr>
</table>

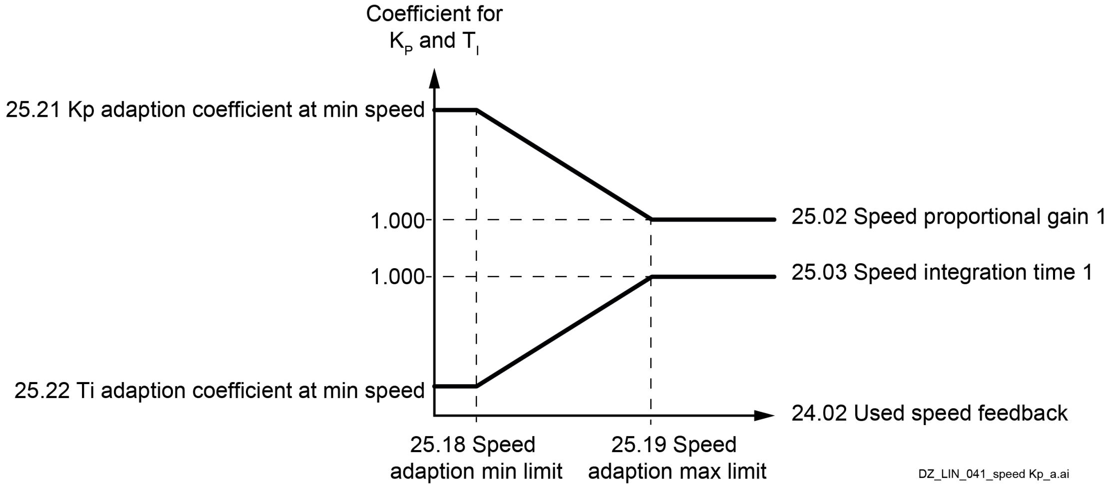
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– The speed controller generates 30 % of motor nominal torque, if the speed error is constant, after 300 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0 … 32500</td><td>2500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**25.04**</td><td colspan="7">**Speed derivation time**</td></tr>
<tr><td colspan="7">Derivation time ($T_D$) of the speed controller.<br>Speed controller derivation time. If the derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller.<br>For normal applications, derivation time should be left at zero.<br>Derivative action boosts the controller output if the error value changes. The longer the derivation time, the more the speed controller output is boosted during the change. The derivation makes the control more responsive for disturbances. The speed error derivative must be filtered with a low pass filter to eliminate external disturbances. See 25.05 Derivation filter time.<br>The figure below shows a controller output after an error step when the error remains constant:<br> <br>Gain = $K_P$ = 1<br>$T_I$ = integration time > 0<br>$T_D$ = derivation time > 0<br>$T_S$= sample time period = 500 µs<br>Δe = error value change between two samples</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**25.05**</td><td colspan="7">**Derivation filter time**</td></tr>
<tr><td colspan="7">Derivation filter time constant.<br>Derivation filter time constant for 25.04 Speed derivation time.</td></tr>
<tr><td>0 … 32500</td><td>8</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**25.06**</td><td colspan="7">**Acceleration compensation derivation time**</td></tr>
<tr><td colspan="7">Acceleration compensation derivation time.<br>Derivation time for the acceleration compensation. Setting the acceleration compensation to zero disables it.<br>In order to compensate for high inertia loads during acceleration/deceleration, a derivative of 23.03 Speed reference 7 is added to the output of the speed controller.<br>**Note**: As a rule, use a value between 50 … 100 % of the sum of the mechanical time constants of the motor and the driven machinery.<br>The figures below shows the speed responses when a high inertia load is accelerated along a ramp.<br>Without acceleration compensation:</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<br>DZ_LIN_040_speed control_a.ai<br>With acceleration compensation:<br>
<br>DZ_LIN_040_speed control_a.ai</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**25.07**</td><td colspan="7">**Acceleration compensation filter time**</td></tr>
<tr><td colspan="7">Acceleration compensation filter time constant.<br>Acceleration compensation filter time constant for 25.06 Acceleration compensation derivation time.</td></tr>
<tr><td>0.0 … 32500.0</td><td>8.0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**25.08**</td><td colspan="7">**Drooping rate**</td></tr>
<tr><td colspan="7">Droop rate.<br>Droop rate in percent of 46.02 M1 speed scaling actual. Drooping decreases the drive speed slightly as the drive load increases. The amount of speed drop caused by the load is determined by 25.08 Drooping rate.<br>Drooping may become necessary for proper load sharing between drives that are linked via material (e.g. paper, steel, foil) and running with a common speed reference. The correct droop rate for a process must be found out case by case in practice.<br>**Example**: following formula is valid:<br>Speed decrease = Speed controller output • Drooping • Speed scaling<br>With:<br>– Speed controller output = 25.57 Torque reference unbalanced = 50 %.<br>– Drooping = 25.08 Drooping rate = 1 %.<br>– Speed scaling = 46.02 M1 speed scaling actual = 1500 rpm.</td></tr>
</table>

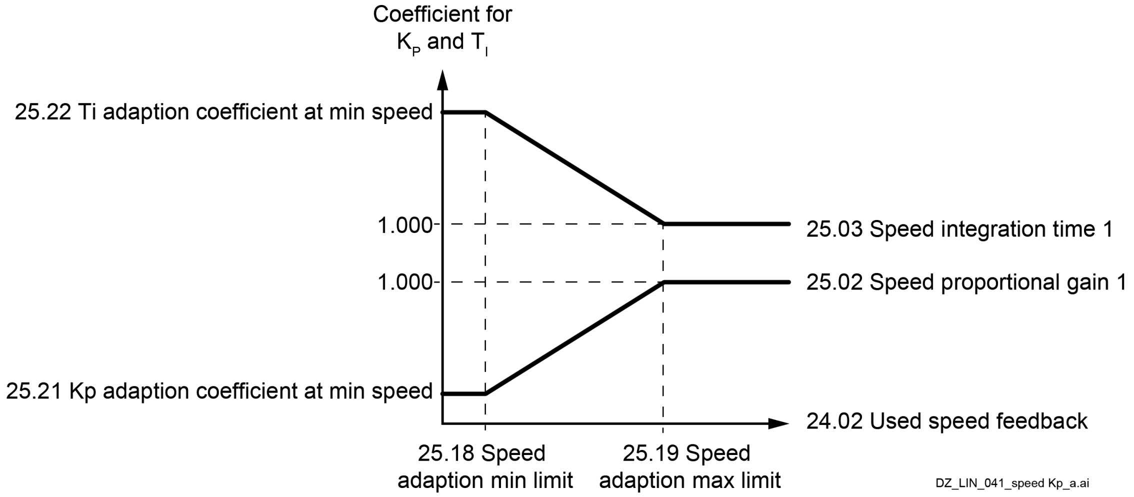
| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | Follows:<br>Speed decrease = 0.5 x 0.01 x 150 rpm = 7.5 rpm.<br><br> | | | | | | |
| | 0.00 … 100.00 | 0.00 | % | 100 = 1 % | n | y | Parameter |
| **25.09** | **Speed control balancing enable** | | | | | | |
| | Force speed controller output to 25.10 Speed control balancing reference.<br>Selects the source to force the speed controller output balancing.<br>This function is used to generate a smooth, bumpless transfer from a torque- or tension-controlled motor back to being speed controlled.<br>Balancing is also possible in the speed ramp. See 23.26 Ramp out balancing enable.<br>0 = Enable output.<br>1 = Balance output.<br>**Other [bit]**; source selection.<br>0: **Enable output**; 0, enable speed controller output. Normal operation.<br>1: **Balance output**; 1, force speed controller to 25.10 Speed control balancing reference.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Enable output | - | 1 = 1 | n | y | Parameter |
| **25.10** | **Speed control balancing reference** | | | | | | |
| | Speed controller output balancing reference.<br>Defines the reference for speed controller output balancing in percent of 99.02 M1 nominal torque. The output of the speed controller is forced to this value when speed controller output balancing is enabled. See 25.09 Speed control balancing enable. | | | | | | |
| | -325.00 … 325.00 | 0.00 | % | See 46.04 | n | y | Parameter |
| **25.11** | **Proportional gain emergency stop** | | | | | | |
| | Proportional gain ($K_P$) upon an Off3 (emergency stop) command.<br>Proportional gain of the speed controller when an Off3 (emergency stop) command is active and 25.11 Proportional gain emergency stop is ≠ zero. Otherwise the value of either 25.02 Speed proportional gain 1 or 25.14 Speed proportional gain 2 is taken. | | | | | | |
| | 0.00 … 325.00 | 0.00 | - | 100 = 1 | n | y | Parameter |
| **25.13** | **Speed controller set selection** | | | | | | |
| | Select active speed controller parameters. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Selects the source that switches between the two sets of speed controller parameters. 25.02 Speed proportional gain 1, 25.03 Speed integration time 1, 25.14 Speed proportional gain 2 and 25.15 Speed integration time 2.<br>0 = Speed controller set 1.<br>1 = Speed controller set 2.<br>**Other [bit]**; source selection.<br>0: **Speed controller set 1**; 0, proportional gain 1 and integration time 1 are active. Normal operation.<br>1: **Speed controller set 2**; 1, proportional gain 2 and integration time 2 are active.<br>2: **Speed level**; if \|90.01 Motor speed for control\| ≤ \|46.31 Above speed level\|, then Speed controller set 1 is active. If \|90.01 Motor speed for control\| > \|46.31 Above speed level\|, then Speed controller set 2 is active.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>20: **Speed error**; if \|24.04 Speed error inverted\| ≤ \|46.31 Above speed level\|, then Speed controller set 1 is active. If \|24.04 Speed error inverted\| > \|46.31 Above speed level\|, then Speed controller set 2 is active.<br>21: **Motor1/Motor2**; used speed controller set depends on setting of 42.01 Motor 1/2 selection. If 42.01 Motor 1/2 selection = Motor 1 use Speed controller set 1. If 42.01 Motor 1/2 selection = Motor 2 use Speed controller set 2. | | | | | | |
| | 0 … 21 | Speed controller set 1 | - | 1 = 1 | n | y | Parameter |
| **25.14** | **Speed proportional gain 2** | | | | | | |
| | Proportional gain 2 ($K_P$) of the speed controller.<br>See 25.02 Speed proportional gain 1. | | | | | | |
| | 0.00 … 325.00 | 5.00 | - | 100 = 1 | n | y | Parameter |
| **25.15** | **Speed integration time 2** | | | | | | |
| | Integration time 2 ($T_I$) of the speed controller.<br>See 25.03 Speed integration time 1. | | | | | | |
| | 0 … 32500 | 2500 | ms | 1 = 1 ms | n | y | Parameter |
| | **Speed adaptive proportional gain and integration time:**<br>In certain applications, it is useful to increase/decrease proportional gain and decrease/increase integration time of the speed controller at low speeds to improve the performance of the speed controller. Thus, it is possible to adapt proportional gain and integration time according to the speed feedback. See 25.02 Speed proportional gain 1, 25.03 Speed integration time 1 and 24.02 Used speed feedback.<br>This is done by multiplying proportional gain and integration time by coefficients at certain speeds. The coefficients are defined individually for both proportional gain and integration time.<br>When the speed feedback is below or equal to 25.18 Speed adaption min limit, proportional gain is multiplied by 25.21 Kp adaption coefficient at min speed and integration time is multiplied by 25.22 Ti adaption coefficient at min speed.<br>When the speed feedback is between 25.18 Speed adaption min limit and 25.19 Speed adaption max limit, the coefficients for proportional gain and integration time are calculated linearly.<br>When the speed feedback is equal to or above 25.19 Speed adaption max limit, no adaptation takes place. Thus, the coefficient is 1.<br>The speed adaptation is valid for positive and negative speeds.<br>Increase the proportional gain ($K_P$) and decrease the integration time ($T_I$): | | | | | | |

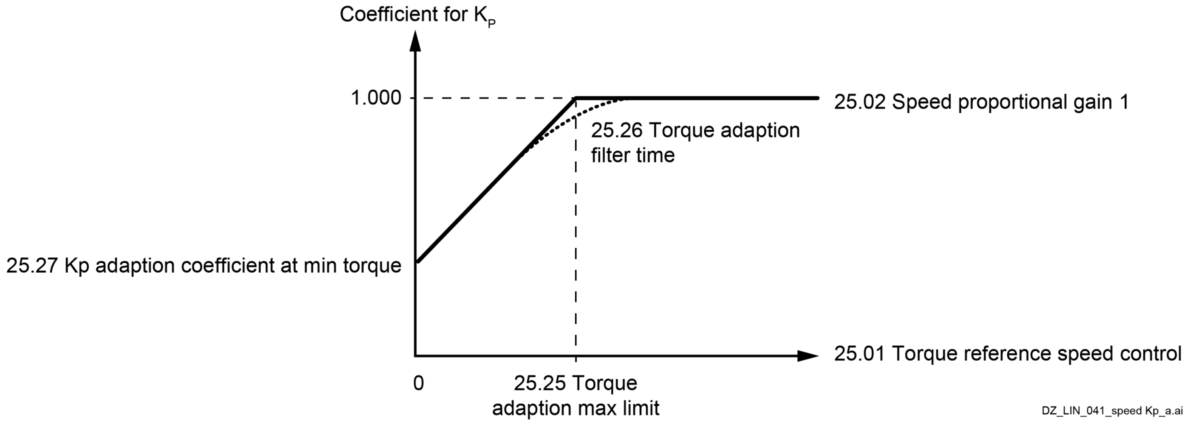
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">



Decrease the proportional gain ($K_P$) and increase the integration time($T_I$):



</td></tr>
<tr><td rowspan="3"><b>25.18</b></td><td colspan="7"><b>Speed adaption min limit</b></td></tr>
<tr><td colspan="7">Minimum speed feedback for the speed controller adaptation.<br>The speed feedback limit below that the proportional gain is defined by 25.21 Kp adaption coefficient at min speed and the integration time is defined 25.22 Ti adaption coefficient at min speed. The speed feedback is 24.02 Used speed feedback.</td></tr>
<tr><td>0 … see 25.19</td><td>0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>25.19</b></td><td colspan="7"><b>Speed adaption max limit</b></td></tr>
<tr><td colspan="7">Maximum speed feedback for the speed controller adaptation.<br>The speed feedback limit above that the proportional gain is defined by 25.02 Speed proportional gain 1 and the integration time is defined by 25.03 Speed integration time 1. The speed feedback is 24.02 Used speed feedback.</td></tr>
<tr><td>See 25.18 … 30000</td><td>0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>25.21</b></td><td colspan="7"><b>Kp adaption coefficient at min speed</b></td></tr>
<tr><td colspan="7">Proportional gain ($K_P$) coefficient at minimum speed feedback.<br>Determines the proportional gain coefficient at the speed feedback defined by 25.18 Speed adaption min limit.</td></tr>
<tr><td>0.000 … 10.000</td><td>1.000</td><td>-</td><td>1000 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>25.22</b></td><td colspan="7"><b>Ti adaption coefficient at min speed</b></td></tr>
<tr><td colspan="7">Integration time ($T_I$) coefficient at minimum speed feedback.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Determines the integration time coefficient at the speed feedback defined by 25.18 Speed adaption min limit.</td></tr>
<tr><td>0.000 … 10.000</td><td>1.000</td><td>-</td><td>1000 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td></td><td colspan="7">**Torque adaptive proportional gain:**<br>It is possible to adapt proportional gain of the speed controller according to the torque reference. See 25.02 Speed proportional gain 1 and 25.01 Torque reference speed control. This can be used to smooth out disturbances caused by small loads and backlashes.<br>This is done by multiplying proportional gain by a coefficient within a certain torque range.<br>When the torque reference is 0 %, proportional gain is multiplied by 25.27 Kp adaption coefficient at min torque.<br>When the torque reference is between 0 % and 25.25 Torque adaption max limit, the coefficient for proportional gain is calculated linearly.<br>When the torque reference is equal to or above 25.25 Torque adaption max limit, no adaptation takes place. Thus, the coefficient is 1.<br>Filtering can be applied on the torque reference using 25.26 Torque adaption filter time.<br>The load adaptation is valid for positive and negative torque.<br><br> </td></tr>
<tr><td rowspan="3">**25.25**</td><td colspan="7">**Torque adaption max limit**</td></tr>
<tr><td colspan="7">Maximum torque reference for the speed controller adaptation.<br>The torque reference limit in percent of 99.02 M1 nominal torque above which the proportional gain is defined by 25.02 Speed proportional gain 1. The torque reference is 25.01 Torque reference speed control.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**25.26**</td><td colspan="7">**Torque adaption filter time**</td></tr>
<tr><td colspan="7">Filter time constant for the speed controller adaptation.<br>Filter time constant to soften the proportional gain rate of change.</td></tr>
<tr><td>0 … 32500</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**25.27**</td><td colspan="7">**Kp adaption coefficient at min torque**</td></tr>
<tr><td colspan="7">Proportional gain ($K_P$) coefficient at 0 % torque reference.<br>Determines the proportional gain coefficient at 0 % torque reference.</td></tr>
<tr><td>0.000 … 10.000</td><td>1.000</td><td>-</td><td>1000 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**25.30**</td><td colspan="7">**Integration time initial enable**</td></tr>
<tr><td colspan="7">Force integration time ($T_I$) to 25.31 Integration time initial reference.<br>Selects the source to force the integration time.<br>0 = Automatic.<br>1 = Initial reference.<br>**Other [bit]**; source selection.<br>0: **Automatic**; 0, the integration time is set to 25.31 Integration time initial reference as soon as Ready reference is set, see 06.15.b02 Main Status Word, or if 19.01 Actual operation mode changes from Torque to Speed. Normal operation.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1: <b>Initial reference</b>; 1, force integration time ($T_I$) to 25.31 Integration time initial reference.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Automatic</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>25.31</b></td><td colspan="7"><b>Integration time initial reference</b></td></tr>
<tr><td colspan="7">Initial reference of the integration time ($T_I$).<br>Initial value of the speed controller integration time in percent of 99.02 M1 nominal torque. The integration time is set:<br>– As soon as Ready reference is set. See 06.15.b02 Main Status Word.<br>– If 19.01 Actual operation mode changes from Torque to Speed.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>25.53</b></td><td colspan="7"><b>Torque proportional reference</b></td></tr>
<tr><td colspan="7">Proportional gain ($K_P$) part of the speed controller.<br>Displays the proportional gain ($K_P$) part of the speed controller in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>25.54</b></td><td colspan="7"><b>Torque integral reference</b></td></tr>
<tr><td colspan="7">Integration time ($T_I$) part of the speed controller.<br>Displays the integration time ($T_I$) part of the speed controller in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>25.55</b></td><td colspan="7"><b>Torque derivative reference</b></td></tr>
<tr><td colspan="7">Derivation time ($T_D$) part of the speed controller.<br>Displays the derivation time ($T_D$) part of the speed controller in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>25.56</b></td><td colspan="7"><b>Torque acceleration compensation</b></td></tr>
<tr><td colspan="7">Output of the acceleration compensation function.<br>Displays the output of the acceleration compensation function in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>25.57</b></td><td colspan="7"><b>Torque reference unbalanced</b></td></tr>
<tr><td colspan="7">Unlimited speed controller output torque.<br>Displays the unlimited speed controller output torque after acceleration compensation in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

## 26 Torque reference chain

Settings for the torque reference chain.

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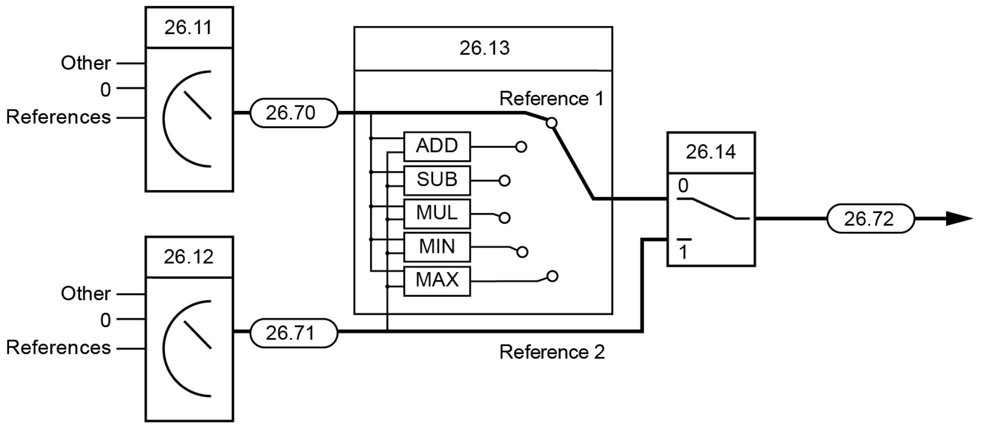
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"><b>26.01</b></td><td colspan="7"><b>Torque reference to limitation</b></td></tr>
<tr><td colspan="7">Torque reference after gear backlash compensation.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after gear backlash compensation and before limitation.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**26.02**</td><td colspan="7">**Torque reference used**</td></tr>
<tr><td colspan="7">Torque reference after torque correction.<br>Displays the final torque reference in percent of 99.02 M1 nominal torque after torque correction and before current control.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**26.05**</td><td colspan="7">**Motor torque unfiltered**</td></tr>
<tr><td colspan="7">Unfiltered motor torque.<br>Displays the unfiltered motor torque in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**26.07**</td><td colspan="7">**External torque reference 1**</td></tr>
<tr><td colspan="7">1st external torque reference.<br>External torque reference 1 in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**26.08**</td><td colspan="7">**External torque reference 2**</td></tr>
<tr><td colspan="7">2nd external torque reference.<br>External torque reference 2 in percent of 99.02 M1 nominal torque.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**26.11**</td><td colspan="7">**Torque reference 1 source**</td></tr>
<tr><td colspan="7">Selects torque reference source 1.<br>Two signal sources can be defined. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source. 26.14 Torque reference 1/2 selection switches between the two sources or a mathematical function. The mathematical function depends on 26.13 Torque reference function.<br> <br>SF_880_025_DCS_speed reference_a.ai<br>**Other**; source selection.<br>0: **Zero**; 0 %, torque reference is set to zero.<br>1: **External torque ref 1**; 26.07 External torque reference 1.<br>2: **External torque ref 2**; 26.08 External torque reference 2.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.<br>9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.</td></tr>
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| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.<br>17: **Motor potentiometer reference**; 22.80 Motor potentiometer reference.<br>18: **Process PID output actual**; 40.01 Process PID output actual. | | | | | | |
| | 0 … 18 | Zero | - | 1 = 1 | n | y | Parameter |
| **26.12** | **Torque reference 2 source** | | | | | | |
| | Selects torque reference source 2.<br>For selections and diagram, see 26.11 Torque reference 1 source. | | | | | | |
| | 0 … 18 | Zero | - | 1 = 1 | n | y | Parameter |
| **26.13** | **Torque reference function** | | | | | | |
| | Torque reference function.<br>Selects a mathematical function between torque reference 1 and torque reference 2. See 26.11 Torque reference 1 source.<br>0: **Ref 1**; torque reference 1 selected by 26.11 Torque reference 1 source is used.<br>1: **Add (ref 1 + ref 2)**; the sum of the two torque references is used.<br>2: **Sub (ref 1 - ref 2)**; the result of torque reference 1 minus torque reference 2 is used.<br>3: **Mul (ref 1 • ref 2)**; the multiplication of the two torque references is used.<br>4: **Min (ref 1, ref 2)**; the smaller of the two torque references is used.<br>5: **Max (ref 1, ref 2)**; the greater of the two torque references is used. | | | | | | |
| | 0 … 5 | Ref 1 | - | 1 = 1 | n | y | Parameter |
| **26.14** | **Torque reference 1/2 selection** | | | | | | |
| | Selection between torque reference 1 and torque reference 2.<br>Configures the selection between torque reference 1 and torque reference 2. See 26.11 Torque reference 1.<br>0 = Torque reference 1.<br>1 = Torque reference 2.<br>**Other [bit]**; source selection.<br>0: **Torque reference 1**; 0, normal operation.<br>1: **Torque reference 2**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status | | | | | | |
| | 0 … 19 | Torque reference 1 | - | 1 = 1 | n | y | Parameter |
| **26.15** | **Load share** | | | | | | |
| | Torque reference scaling factor.<br>Defines a scaling factor between 26.72 Torque reference 3 and 26.73 Torque reference 4. This allows drives sharing the load between two motors on the same mechanical plant to be tailored to share the correct amount each, yet use the same master torque reference. | | | | | | |
| | -8.000 … 8.000 | 1.000 | - | 1000 = 1 | n | y | Parameter |
| **26.16** | **Torque additive 1 source** | | | | | | |
| | 1$^{st}$ additive torque reference.<br>Defines a torque reference to be added to the torque reference after load sharing. See 26.11 Torque reference 1 source.<br>**Note:** Due to safety reasons, the additive torque reference is not applied during an emergency stop. | | | | | | |
| | 0 … 18 | Zero | - | 1 = 1 | n | y | Parameter |

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| **26.17** | **Torque reference filter time** | | | | | | |
| | Filter time constant for the torque reference.<br>Low-pass filter time constant for the torque reference. | | | | | | |
| | 0 … 32500 | 0 | ms | 1 = 1 ms | n | y | Parameter |
| **26.18** | **Torque ramp up time** | | | | | | |
| | Torque reference ramp-up time.<br>The time within the torque reference will increase from zero to 99.02 M1 nominal torque. | | | | | | |
| | 0.0 … 3250.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **26.19** | **Torque ramp down time** | | | | | | |
| | Torque reference ramp-down time.<br>The time within the torque reference will decrease from 99.02 M1 nominal torque to zero. | | | | | | |
| | 0.0 … 3250.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **26.24** | **Torque additive 2 enable** | | | | | | |
| | Enable 2nd additive torque (load compensation).<br>Source to enable torque additive 2.<br>0 = Disable torque additive 2.<br>1 = Enable torque additive 2.<br>**Other [bit]**; source selection.<br>0: **Disable torque additive 2**; 0, normal operation.<br>1: **Enable torque additive 2**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Disable torque additive 2 | - | 1 = 1 | n | y | Parameter |
| **26.25** | **Torque additive 2 source** | | | | | | |
| | 2nd additive torque reference (load compensation).<br>Defines a torque reference to be added to 26.75 Torque reference 5. See 26.11 Torque reference 1 source.<br>**Note**: Due to safety reasons, the additive torque reference is not applied during an emergency stop.<br>**WARNING!**<br>If the additive torque 2 exceeds the limits set by 30.13 Speed control min torque and 30.14 Speed control max torque, a ramp stop may be impossible. Make sure additive torque 2 is reduced or removed when a ramp stop is required. See 26.24 Torque additive 2 enable. | | | | | | |
| | 0 … 18 | Zero | - | 1 = 1 | n | y | Parameter |
| **26.30** | **Torque step enable** | | | | | | |
| | Enable a torque step.<br>Enables/Disables a torque step.<br>0: **Disable**; disable torque step.<br>1: **Enable**; enable torque step. | | | | | | |
| | 0 … 1 | Disable | - | 1 = 1 | n | y | Parameter |
| **26.31** | **Torque step** | | | | | | |
| | Torque step value.<br>Adds an additional torque step in percent of 99.02 M1 nominal torque to 26.76 Torque reference 6.<br>**Note**: Due to safety reasons, the torque step is not applied during an emergency stop.<br>**WARNING!** | | | | | | |

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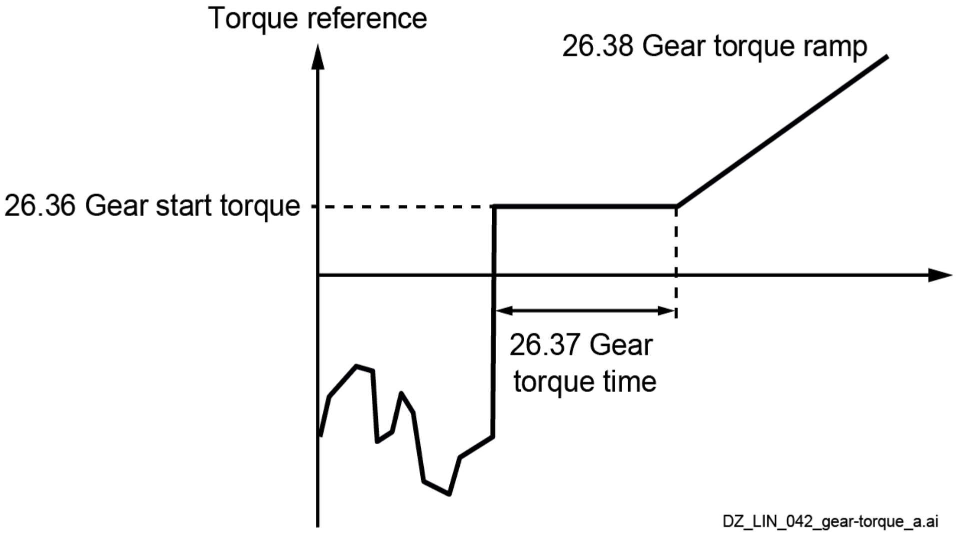
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">If the torque step exceeds the limits set by 30.13 Speed control min torque and 30.14 Speed control max torque, a ramp stop may be impossible. Make sure the torque step is reduced or removed when a ramp stop is required. See 26.30 Torque step enable.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>.</td><td colspan="7"><b>Gear backlash compensation:</b><br>Gear backlash compensation is used to reduce the gear backlash. Thus, it is possible to make torque reference direction changes faster without damaging the gearbox.<br>When the torque reference is changing its direction, the torque limit is reduced to 26.36 Gear start torque for the time defined by 26.37 Gear torque time. After the time has elapsed, the torque limit is increased to its normal value according to the ramp time defined by 26.38 Gear torque ramp.<br><br> </td></tr>
<tr><td rowspan="3"><b>26.36</b></td><td colspan="7"><b>Gear start torque</b></td></tr>
<tr><td colspan="7">Torque limit for the gear backlash compensation.<br>Defines the reduced torque limit in percent of 99.02 M1 nominal torque after a direction change of the torque reference.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>26.37</b></td><td colspan="7"><b>Gear torque time</b></td></tr>
<tr><td colspan="7">Torque limit time for the gear backlash compensation.<br>When the torque reference is changing its direction, the torque limit is reduced for the time defined by 26.37 Gear torque time.</td></tr>
<tr><td>0 … 32500</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>26.38</b></td><td colspan="7"><b>Gear torque ramp</b></td></tr>
<tr><td colspan="7">Torque reference ramp-up time for the gear backlash compensation.<br>The time within the torque reference will increase from zero to 99.02 M1 nominal torque.</td></tr>
<tr><td>0 … 32500</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>26.43</b></td><td colspan="7"><b>Torque correction enable</b></td></tr>
<tr><td colspan="7">Enable torque correction.<br>Source to enable torque correction.<br>0 = Disable torque correction.<br>1 = Enable torque correction.<br><b>Other [bit]</b>; source selection.<br>0: <b>Disable torque correction</b>; 0, normal operation.<br>1: <b>Enable torque correction</b>; 1.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.</td></tr>
</table>

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|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Disable torque correction | - | 1 = 1 | n | y | Parameter |
| **26.44** | **Torque correction source** | | | | | | |
| | Torque correction.<br>Defines a torque correction to be added to the torque reference after the limitation. See 26.11 Torque reference 1 source.<br>**Note**: Due to safety reasons, the additive torque reference is not applied during an emergency stop.<br>**WARNING!**<br>If the torque correction exceeds the limits set by 30.03 Minimum torque all limits and 30.04 Maximum torque all limits, a ramp stop may be impossible. Make sure torque correction is reduced or removed when a ramp stop is required. See 26.43 Torque correction enable. | | | | | | |
| | 0 … 18 | Zero | - | 1 = 1 | n | y | Parameter |
| **26.70** | **Torque reference 1** | | | | | | |
| | Value of torque reference 1 source.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after torque reference 1 source. See 26.11 Torque reference 1 source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.71** | **Torque reference 2** | | | | | | |
| | Value of torque reference 2 source.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after torque reference 2 source. See 26.12 Torque reference 2 source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.72** | **Torque reference 3** | | | | | | |
| | Torque reference after source selection.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after the mathematical function and torque reference 1/2 selection. See 26.13 Torque reference function and 26.14 Torque reference 1/2 selection. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.73** | **Torque reference 4** | | | | | | |
| | Torque reference after additive 1.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after 1st additive torque and after torque reference from control panel. See 26.16 Torque additive 1 source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.74** | **Torque reference ramp output** | | | | | | |
| | Torque reference at the ramp output.<br>Displays the limited, filtered and ramped torque reference in percent of 99.02 M1 nominal torque. See 30.03 Minimum torque all limits and 30.04 Maximum torque all limits. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.75** | **Torque reference 5** | | | | | | |
| | Torque reference after torque selector.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after control mode selection. See 19.01 Actual operation mode. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| **26.76** | **Torque reference 6** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Torque reference after additive 2 (load compensation).<br>Displays the torque reference in percent of 99.02 M1 nominal torque after $2^{nd}$ additive torque. See 26.24 Torque additive 2 enable and 26.25 Torque additive 2 source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| 26.77 | **Torque reference additive A** | | | | | | |
| | Torque reference after additive 2 (load compensation) source selection.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after additive 2 selection. See 26.25 Torque additive 2 source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| 26.78 | **Torque reference additive B** | | | | | | |
| | Torque reference after additive 2 (load compensation) enable.<br>Displays the torque reference in percent of 99.02 M1 nominal torque after additive 2 enable. See 26.24 Torque additive 2 enable. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |
| 26.79 | **Torque correction reference** | | | | | | |
| | Torque correction reference after source selection and enable.<br>Displays the torque correction reference in percent of 99.02 M1 nominal torque after source selection and enable. See 26.43 Torque correction enable and 26.44 Torque correction source. | | | | | | |
| | -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |

## 27 Armature current control

Settings for the armature current control chain.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 27.01 | **Current reference** | | | | | | |
| | Armature current reference after flux adaption.<br>Displays the armature current reference in percent of 99.11 M1 nominal current after flux adaption. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| 27.02 | **Used current reference** | | | | | | |
| | Armature current reference after limitation.<br>Displays the armature current reference in percent of 99.11 M1 nominal current after current limitation. See 30.34 M1 current limit bridge 2, 30.35 M1 current limit bridge 1 and 30.37 … 30.41 Current limit at speed 1 … 5. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| 27.05 | **Motor current** | | | | | | |
| | Motor current.<br>Measured motor current in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| 27.06 | **Motor peak current** | | | | | | |
| | Motor peak current.<br>Measured motor peak current in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| 27.09 | **Current controller i-part** | | | | | | |
| | Integration time ($T_I$) part of the armature current controller.<br>Displays the integration time ($T_I$) part of the armature current controller in percent of 99.11 M1 nominal current. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| 27.18 | **Firing angle** | | | | | | |
| | Firing angle. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the firing angel in degrees.</td></tr>
<tr><td>0.00 … 180.00</td><td>-</td><td>°</td><td>100 = 1°</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>27.19</b></td><td colspan="7"><b>Selected bridge</b></td></tr>
<tr><td colspan="7">Selected (current-conducting) bridge:<br>0: <b>No bridge</b>; no bridge selected.<br>1: <b>Bridge 1</b>; bridge 1 selected.<br>2: <b>Bridge 2</b>; bridge 2 selected.</td></tr>
<tr><td>0 … 2</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>27.22</b></td><td colspan="7"><b>Current reference source</b></td></tr>
<tr><td colspan="7">Selects the current reference source.<br>Selects the source for the current reference either as armature drive or as field exciter.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0, forces single firing pulses to suppress the DC current and sets 27.01 Current reference to zero.<br>1: <b>27.01 Current reference</b>; 27.01 Current reference as armature current reference.<br>2: <b>27.23 Current reference external</b>; 27.23 Current reference external as armature current reference.<br>3: <b>26.02 Torque reference used</b>; 26.02 Torque reference used is directly used as armature current reference (torque = current).<br><b>Note</b>: The flux adaption in field weakening is inactive (means no flux dependent armature current reference).<br>4: <b>AI1 scaled</b>; 12.12 AI1 scaled value as armature current reference.<br>5: <b>AI2 scaled</b>; 12.22 AI2 scaled value as armature current reference.<br>6: <b>AI3 scaled</b>; 12.32 AI3 scaled value as armature current reference.<br>7: <b>FBA A reference 1</b>; 03.05 FBA A reference 1 as armature current reference.<br>8: <b>FBA A reference 2</b>; 03.06 FBA A reference 2 as armature current reference.<br>9: <b>FBA B reference 1</b>; 03.07 FBA B reference 1 as armature current reference.<br>10: <b>FBA B reference 2</b>; 03.08 FBA B reference 2 as armature current reference.<br>11: <b>EFB reference 1</b>; 03.09 EFB reference 1 as armature current reference.<br>12: <b>EFB reference 2</b>; 03.10 EFB reference 2 as armature current reference.<br>13: <b>DDCS controller ref 1</b>; 03.11 DDCS controller ref 1 as armature current reference.<br>14: <b>DDCS controller ref 2</b>; 03.12 DDCS controller ref 2 as armature current reference.<br>15: <b>M/F or D2D ref 1</b>; 03.13 M/F or D2D ref 1 as armature current reference.<br>16: <b>M/F or D2D ref 2</b>; 03.14 M/F or D2D ref 2 as armature current reference.<br>30: <b>FieldRef via DCSLink</b>; from the armature drive via DCSLink. Depending on the node number settings in group 70 either 28.14 M1 field current reference (if motor 1 field exciter) or 42.45 M2 field current reference (if motor 2 field exciter) as field current reference. Only available if 99.06 Operation mode = Field exciter.<br>32: <b>FieldRef via DCSLink+CurRefExt</b>; from the armature drive via DCSLink. Depending on the node number settings in group 70 either 28.14 M1 field current reference (if motor 1 field exciter) or 42.45 M2 field current reference (if motor 2 field exciter). Plus 27.23 Current reference external as field current reference. Only available if 99.06 Operation mode = Field exciter.<br>34: <b>FluxRef after EMF control</b>; 28.09 Flux reference after EMF control from the armature drive via DCSLink as field current reference. Only available if 99.06 Operation mode = Field exciter.</td></tr>
<tr><td>0 … 34</td><td>27.01 Current reference</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>27.23</b></td><td colspan="7"><b>Current reference external</b></td></tr>
<tr><td colspan="7">External armature current reference.<br>External armature current reference in percent of 99.11 M1 nominal current.<br><b>Note</b>: 27.23 Current reference external is only valid, if 27.22 Current reference source = Current reference external.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>27.24</b></td><td colspan="7"><b>Current reference slope</b></td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Armature current reference slope.<br>Armature current reference slope in percent of 99.11 M1 nominal current per 1 ms. The di/dt limitation is located at the input of the armature current controller. | | | | | | |
| | 0.2 … 120.0 | 10.0 | %/ms | 100 = 1 %/ms | n | y | Parameter |
| **27.27** | **Current control mode** | | | | | | |
| | Armature current control mode.<br>Armature current controller mode selection.<br>0: **Standard**; PI-controller with RL compensation from EMF calculation based on 27.05 Motor current and feed forward from 99.01 Mains voltage.<br>1: **Feed forward reference**; PI-controller with RL compensation from EMF calculation based on current reference, see 27.22 Current reference source, and feed forward from 99.01 Mains voltage. More stable since a current reference is used.<br>2: **No feed forward**; PI-controller without RL compensation from EMF calculation and feed forward from 99.01 Mains voltage. Do not use for motor applications.<br>5: **Feedforward dev**; same control type as selection Standard, but improved performance and stability, thus faster current control (higher p-part and lower i-part in current controller possible). | | | | | | |
| | 0 … 5 | Standard | - | 1 = 1 | n | y | Parameter |
| **27.28** | **Current control feedback mode** | | | | | | |
| | Proportional gain ($K_P$) feedback mode.<br>Chooses the armature current feedback type for the proportional gain of the armature current controller.<br>0: **Peak current**; peak current measurement is used.<br>1: **Average current**; average current measurement is used. | | | | | | |
| | 0 … 1 | Peak current | - | 1 = 1 | n | y | Parameter |
| **27.29** | **M1 current proportional gain** | | | | | | |
| | Proportional gain ($K_P$) of the armature current controller.<br>**Example**: The controller generates 15 % of motor nominal current with 27.29 M1 current proportional gain = 3, if the armature current error is 5 % of 99.11 M1 nominal current. | | | | | | |
| | 0.00 … 325.00 | 0.10 | - | 100 = 1 | n | y | Parameter |
| **27.30** | **M1 current integration time** | | | | | | |
| | Integration time ($T_I$) of the armature current controller.<br>Setting the integration time to zero disables the integral part of the armature current controller and resets the integrator.<br>The integration time defines the time within the integral part of the armature current controller achieves the same value as the proportional part, when the error value is constant.<br>**Example**: The controller generates 15 % of motor nominal current with 27.29 M1 current proportional gain = 3, if the armature current error is 5 % of 99.11 M1 nominal current. On that condition and with 27.30 M1 current integration time = 50 ms follows:<br>– The controller generates 30 % of motor nominal current, if the armature current error is constant, after 50 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part. | | | | | | |
| | 0.0 … 32500.0 | 50.0 | ms | 1 = 1 ms | n | y | Parameter |
| **27.31** | **M1 discontinuous current limit** | | | | | | |
| | Motor 1 discontinuous current limit.<br>Threshold continuous/discontinuous current in percent of 99.11 M1 nominal current. The measured continuous/discontinuous current state can be read from 06.24.b12 Current controller status word 1. | | | | | | |
| | 0.00 … 325.00 | 100.00 | % | 100 = 1 % | n | y | Parameter |
| **27.32** | **M1 armature resistance** | | | | | | |
| | Motor 1 armature resistance.<br>Resistance of the armature circuit in mΩ. Used for the EMF calculation/compensation: | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">$EMF = U_A - R_A \times I_A - L_A \times \frac{dI_A}{dt}$<br>27.32 M1 armature resistance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.<br>**Note**: Do not change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance before autotuning! Changing them will falsify the autotuning results.</td></tr>
<tr><td>0 … 65500</td><td>0</td><td>mOhm</td><td>1 = 1 mOhm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.33**</td><td colspan="7">**M1 armature inductance**</td></tr>
<tr><td colspan="7">Motor 1 armature inductance.<br>Inductance of the armature circuit in mH.<br>27.33 M1 armature inductance can be obtained by means of autotuning, see 99.20 Tuning request, or from the motor data sheet.<br>**Note**: Do not change the default values of 27.32 M1 armature resistance and 27.33 M1 armature inductance before autotuning! Changing them will falsify the autotuning results.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>mH</td><td>10 = 1 mH</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.34**</td><td colspan="7">**Mains compensation time**</td></tr>
<tr><td colspan="7">Mains compensation filter time constant.<br>Mains voltage compensation filter time constant. Is used for the mains voltage compensation at the current controller output.<br>Setting the mains compensation filter time constant to 32500 ms disables the mains voltage compensation.</td></tr>
<tr><td>0 … 32500</td><td>10</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**27.36**</td><td colspan="7">**Block bridge 1 source**</td></tr>
<tr><td colspan="7">Block bridge 1 source.<br>Binary signal to block bridge 1. See 27.19 Selected bridge.<br>0 = Release bridge 1.<br>1 = Block bridge 1.<br>**Other [bit]**; source selection.<br>0: **Release bridge 1**; 0, release bridge 1. Normal operation.<br>1: **Block bridge 1**; 1, block bridge 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Release bridge 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**27.37**</td><td colspan="7">**Block bridge 2 source**</td></tr>
<tr><td colspan="7">Block bridge 2 source.<br>Binary signal to block bridge 2. See 27.19 Selected bridge.<br>0 = Release bridge 2.<br>1 = Block bridge 2.<br>**Other [bit]**; source selection.<br>0: **Release bridge 2**; 0, release bridge 2. Normal operation.<br>1: **Block bridge 2**; 1, block bridge 2.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.</td></tr>
</table>

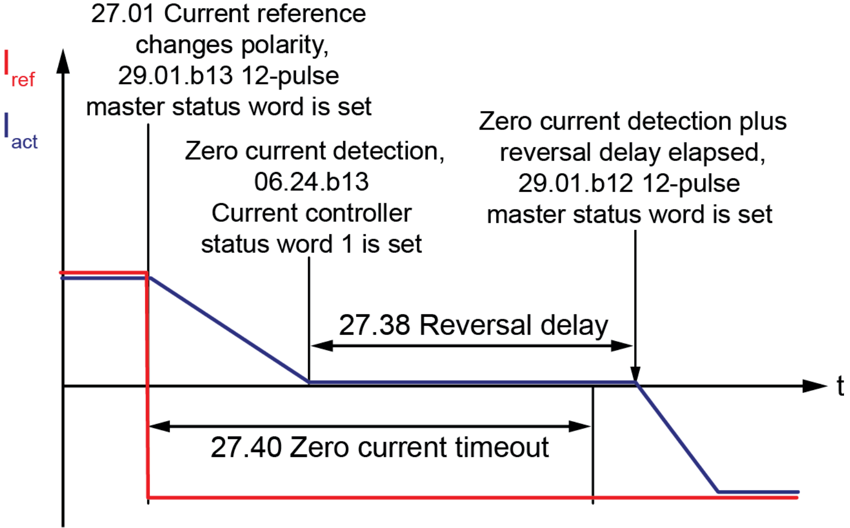
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

7: **DI5**; 10.02.b04 DI delayed status.
8: **DI6**; 10.02.b05 DI delayed status.
11: **DIO1**; 11.02.b00 DIO delayed status.
12: **DIO2**; 11.02.b01 DIO delayed status.
19: **DIL**; 10.02.b15 DI delayed status.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 19 | Release bridge 2 | - | 1 = 1 | n | y | Parameter |

**27.38** **Reversal delay**

Reversal delay during a bridge reversal (bridge changeover/change armature current direction).
The reversal delay defines the delay time during a bridge reversal.



DZ_LIN_046_RevDly_a.AI

The reversal delay starts after a bridge reversal command has been given and zero current has been detected. See 27.01 Current reference, 29.01.b13 12-pulse master status word and 06.24.b13 Current controller status word 1.
After a bridge reversal command, zero current has to be reached before 27.40 Zero current timeout elapses otherwise the event generates fault F557 Reversal time. See 04.24.b08 Fault word 4.
The setting of the reversal delay depends on the discontinuous current limit:

| 27.31 M1 discontinuous current limit | 27.38 Reversal delay | delta | 27.40 Zero current timeout |
|---|---|---|---|
| 50 % | 5.0 ms | 15 ms | 20 ms |
| ≤ 35 % | 10.0 ms | 25 ms | 35 ms |
| ≤ 20 % | 15.0 ms | 35 ms | 50 ms |
| ≤ 10 % | 20.0 ms | 50 ms | 70 ms |

**Notes**:

– 29.14 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay.

– 27.38 Reversal delay must have the same setting in 12-pulse master and 12-pulse slave with one exception only:
If there is no current measurement in the 12-pulse serial slave, set 27.38 Reversal delay in the 12-pulse serial slave to 0 ms. Now the 12-pulse serial slave uses the reversal command of the 12-pulse master for its own bridge reversal. See 29.01.b12 12-pulse master status word.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0.0 … 32500.0 | 5.0 | ms | 1 = 1 ms | n | y | Parameter |

**27.39** **Zero current detection**

Zero current detection method.
Selects the zero current detection method. Use a binary signal, if the zero current detection is done by another drive.

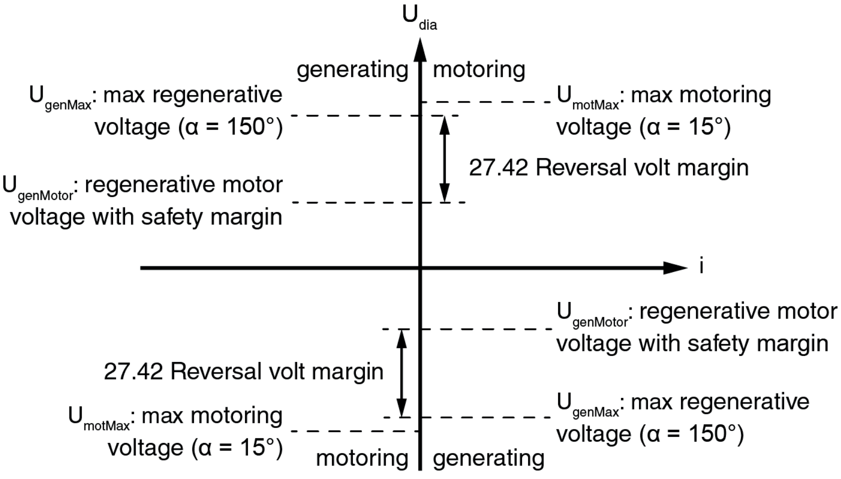
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0 = Current not zero.<br>1 = Zero current detected.<br><b>Notes</b>:<br>– If zero current is detected if the thyristor voltage is either ≤ 10 V or ≤ 10 % of 99.01 Mains voltage.<br>– With 27.39 Zero current detection = DIx the zero current detection flag is set, in case the mains contactor is switched off and the synchronization to the mains is interrupted.<br><b>Other [bit]</b>; source selection.<br>0: <b>Current</b>; based on the drive’s own zero current detection resistors. Normal operation.<br>1: <b>Voltage</b>; based on the drive’s own thyristor voltages. Not valid when galvanic isolation is used.<br>2: <b>Current and voltage</b>; based on discontinuous current and thyristor voltages. Not valid when galvanic isolation is used.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Current</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>27.40</b></td><td colspan="7"><b>Zero current timeout</b></td></tr>
<tr><td colspan="7">Zero current timeout during a bridge reversal (bridge changeover/change armature current direction). The zero current timeout defines the time during a bridge reversal, while zero current has to be reached. Otherwise, the event generates fault F557 Reversal time. See 04.24.b08 Fault word 4.<br>See 27.38 Reversal delay.<br><b>Notes</b>:<br>– 29.14 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay.<br>– 27.40 Zero current timeout must have the same setting in 12-pulse master and 12-pulse slave with one exception only:<br>If there is no current measurement in the 12-pulse serial slave, set 27.40 Zero current timeout in the 12-pulse serial slave to 32500 ms.</td></tr>
<tr><td>0 … 32500</td><td>20</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>27.41</b></td><td colspan="7"><b>Reversal mode</b></td></tr>
<tr><td colspan="7">Reversal mode for a bridge reversal (bridge changeover/change armature current direction). Reversal mode defines the behavior of the speed ramp and speed controller during a bridge reversal or a field reversal (torque reversal).<br><b>Note</b>: 27.41 Reversal mode is automatically set to Hard when 27.38 Reversal delay ≤ 25 ms.<br>0: <b>Soft</b>; the speed ramp and speed controller are frozen during reversal. Leading to a bumpless reversal (no speed steps).<br><b>Attention</b>: Do not use for hanging loads (e.g. cranes).<br>1: <b>Hard</b>; the speed ramp and speed controller are released during reversal. Thus, the drive follows the ramp.</td></tr>
<tr><td>0 … 1</td><td>Hard</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>27.42</b></td><td colspan="7"><b>Reversal volt margin</b></td></tr>
<tr><td colspan="7">Reversal volt safety margin. <b>Note</b>: Typically left at default.<br>The reversal volt margin in percent of 99.10 Nominal mains voltage is a safety margin for the motor voltage during regenerative mode. Setting the reversal volt margin to zero removes the protection against commutation faults (shooting through).<br>The margin for the reversal volt function is doing the following:</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

To prevent the drive from blowing fuses when going from motoring to generating the armature voltage has to be lower than the corresponding mains voltage, because thyristors are line commutated. This is automatically checked by the drive and the reverse bridge is blocked as long as the armature voltage is too high. To lower the armature voltage two ways are possible:

- Lowering the motor speed by idling.
- Adapting the flux by lowering the field current. For this option set 28.41 M1 EMF/field control = EMF.

Both options take time and thus delaying the current/torque reversal. For faster adapting of the armature voltage, activate the field weakening function.
This can be supervised with 06.25.b03 Current controller status word 2 and 31.60 Reversal volt function.



DZ_LIN_047_RevVoltMargin_a.ai

For regenerative mode is valid:

$$U_{genMotor} = |U_{genMax}| - U_{Safety}$$

$$with \quad U_{genMax} = 1.35 \bullet \cos\alpha_{\max} \bullet P01.20$$

$$U_{genMax} = 1.35 \bullet \cos P30.45 \bullet P01.20$$

$$and \quad U_{Safety} = P27.42$$

$$follows:$$

$$U_{genMotor} = |1.35 \bullet \cos P30.45 \bullet P01.20| - P27.42 \bullet P01.20$$

**Example**: With 30.45 Maximum firing angle = 150° and 27.42 Reversal volt margin = 10 % follows:

$$U_{genMotor} = |1.35 \bullet \cos 150° \bullet P01.20)| - 0.1 \bullet P01.20$$

$$U_{genMotor} = |-1.16 \bullet P01.20| - 0.1 \bullet P01.20$$

$$follows:$$

$$U_{genMotor} = 1.06 \bullet P01.20$$

Thus, the bridge reversal is only possible if 1.21 Armature voltage in V < 1.06 x 01.20 Mains voltage in V.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.00 … 20.00 | 6.00 | % | 100 = 1 % | n | y | Parameter |
| **27.50** | **M1 armature inductance current controller** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Motor 1 armature inductance. **Note**: Typically left at default.<br>Inductance of the armature circuit in mH. Used for the feed forward (EMF compensation) of the current controller. | | | | | | |
| | 0.0 … 3250.0 | 0.0 | mH | 10 = 1 mH | n | y | Parameter |
| **27.51** | **M1 armature inductance EMF speed feedback** | | | | | | |
| | Motor 1 armature inductance. **Note**: Typically left at default.<br>Inductance of the armature circuit in mH. Used for the EMF calculation. | | | | | | |
| | 0.0 … 3250.0 | 0.0 | mH | 10 = 1 mH | n | y | Parameter |

## 28 EMF and field current control

Settings for the EMF and field current control chain.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **28.01** | **EMF voltage reference 1** | | | | | | |
| | EMF voltage reference after source selection.<br>Displays the EMF voltage reference in percent of 99.12 M1 nominal voltage after EMF reference source. See 28.18 EMF reference source. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.02** | **EMF voltage reference 2** | | | | | | |
| | EMF voltage reference after source selection.<br>Displays the EMF voltage reference in percent of 99.12 M1 nominal voltage after voltage correction and ramp (slope). This is an input for the EMF controller. See 28.20 EMF voltage correction and 28.21 EMF voltage reference slope. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.05** | **Armature voltage** | | | | | | |
| | Armature voltage.<br>Measured armature voltage in in percent of 99.12 M1 nominal voltage.<br>This value is also influenced by 95.34 DC voltage measurement adjust and 95.35 DC voltage measurement offset. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.06** | **EMF voltage** | | | | | | |
| | EMF voltage.<br>Displays the EMF voltage in percent of 99.12 M1 nominal voltage after the EMF calculation. A filter time constant is defined by 28.23 EMF voltage filter time. This is an input for the EMF controller. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.09** | **Flux reference after EMF control** | | | | | | |
| | Flux reference after the EMF controller.<br>Displays the EMF part of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current.<br>**Note**: 28.09 Flux reference after EMF control is set to zero, if 28.41 M1 EMF/field control = Fix. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.10** | **Flux reference field weakening** | | | | | | |
| | Flux reference from field weakening.<br>Displays the field weakening part of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current.<br>**Note**: 28.10 Flux reference field weakening is set to 100 %, if 28.41 M1 EMF/field control = Fix. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **28.11** | **Flux reference sum** | | | | | | |
| | Flux reference sum. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the sum of the flux reference in percent of nominal flux. Nominal flux is generated with 100 % field current. 28.11 Flux reference sum = 28.09 Flux reference after EMF control + 28.10 Flux reference field weakening.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**28.14**</td><td colspan="7">**M1 field current reference**</td></tr>
<tr><td colspan="7">Motor 1 field current reference.<br>Displays motor 1 field current reference in percent of 99.13 M1 nominal field current.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**28.15**</td><td colspan="7">**M1 field current**</td></tr>
<tr><td colspan="7">Motor 1 field current.<br>Motor 1 measured field current in percent of 99.13 M1 nominal field current.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**28.17**</td><td colspan="7">**M1 EMF/field control mode**</td></tr>
<tr><td colspan="7">Motor 1 EMF/field control mode<br>Motor 1 EMF/field control mode selection.<br>**Note**: It is not possible to go into field weakening range when 90.41 M1 feedback selection = EMF.<br>0: **Fix**; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque blocked.<br>1: **EMF**; field weakening active, EMF controller released, field reversal blocked, optitorque blocked.<br>2: **Fix/reversal**; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque blocked.<br>3: **EMF/reversal**; field weakening active, EMF controller released, field reversal active, optitorque blocked.<br>4: **Fix/optitorque**; constant field (no field weakening), EMF controller blocked, field reversal blocked, optitorque active.<br>5: **EMF/optitorque**; field weakening active, EMF controller released, field reversal blocked, optitorque active.<br>6: **Fix/reversal/optitorque**; constant field (no field weakening), EMF controller blocked, field reversal active, optitorque active.<br>7: **EMF/reversal/optitorque**; field weakening active, EMF controller released, field reversal active, optitorque active.</td></tr>
<tr><td>0 … 7</td><td>Fix</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.18**</td><td colspan="7">**EMF reference source**</td></tr>
<tr><td colspan="7">Selects the EMF voltage reference source.<br>Selects the source for the EMF voltage reference.<br>**Other**; source selection.<br>0: **Zero**; 0, not in use.<br>1: **Internal**; internally calculated EMF voltage reference.<br>2: **EMF voltage external reference**; 28.19 EMF voltage external reference.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.<br>9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.<br>14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.</td></tr>
<tr><td>0 … 16</td><td>Internal</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

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<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>28.19</b></td><td colspan="7"><b>EMF voltage external reference</b></td></tr>
<tr><td colspan="7">External EMF voltage reference input.<br>External EMF voltage reference input of the drive in percent of 99.12 M1 nominal voltage. Can be connected via 28.18 EMF reference source.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.20</b></td><td colspan="7"><b>EMF voltage correction source</b></td></tr>
<tr><td colspan="7">Selects the EMF voltage correction source.<br>Selects the source for the EMF voltage correction.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0, not in use.<br>1: <b>EMF voltage correction</b>; 28.21 EMF voltage correction.<br>4: <b>AI1 scaled</b>; 12.12 AI1 scaled value.<br>5: <b>AI2 scaled</b>; 12.22 AI2 scaled value.<br>6: <b>AI3 scaled</b>; 12.32 AI3 scaled value.<br>7: <b>FBA A reference 1</b>; 03.05 FBA A reference 1.<br>8: <b>FBA A reference 2</b>; 03.06 FBA A reference 2.<br>9: <b>FBA B reference 1</b>; 03.07 FBA B reference 1.<br>10: <b>FBA B reference 2</b>; 03.08 FBA B reference 2.<br>11: <b>EFB reference 1</b>; 03.09 EFB reference 1.<br>12: <b>EFB reference 2</b>; 03.10 EFB reference 2.<br>13: <b>DDCS controller ref 1</b>; 03.11 DDCS controller ref 1.<br>14: <b>DDCS controller ref 2</b>; 03.12 DDCS controller ref 2.<br>15: <b>M/F or D2D ref 1</b>; 03.13 M/F or D2D ref 1.<br>16: <b>M/F or D2D ref 2</b>; 03.14 M/F or D2D ref 2.</td></tr>
<tr><td>0 … 16</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.21</b></td><td colspan="7"><b>EMF voltage correction</b></td></tr>
<tr><td colspan="7">EMF voltage correction input.<br>EMF voltage correction input of the drive in percent of 99.12 M1 nominal voltage. Can be connected via 28.20 EMF voltage correction source.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.22</b></td><td colspan="7"><b>EMF voltage reference slope</b></td></tr>
<tr><td colspan="7">EMF voltage reference slope.<br>EMF voltage reference slope in percent of 99.12 M1 nominal voltage per 1 ms. The dv/dt limitation is located at the input of the EMF controller.</td></tr>
<tr><td>0.01 … 100.00</td><td>30.00</td><td>%/ms</td><td>100 = 1 %/ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.23</b></td><td colspan="7"><b>EMF voltage filter time</b></td></tr>
<tr><td colspan="7">EMF voltage filter time constant.<br>EMF voltage filter time constant for 28.06 EMF voltage.</td></tr>
<tr><td>0 … 32500</td><td>10</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.24</b></td><td colspan="7"><b>EMF proportional gain</b></td></tr>
<tr><td colspan="7">Proportional gain (KP) of the EMF controller.<br><b>Example</b>: The controller generates 15 % of motor nominal EMF with 28.24 EMF proportional gain = 3, if the EMF error is 5 % of 99.12 M1 nominal voltage.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.50</td><td></td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>28.25</b></td><td colspan="7"><b>EMF integration time</b></td></tr>
<tr><td colspan="7">Integration time ($T_I$) of the EMF controller.<br>Setting the integration time to zero disables the integral part of the EMF controller and resets the integrator.<br>The integration time defines the time within the integral part of the EMF controller achieves the same value as the proportional part, when the error value is constant.</td></tr>
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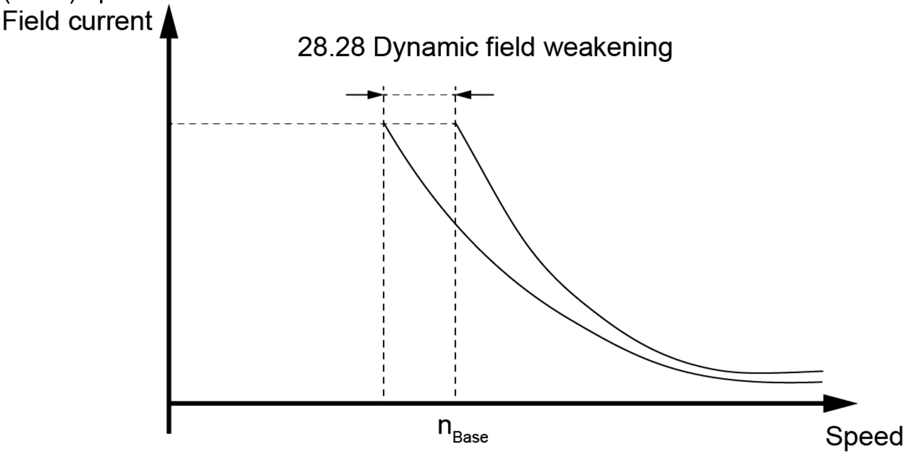
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">**Example**: The controller generates 15 % of motor nominal EMF with 28.24 EMF proportional gain = 3, if the EMF error is 5 % of 99.12 M1 nominal voltage. On that condition and with 28.25 EMF integration time = 50 ms follows:<br>– The controller generates 30 % of motor nominal EMF, if the EMF error is constant, after 50 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0 … 32500</td><td>50</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.28**</td><td colspan="7">**Dynamic field weakening**</td></tr>
<tr><td colspan="7">Dynamic field weakening.<br>If the motor speed passes the base speed (field weakening point) quickly, armature voltage overshoot may occur. To solve this problem the field weakening point can be lowered by means of dynamic field weakening. 28.28 Dynamic field weakening is set in percent of 99.14 M1 nominal (base) speed.<br> <br>DZ_LIN_043_FldWeakDyn_a.ai<br>**Note**: The lowered field weakening point is compensated by the EMF controller in case of constant speed or slow speed change. 30.50 Maximum EMF limit has to be set high enough to allow the EMF controller to compensate.</td></tr>
<tr><td>80.00 … 100.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.29**</td><td colspan="7">**Flux correction source**</td></tr>
<tr><td colspan="7">Selects the flux correction source.<br>Selects the source for the flux correction.<br>**Other**; source selection.<br>0: **Zero**; 0, not in use.<br>1: **Flux correction**; 28.29 Flux correction.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.<br>9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.<br>14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.</td></tr>
<tr><td>0 … 16</td><td>Zero</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.30**</td><td colspan="7">**Flux correction**</td></tr>
</table>

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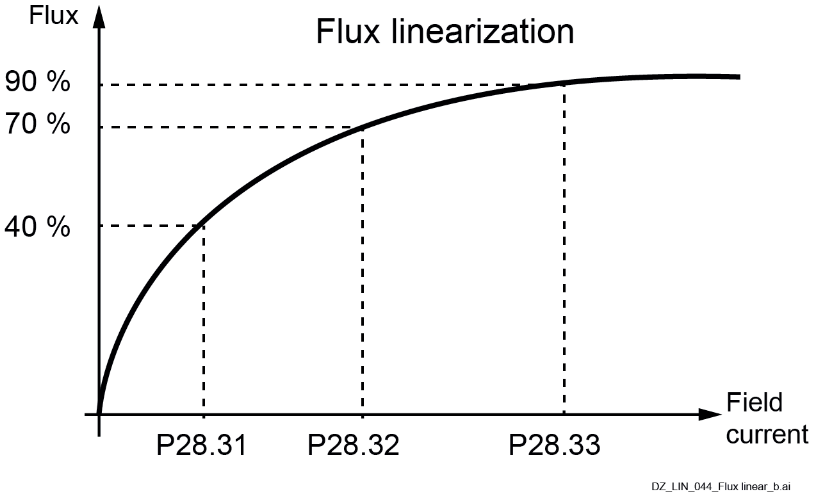
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Flux correction input.<br>Flux correction input of the drive in percent of nominal flux. Nominal flux is generated with 100 % field current. Can be connected via 28.28 Flux correction source.</td></tr>
<tr><td>-100.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.31</b></td><td colspan="7"><b>Field current at 40 % flux</b></td></tr>
<tr><td colspan="7">Field current at 40 % flux.<br>Field current in percent of 99.13 M1 nominal field current needed to generate 40 % of nominal flux. It is used to compensate the non-linearity between flux and field current.<br> </td></tr>
<tr><td>0.00 … 100.00</td><td>40.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.32</b></td><td colspan="7"><b>Field current at 70 % flux</b></td></tr>
<tr><td colspan="7">Field current at 70 % flux.<br>Field current in percent of 99.13 M1 nominal field current needed to generate 70 % of nominal flux. It is used to compensate the non-linearity between flux and field current.</td></tr>
<tr><td>0.00 … 100.00</td><td>70.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.33</b></td><td colspan="7"><b>Field current at 90 % flux</b></td></tr>
<tr><td colspan="7">Field current at 90 % flux.<br>Field current in percent of 99.13 M1 nominal field current needed to generate 90 % of nominal flux. It is used to compensate the non-linearity between flux and field current.</td></tr>
<tr><td>0.00 … 100.00</td><td>90.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>28.36</b></td><td colspan="7"><b>M1 field heating source</b></td></tr>
<tr><td colspan="7">Motor 1 field heating source.<br>Selects the source of motor 1 field heating On/Off command.<br>0 = Disable field heating.<br>1 = Enable with On.<br><b>Notes</b>:<br>– Field heating is disabled if:<br>    – Safe torque off (STO) is active.<br>    – Switch-on inhibited is active.<br>    – A fault is active.<br>    – Off2 (emergency off/fast current off) is active.<br>    – Off3 (emergency stop) is active.<br>    – When the drive is in state Ready reference (Run command).</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– Motor 1 field heating reference is set with 28.37 M1 field heating reference. Motor 1 field heating can be disabled, when the reference is set to zero. Motor 1 field nominal current is set with 99.13 M1 nominal field current.<br>– In case motor 1 field exciter is not connected via a separate field contactor following settings apply for motor 1 field heating:<br>– 20.33 Mains contactor control mode = On.<br>– 28.36 M1 field heating source = Enable with On.<br>– When two motors in shared motion are used and field economy is needed for motor 1, set 28.36 M1 field heating source = Disable field heating.<br>When 28.36 M1 field heating source = Enable with On, 100 % field current for motor 1 is kept, while the procedure to close the brake is active.<br>**Other [bit]**; source selection.<br>0: **Disable field heating**; 0, motor 1 field heating is off. Normal operation.<br>1: **Enable with On**; 1, enable motor 1 field heating with Off1 control = 1 and Run = 0.<br>2: **Enable field heating**; enable motor 1 field heating as long as Off1 control = 0.<br>3: **DI1**; 10.02.b00 DI delayed status. Enable motor 1 field heating with DI1 = 1 and Run = 0.<br>4: **DI2**; 10.02.b01 DI delayed status. Enable motor 1 field heating with DI2 = 1 and Run = 0.<br>5: **DI3**; 10.02.b02 DI delayed status. Enable motor 1 field heating with DI3 = 1 and Run = 0.<br>6: **DI4**; 10.02.b03 DI delayed status. Enable motor 1 field heating with DI4 = 1 and Run = 0.<br>7: **DI5**; 10.02.b04 DI delayed status. Enable motor 1 field heating with DI5 = 1 and Run = 0.<br>8: **DI6**; 10.02.b05 DI delayed status. Enable motor 1 field heating with DI6 = 1 and Run = 0.<br>11: **DIO1**; 11.02.b00 DIO delayed status. Enable motor 1 field heating with DIO1 = 1 and Run = 0.<br>12: **DIO2**; 11.02.b01 DIO delayed status. Enable motor 1 field heating with DO2 = 1 and Run = 0.<br>19: **DIL**; 10.02.b15 DI delayed status. Enable field motor 1 heating with DIL = 1 and Run = 0.</td></tr>
<tr><td>0 … 19</td><td>Disable field heating</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.37**</td><td colspan="7">**M1 field heating reference**</td></tr>
<tr><td colspan="7">Motor 1 field heating current reference.<br>Field current reference in percent of 99.13 M1 nominal field current for field heating and field economy.<br>Field heating:<br>– Field heating is enabled according to 28.36 M1 field heating source.<br>– Field heating is disabled when 28.37 M1 field heating reference = 0.<br>Field economy:<br>– Field economy is only available when 2 motors with 2 independent field exciters are connected to the drive.<br>– Field economy for motor 1 is enabled when 28.37 M1 field heating reference < 100 %.<br>– Field economy for motor 1 is activated, if:<br>– The On command is given for longer than 10 s.<br>– Motor 2 is selected via 42.01 Motor 1/2 selection.<br>– Motor 2 is active. See 06.18.b05 Drive status word 3.<br>– 28.38 M1 field current reference source = 42.53 M2 field current reference source = Internal.</td></tr>
<tr><td>0.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.38**</td><td colspan="7">**M1 field current reference source**</td></tr>
<tr><td colspan="7">Motor 1 field current reference source.<br>Selector for motor 1 field current reference.<br>0: **Internal**; motor 1 field current reference according to field heating or shared motion. See 28.36 Field heating source and 42.01 Motor 1/2 selection.<br>1: **Motor 2 reference**; motor 2 field current reference is taken.<br>2: **Motor 1 external**; 28.39 M1 field current external reference.</td></tr>
<tr><td>0 … 2</td><td>Internal</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
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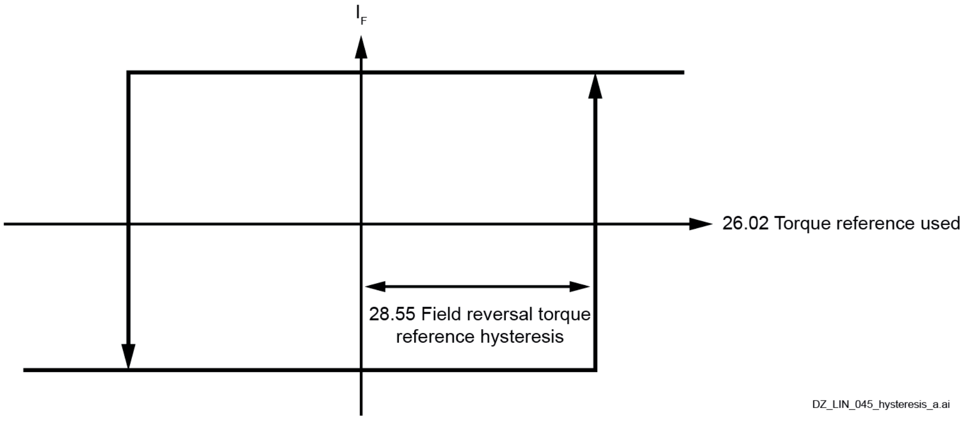
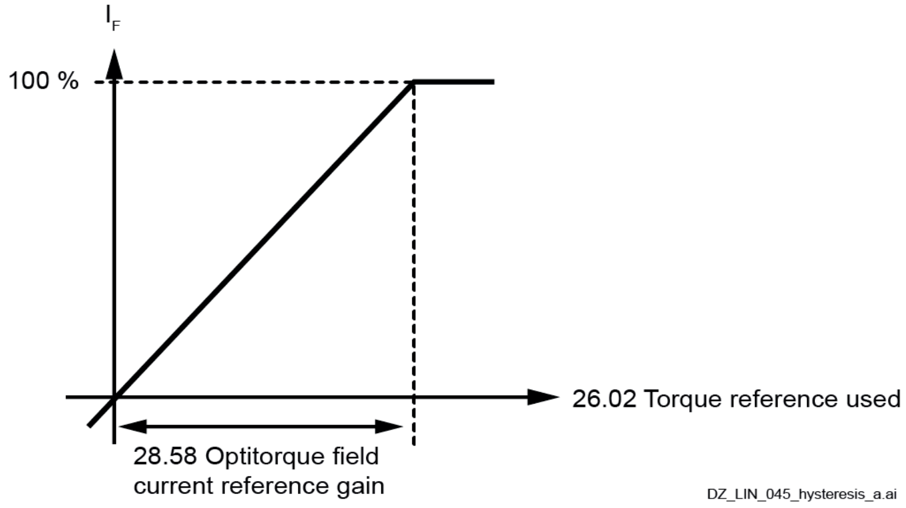
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**28.39**</td><td colspan="7">**M1 field current external reference**</td></tr>
<tr><td colspan="7">Motor1 external field current reference.<br>External field current reference input of the drive in percent of 99.13 M1 nominal field current. Can be connected via 28.38 M1 field current reference source.</td></tr>
<tr><td>-100.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.40**</td><td colspan="7">**Field current reference trimming**</td></tr>
<tr><td colspan="7">Field current reference trimming.<br>The field current of motor 1 and motor 2 can be corrected by means of 28.40 Field current reference trimming in percent of 99.13 M1 nominal field current or 42.10 M2 nominal field current respectively. See drawing in 28.38 M1 field current reference source.</td></tr>
<tr><td>-100.00 … 100.00</td><td>0.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.44**</td><td colspan="7">**M1 field control voltage limit**</td></tr>
<tr><td colspan="7">Motor 1 voltage limit for the field exciter.<br>Positive voltage limit for motor 1 field exciter in percent of the maximum possible field exciter output voltage.<br>**Example**: With a 3-phase supply voltage of 400 $V_{AC}$ the field current controller can generate a maximum average output voltage of 521 $V_{DC}$. In case the rated field supply voltage is 200 $V_{DC}$ it is possible to limit the field exciter output voltage.<br>E.g. to get a maximum average output voltage of 240$V_{DC}$ set the limit to 46 %. This is archived by limiting the firing angle of the field current controller.<br>**Note**: 4-Q field exciters that can reverse the field current will use the setting for positive and negative voltage limit.</td></tr>
<tr><td>0.00 … 100.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.45**</td><td colspan="7">**M1 field current proportional gain**</td></tr>
<tr><td colspan="7">Proportional gain ($K_P$) of the field current controller.<br>**Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 28.45 M1 field current proportional gain = 3, if the field current error is 5 % of 99.13 M1 nominal field current.</td></tr>
<tr><td>0.00 … 325.00</td><td>0.20</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**28.46**</td><td colspan="7">**M1 field current integration time**</td></tr>
<tr><td colspan="7">Integration time ($T_I$) of the field current controller.<br>Setting the integration time to zero disables the integral part of the filed current controller and resets the integrator.<br>The integration time defines the time within the integral part of the field current controller achieves the same value as the proportional part, when the error value is constant.<br>**Example**: The controller generates 15 % of motor nominal field voltage (see motor nameplate) with 28.45 M1 field current proportional gain = 3, if the field current error is 5 % of 99.13 M1 nominal field current. On that condition and with 28.46 M1 field current integration time = 200 ms follows:<br>– The controller generates 30 % of motor nominal field voltage, if the field current error is constant, after 200 ms are elapsed. 15 % derive from the proportional part and 15 % derive from the integral part.</td></tr>
<tr><td>0 … 32500</td><td>200</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**28.54**</td><td colspan="7">**Field current force direction**</td></tr>
<tr><td colspan="7">Force field current direction.<br>Selects the source for the field current direction.<br>0 = Forward.<br>1 = Reverse.<br>**Other [bit]**; source selection.<br>0: **Forward**; field current direction is forced to forward direction. Normal operation.<br>1: **Reverse**; field current direction is forced to reverse direction.<br>2: **None**; inactive. Field current force direction is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>20: **External reverse**; In case an external contactor in the field current loop is used to change the field direction, 28.54 Field current force direction has to be switched between Forward and External reverse. External reverse adapts the armature voltage and speed supervision. The external contactor interlocking and the control of 28.54 Field current force direction has to be done by means of Adaptive Program, application program or overriding control.</td></tr>
<tr><td></td><td>0 … 20</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.55**</td><td colspan="7">**Field reversal torque reference hysteresis**</td></tr>
<tr><td></td><td colspan="7">Torque reference hysteresis for field reversal.<br>To prevent the field reversal from continuous toggling at a small 26.02 Torque reference used, a hysteresis in percent of 99.02 M1 nominal torque is available. The hysteresis is symmetrical and is set by 28.55 Field reversal torque reference hysteresis.<br>The field reversal itself is controlled by the sign of 26.02 Torque reference used.<br> <br>**Note**: The hysteresis is only effective for 28.43 M1 EMF/field control mode = Fix/reversal or EMF/reversal.</td></tr>
<tr><td></td><td>0.00 … 325.00</td><td>2.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.56**</td><td colspan="7">**Field reversal field current hysteresis**</td></tr>
<tr><td></td><td colspan="7">Field current hysteresis for field reversal.<br>The sign of 28.15 M1 field current is used to generate the acknowledge signal for the field reversal. To avoid signal noise problems a small hysteresis in percent of 99.13 M1 nominal field current is needed.<br>**Note**: The hysteresis is only effective for 28.43 M1 EMF/field control mode = Fix/reversal, EMF/reversal, Fix/reversal/optitorque or EMF/reversal/optitorque.</td></tr>
<tr><td></td><td>0.00 … 100.00</td><td>2.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**28.57**</td><td colspan="7">**Field reversal flux monitoring delay**</td></tr>
<tr><td></td><td colspan="7">Flux monitoring delay for field reversal.<br>Maximum allowed time within the sign of 28.15 M1 field current and the internal motor flux do not correspond to each other during field reversal. During this time, 7301 Motor speed feedback and 73A1 Load speed feedback are disabled. See 4.22.b05 Fault word 2.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><b>Note</b>: The delay is only effective for 28.43 M1 EMF/field control mode = Fix/reversal, EMF/reversal, Fix/reversal/optitorque or EMF/reversal/optitorque.</td></tr>
<tr><td></td><td>0 … 32500</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.58</b></td><td colspan="7"><b>Optitorque field current reference gain</b></td></tr>
<tr><td colspan="7">Field current reference gain for optitorque.<br>Optitorque calculates the field current reference depending on the torque reference. See 26.02 Torque reference used. The field current is reduced to a smaller value in case of low torque references. Thus, for low torque references the field reversal is faster. Optitorque is activated by means of 28.43 M1 EMF/field control mode.<br>The relation between 26.02 Torque reference used and 28.14 M1 field current reference is linear and without offset. The gradient is defined by means of 28.58 Optitorque field current reference gain.<br><br> <br><b>Example</b>: With 28.58 Optitorque field current reference gain = 20 %, 100 % field current is generated at 26.02 Torque reference used = 20 %.<br><b>Note</b>: The gain is only effective for 28.43 M1 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque or EMF/reversal/optitorque.</td></tr>
<tr><td>0.00 … 100.00</td><td>50.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>28.61</b></td><td colspan="7"><b>Set: M1 field exciter current scaling</b></td></tr>
<tr><td colspan="7">Set: Motor 1 field exciter scaling factor.<br>If the scaling is changed, the new value is taken over immediately.<br>To use 28.61 Set: M1 field exciter current scaling following inequation has to be valid:<br>– 99.13 M1 nominal field current ≤ 28.61 Set: M1 field exciter current scaling ≤ maximum field current of the used field exciter.<br><b>Notes</b>:<br>– For 28.61 Set: M1 field exciter current scaling > maximum field current of the used field exciter A132 Parameter setting conflict is generated. See 4.32.b15 Warning word 2.<br>– For 99.13 M1 nominal field current > 28.61 Set: M1 field exciter current scaling the scaling is set automatically.<br>– The scaling factor is released when 99.13 M1 nominal field current < 28.61 Set: M1 field exciter current scaling and 99.07 M1 used field exciter type = OnBoard … DCF804-0060.</td></tr>
<tr><td>0.00 … 60.00</td><td>0.00</td><td>A</td><td>100 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>28.62</b></td><td colspan="7"><b>M1 field exciter freewheeling level</b></td></tr>
<tr><td colspan="7">Motor 1 field exciter freewheeling level.<br>The freewheeling level is shown in percent per 1 ms of the measured field exciter supply voltage. If 2 successive AC-voltage measurements differ more than 28.62 M1 field exciter freewheeling level, the freewheeling function is activated.</td></tr>
</table>

| Index | Name | | | | | |
|---|---|---|---|---|---|---|
| | Text | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | **Note**: The freewheeling level is only valid, for 99.07 M1 used field exciter type = DCF804-0050 … DCF804-0060. | | | | | | |
| | 0.00 … 100.00 | 20.00 | %/ms | 100 = 1 %/ms | n | y | Parameter |
| **28.63** | **M1 field exciter operation mode** | | | | | | |
| | Motor 1 operation mode for certain field exciters.<br>The field exciters DCF803-0016, FEX-425-Int and DCF803-0035 can be connected to either a 3-phase supply or a single-phase supply.<br>0: **1-phase**; single-phase supply for the field exciter.<br>1: **3-phase**; 3-phase supply for the field supply. | | | | | | |
| | 0 … 1 | 3-phase | - | 1 = 1 | n | y | Parameter |

## 29 12-pulse/Hardparallel

Settings for 12-pulse and hardparallel.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **29.01** | **12-pulse master status word** | | | | | | |
| | 12-pulse master status word.<br>Displays the 12-pulse master status word send from the 12-pulse master to the 12-pulse slave, when 20.01 Command location = 12-pulse link.<br>**Note**: The status word is valid in 12-pulse master and slave.<br>Bit assignment: | | | | | | |

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Off1 control | 1 | On command for the 12-pulse slave. |
| | | 0 | Off1 command for the 12-pulse slave. |
| 1 | Off2 control | 1 | Normal operation (Off2 inactive) for the 12-pulse slave. |
| | | 0 | Off2 (emergency off/fast current off) command for the 12-pulse slave. |
| 2 | Motor heating | 1 | Motor heating active. |
| | | 0 | Motor heating inactive. |
| 3 | Run | 1 | Run command for the 12-pulse slave. |
| | | 0 | Stop command for the 12-pulse slave. |
| 4 | Field exciter | 1 | Field exciter On command for the 12-pulse slave. |
| | | 0 | Field exciter Off command for the 12-pulse slave. |
| 5 | Dynamic braking | 1 | Dynamic braking active/started. |
| | | 0 | Dynamic braking inactive. |
| 6 | 12-pulse type | 1 | 12-pulse serial operation in the 12-pulse master. See 99.06 Operation mode. |
| | | 0 | 12-pulse parallel operation in the 12-pulse master. See 99.06 Operation mode. |
| 7 | Reset | 0 → 1 | Acknowledge fault indications in the 12-pulse slave with the positive edge. |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | Waiting for EMF reduction | 1 | Waiting for reduction of EMF to match the mains voltage. See 27.42 Reversal volt margin. |
| 11 | Autotuning current controller | 1 | Autotuning armature current controller active. |
| 12 | Zero current + reversal delay | 1 | Zero current detection plus reversal delay elapsed. See 06.24.b13 Current controller status word 1 and 27.38 Reversal delay. |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 13 | Change current direction | 1 | Command to change the direction of the armature current. Bridge changeover is active. |
| 14 | Blocked current controller | 1 | 6.25 Current controller status word 2 > 0. Thus, the armature current controller is blocked. |
| 15 | Current direction | 1 | 27.02 Used current reference is negative. |
| | | 0 | 27.02 Used current reference is positive. |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**29.02** **12-pulse slave status word**

12-pulse slave status word.
Displays the 12-pulse slave status word send from the 12-pulse slave to the 12-pulse master, when 20.01 Command location = 12-pulse link.
**Note**: The status word is valid in 12-pulse master and slave.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | reserved | | |
| 1 | reserved | | |
| 2 | reserved | | |
| 3 | 12-pulse slave tripped | 1 | 12-pulse slave is tripped. |
| 4 | reserved | | |
| 5 | reserved | | |
| 6 | 12-pulse type | 1 | 12-pulse serial operation in the 12-pulse slave. See 99.06 Operation mode. |
| | | 0 | 12-pulse parallel operation in the 12-pulse slave. See 99.06 Operation mode. |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | Change current direction | 1 | Command to change the direction of the armature current. Bridge changeover is active. |
| 14 | Blocked current controller | 1 | 6.25 Current controller status word 2 > 0. Thus, the armature current controller is blocked. |
| 15 | Current direction | 1 | 27.02 Used current reference is negative. |
| | | 0 | 27.02 Used current reference is positive. |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**29.03** **12-pulse slave firing angle**

12-pulse slave firing angle.
Displays the firing angle of the 12-pulse slave in degrees.
**Note:** Valid in the 12-pulse master only.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0.00 … 180.00 | - | ° | 100 = 1° | y | n | Signal |

**29.05** **12-pulse mode**

12-pulse mode.
The setting of 99.06 Operation mode determines the reaction of 29.05 12-pulse mode. 29.05 12-pulse mode must have the same setting in both master and slave.
**Note:** The setting Diode bridge is only valid in the master.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | 29.05 12-pulse mode | | |
|---|---|---|---|
| 99.06 Operation mode | Normal | Difference | Diode bridge |
| 12-pulse parallel master/slave | Valid | Valid | - |
| 12-pulse serial master/slave | Valid | - | Valid |
| 6-pulse serial master/slave | Valid | - | Valid |
| All other | Valid | - | - |

**12-pulse parallel**

99.06 Operation mode = 12-pulse parallel master or 12-pulse parallel slave:

0: **Normal**; 12-pulse parallel master and 12-pulse parallel slave use their own current controller independently.

1: **Difference**; the 12-pulse parallel slave calculates the difference between the 12-pulse parallel master actual current and its own actual current and controls this difference to zero by means of its current controller, not implemented yet.

2: **Diode bridge**; not used for 12-pulse parallel mode.

**12-pulse serial**

99.06 Operation mode = 12-pulse serial master/6-pulse serial master or 12-pulse serial slave/6-pulse serial slave:

0: **Normal**; 12-pulse serial master/6-pulse serial master and 12-pulse serial slave/6-pulse serial slave are controlled by the same firing angle.

1: **Difference**; not used for 12-pulse serial/6-pulse serial mode.

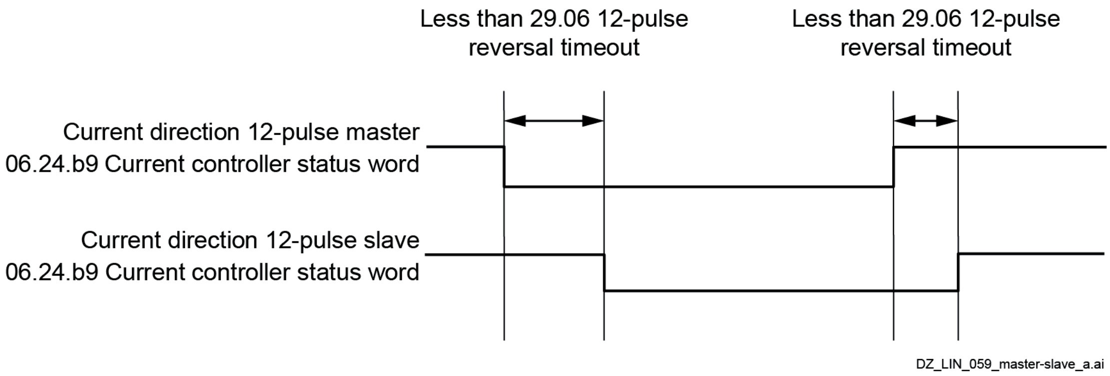
3: **Diode bridge**; the 2-pulse serial slave/6-pulse serial slave unit is a diode bridge, not implemented yet.

| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 2 | Normal | - | 1 = 1 | n | n | Parameter |

**29.06** **12-pulse reversal timeout**

12-pulse reversal timeout.

In 12-pulse mode the current direction of both - master and slave - units is monitored. Fault F533 12-pulse reversal timeout is generated, if the 2 units have different bridges fired for longer than 29.06 12-pulse reversal timeout.



**Notes:**

- Fault F533 12-pulse reversal timeout is inactive, if 29.06 12-pulse reversal timeout.is set to 1000 ms.
- 29.06 12-pulse reversal timeout must be longer than 27.40 Zero current timeout and 27.40 Zero current timeout must be longer than 27.38 Reversal delay.
- Valid in the 12-pulse master only.

| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 1000 | 100 | ms | 1 = 1 | n | y | Parameter |

**29.07** **12-pulse parallel current difference level**

12-pulse parallel current difference level.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Permitted current difference between the units in 12-pulse parallel configuration in percent of 99.11 M1 nominal current.<br>Fault F534 12-pulse current difference is generated, if 29.07 12-pulse parallel current difference level is still exceeded when 29.08 12-pulse parallel current difference delay is elapsed.<br><b>Note:</b> Valid in the 12-pulse master only.</td></tr>
<tr><td>1 … 50</td><td>10</td><td>%</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>29.08</b></td><td colspan="7"><b>12-pulse parallel current difference delay</b></td></tr>
<tr><td colspan="7">12-pulse parallel current difference delay.<br>29.08 12-pulse parallel current difference delay delays F534 12-pulse current difference. If the current difference becomes smaller than 29.07 12-pulse parallel current difference level before the delay is elapsed F534 will be disregarded.<br><b>Note:</b> Valid in the 12-pulse master only.</td></tr>
<tr><td>10 … 64000</td><td>500</td><td>ms</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>29.10</b></td><td colspan="7"><b>Ch1 power unit current calculated</b></td></tr>
<tr><td colspan="7">Channel 1 power unit calculated current.<br>Calculated total current of the power unit connected to channel 1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is:<br>29.10 = (29.11 + 29.12) / 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.11</b></td><td colspan="7"><b>Ch1 power unit current terminal C1</b></td></tr>
<tr><td colspan="7">Channel 1 power unit current flowing through terminal C1.<br>Measured current flowing through terminal C1 of the power unit connected to channel 1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.12</b></td><td colspan="7"><b>Ch1 power unit current terminal D1</b></td></tr>
<tr><td colspan="7">Channel 1 power unit current flowing through terminal D1.<br>Measured current flowing through terminal D1 of the power unit connected to channel 1 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>29.17</b></td><td colspan="7"><b>Ch1 power unit unbalanced current word</b></td></tr>
<tr><td colspan="7">Channel 1 power unit unbalanced current word.<br>Displays the thyristors of the power unit connected to channel 1 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded.<br>Any high bit means, that all thyristors of the power unit are in operation but one or more thyristors do not conduct the full current.<br><b>Note</b>: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>reserved</td><td></td><td></td></tr>
<tr><td>1</td><td>Thyristor V11</td><td>1</td><td>Current is unbalanced, this thyristor is not conducting the full current.</td></tr>
<tr><td>2</td><td>Thyristor V12</td><td>1</td><td>Current is unbalanced, this thyristor is not conducting the full current.</td></tr>
<tr><td>3</td><td>Thyristor V13</td><td>1</td><td>Current is unbalanced, this thyristor is not conducting the full current.</td></tr>
<tr><td>4</td><td>Thyristor V14</td><td>1</td><td>Current is unbalanced, this thyristor is not conducting the full current.</td></tr>
<tr><td>5</td><td>Thyristor V15</td><td>1</td><td>Current is unbalanced, this thyristor is not conducting the full current.</td></tr>
</table></td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 6 | Thyristor V16 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | Thyristor V21 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 10 | Thyristor V22 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 11 | Thyristor V23 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 12 | Thyristor V24 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 13 | Thyristor V25 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 14 | Thyristor V26 | 1 | Current is unbalanced, this thyristor is not conducting the full current. |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**29.18** **Ch1 power unit thyristor loss word**

Channel 1 power unit thyristor/branch fuse loss word.
Displays the thyristors/branch fuses of the power unit connected to channel 1 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function.
Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation.
**Note**: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | reserved | | |
| 1 | Thyristor V11 | 1 | This thyristor/branch fuse is not conducting current. |
| 2 | Thyristor V12 | 1 | This thyristor/branch fuse is not conducting current. |
| 3 | Thyristor V13 | 1 | This thyristor/branch fuse is not conducting current. |
| 4 | Thyristor V14 | 1 | This thyristor/branch fuse is not conducting current. |
| 5 | Thyristor V15 | 1 | This thyristor/branch fuse is not conducting current. |
| 6 | Thyristor V16 | 1 | This thyristor/branch fuse is not conducting current. |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | Thyristor V21 | 1 | This thyristor/branch fuse is not conducting current. |
| 10 | Thyristor V22 | 1 | This thyristor/branch fuse is not conducting current. |
| 11 | Thyristor V23 | 1 | This thyristor/branch fuse is not conducting current. |
| 12 | Thyristor V24 | 1 | This thyristor/branch fuse is not conducting current. |
| 13 | Thyristor V25 | 1 | This thyristor/branch fuse is not conducting current. |
| 14 | Thyristor V26 | 1 | This thyristor/branch fuse is not conducting current. |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**29.20** **Ch2 power unit current calculated**

Channel 2 power unit calculated current.
Calculated total current of the power unit connected to channel 2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is:
29.20 = (29.21 + 29.22) / 2

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>29.21</b></td><td colspan="7"><b>Ch2 power unit current terminal C1</b></td></tr>
<tr><td colspan="7">Channel 2 power unit current flowing through terminal C1.<br>Measured current flowing through terminal C1 of the power unit connected to channel 2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.22</b></td><td colspan="7"><b>Ch2 power unit current terminal D1</b></td></tr>
<tr><td colspan="7">Channel 2 power unit current flowing through terminal D1.<br>Measured current flowing through terminal D1 of the power unit connected to channel 2 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.27</b></td><td colspan="7"><b>Ch2 power unit unbalanced current word</b></td></tr>
<tr><td colspan="7">Channel 2 power unit unbalanced current word.<br>Displays the thyristors of the power unit connected to channel 2 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded.<br>Any high bit means, that all thyristors of the power unit are in operation but one or more thyristors do not conduct the full current.<br><b>Note</b>: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning.<br>Bit assignment:<br>See 29.17 Ch1 power unit unbalanced current word.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.28</b></td><td colspan="7"><b>Ch2 power unit thyristor loss word</b></td></tr>
<tr><td colspan="7">Channel 2 power unit thyristor/branch fuse loss word.<br>Displays the thyristors/branch fuses of the power unit connected to channel 2 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function.<br>Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation.<br><b>Note</b>: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning.<br>Bit assignment:<br>See 29.18 Ch1 power unit thyristor loss word.</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.30</b></td><td colspan="7"><b>Ch3 power unit current calculated</b></td></tr>
<tr><td colspan="7">Channel 3 power unit calculated current.<br>Calculated total current of the power unit connected to channel 3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is:<br>29.30 = (29.31 + 29.32) / 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.31</b></td><td colspan="7"><b>Ch3 power unit current terminal C1</b></td></tr>
<tr><td colspan="7">Channel 3 power unit current flowing through terminal C1.<br>Measured current flowing through terminal C1 of the power unit connected to channel 3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>29.32</b></td><td colspan="7"><b>Ch3 power unit current terminal D1</b></td></tr>
<tr><td colspan="7">Channel 3 power unit current flowing through terminal D1.<br>Measured current flowing through terminal D1 of the power unit connected to channel 3 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>29.37</b></td><td colspan="7"><b>Ch3 power unit unbalanced current word</b></td></tr>
<tr><td colspan="7">Channel 3 power unit unbalanced current word.</td></tr>
</table>

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Displays the thyristors of the power unit connected to channel 3 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded.<br>Any high bit means, that all thyristors of the power unit are in operation but one or more thyristors do not conduct the full current.<br>**Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning.<br>Bit assignment:<br>See 29.17 Ch1 power unit unbalanced current word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **29.38** | **Ch3 power unit thyristor loss word** | | | | | | |
| | Channel 3 power unit thyristor/branch fuse loss word.<br>Displays the thyristors/branch fuses of the power unit connected to channel 3 which are lost, in other words not conducting any current. See 29.68 Power unit thyristor loss function.<br>Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation.<br>**Note**: The bits are not latched in case of 29.68 Power unit thyristor loss function = Warning.<br>Bit assignment:<br>See 29.18 Ch1 power unit thyristor loss word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **29.40** | **Ch4 power unit current calculated** | | | | | | |
| | Channel 4 power unit calculated current.<br>Calculated total current of the power unit connected to channel 4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current. The used formula is:<br>29.40 = (29.41 + 29.42) / 2. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **29.41** | **Ch4 power unit current terminal C1** | | | | | | |
| | Channel 4 power unit current flowing through terminal C1.<br>Measured current flowing through terminal C1 of the power unit connected to channel 4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **29.42** | **Ch4 power unit current terminal D1** | | | | | | |
| | Channel 4 power unit current flowing through terminal D1.<br>Measured current flowing through terminal D1 of the power unit connected to channel 4 of the SDCS-OPL-H01 in percent of 99.11 M1 nominal current.<br>This signal is used to monitor the current balance between the hardparallel connected power units. | | | | | | |
| | -325.00 … 325.00 | - | % | 100 = 1 % | y | n | Signal |
| **29.47** | **Ch4 power unit unbalanced current word** | | | | | | |
| | Channel 4 power unit unbalanced current word.<br>Displays the thyristors of the power unit connected to channel 4 which are affected by unbalanced current, if 29.65 Power unit unbalanced current level is exceeded.<br>Any high bit means, that all thyristors of the power unit are in operation but one or more thyristors do not conduct the full current.<br>**Note**: The bits are not latched in case of 29.63 Power unit unbalanced current function = Warning.<br>Bit assignment:<br>See 29.17 Ch1 power unit unbalanced current word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **29.48** | **Ch4 power unit thyristor loss word** | | | | | | |
| | Channel 4 power unit thyristor/branch fuse loss word.<br>Displays the thyristors/branch fuses of the power unit connected to channel 4 which are lost, in other words not conducting any current. See 29.68 Power units thyristor loss function.<br>Any high bit means, that at least one thyristor/branch fuse of the power unit is out of operation.<br>**Note**: The bits are not latched in case of 29.68 Power units thyristor loss function = Warning.<br>Bit assignment: | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | See 29.18 Ch1 power unit thyristor loss word. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **29.60** | **Power units status word** | | | | | | |

Power units status word.
Displays the status of all hardparallel connected power units.
**Note**: The bits are latched in case of 29.68 Power unit thyristor loss function = Warning.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | reserved | | |
| 1 | Ch1 power unit unbalanced current | 1 | All thyristors of the power unit connected to channel 1 are in operation but one or more thyristors do not conduct the full current. |
| 2 | Ch2 power unit unbalanced current | 1 | All thyristors of the power unit connected to channel 2 are in operation but one or more thyristors do not conduct the full current. |
| 3 | Ch3 power unit unbalanced current | 1 | All thyristors of the power unit connected to channel 3 are in operation but one or more thyristors do not conduct the full current. |
| 4 | Ch4 power unit unbalanced current | 1 | All thyristors of the power unit connected to channel 4 are in operation but one or more thyristors do not conduct the full current. |
| 5 | reserved | | |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | Ch1 power unit thyristor loss | 1 | At least one thyristor/branch fuse of the power unit connected to channel 1 is out of operation. |
| 10 | Ch2 power unit thyristor loss | 1 | At least one thyristor/branch fuse of the power unit connected to channel 2 is out of operation. |
| 11 | Ch3 power unit thyristor loss | 1 | At least one thyristor/branch fuse of the power unit connected to channel 3 is out of operation. |
| 12 | Ch4 power unit thyristor loss | 1 | At least one thyristor/branch fuse of the power unit connected to channel 4 is out of operation. |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | reserved | | |

| Index | Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 29.60 | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **29.63** | **Power units unbalanced current function** | | | | | | |

Power units unbalanced current.
Selects the type of event power unit, unbalanced current. The drive reacts according 29.63 Power unit unbalanced current function if 27.05 Motor current exceeds 29.65 Power unit unbalanced current level and the unbalanced current is outside the window defined by 29.64 Power unit unbalanced current window.
**Example:** |27.05| > 29.65 AND current outside window of 29.64 (e.g. |29.11 Ch1 power unit current terminal C1 - 29.2 Ch2 power unit current terminal C1| > 29.64.
0: **No action**; none, disable event power unit, unbalanced current.
1: **Fault**; the event generates fault F560 Power unit, unbalanced current.
2: **Warning**; the event generates warning A560 Power unit, unbalanced current.

| Index | Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 29.63 | 0 … 2 | Warning | - | 1 = 1 | n | y | Parameter |
| **29.64** | **Power units unbalanced current window** | | | | | | |

Power units unbalanced current window.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Power units unbalanced current window in percent of 99.11 M1 nominal current. As long as the current of all power units current is inside the window (default -25.00 % … 25.00 %) event power units, unbalanced current is disabled. See 29.63 Power unit unbalanced current function.</td></tr>
<tr><td>0.00 … 325.00</td><td>25.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>29.65</b></td><td colspan="7"><b>Power units unbalanced current level</b></td></tr>
<tr><td colspan="7">Power units unbalanced current level.<br>Power units unbalanced current tripping level in percent of 99.11 M1 nominal current. See 29.63 Power units unbalanced current function.</td></tr>
<tr><td>0.00 … 325.00</td><td>15.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>29.68</b></td><td colspan="7"><b>Power units thyristor loss function</b></td></tr>
<tr><td colspan="7">Power units, thyristor loss.<br>Selects the type of event power unit, thyristor loss. A lost thyristor/branch fuse means, that no current is conducted through thyristor and branch fuse.<br>0: <b>No action</b>; none, disable event power unit, thyristor loss.<br>1: <b>Fault</b>; the event generates fault F561 Power unit, thyristor loss.<br>2: <b>Warning</b>; the event generates warning A561 Power unit, thyristor loss.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>29.70</b></td><td colspan="7"><b>Power units test</b></td></tr>
<tr><td colspan="7">Power units test.<br>29.69 Power units test is used to simulate events power units unbalanced current and power units thyristor loss. This is executed by removing firing pulses from thyristors V11 and V21.<br>0: <b>Normal mode</b>; normal operating mode.<br>1:<b>Ch1 power unit</b>; remove channel 1 power unit firing pulses from thyristors V11 and V21.<br>2:<b>Ch2 power unit</b>; remove channel 2 power unit firing pulses from thyristors V11 and V21.<br>3:<b>Ch3 power unit</b>; remove channel 3 power unit firing pulses from thyristors V11 and V21.<br>4:<b>Ch4 power unit</b>; remove channel 4 power unit firing pulses from thyristors V11 and V21.</td></tr>
<tr><td>0 … 4</td><td>Normal mode</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
</table>

## 30 Control limits

Drive operation limits.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"><b>30.01</b></td><td colspan="7"><b>Limit word 1</b></td></tr>
<tr><td colspan="7">Drive limit word 1.<br>Displays the limit word 1 of the drive.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Negative speed</td><td>1</td><td>Speed reference is limited by 20.24 Negative speed enable.</td></tr>
<tr><td>1</td><td>Positive speed</td><td>1</td><td>Speed reference is limited by 20.23 Positive speed enable.</td></tr>
<tr><td>2</td><td>Min speed</td><td>1</td><td>Speed reference is limited by 30.11 Minimum speed.</td></tr>
<tr><td>3</td><td>Max speed</td><td>1</td><td>Speed reference is limited by 30.12 Maximum speed.</td></tr>
<tr><td>4</td><td>Bridge 2 current</td><td>1</td><td>Armature current reference is limited by 30.34 M1 current limit bridge 2.</td></tr>
<tr><td>5</td><td>Bridge 1 current</td><td>1</td><td>Armature current reference is limited by 30.35 M1 current limit bridge 1.</td></tr>
<tr><td>6</td><td>Speed 1 current</td><td>1</td><td>Armature current reference is limited by 30.37 Current limit at speed 1.</td></tr>
<tr><td>7</td><td>Speed 2 current</td><td>1</td><td>Armature current reference is limited by 30.38 Current limit at speed 2.</td></tr>
</table></td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 8 | Speed 3 current | 1 | Armature current reference is limited by 30.39 Current limit at speed 3. |
| 9 | Speed 4 current | 1 | Armature current reference is limited by 30.40 Current limit at speed 4. |
| 10 | Speed 5 current | 1 | Armature current reference is limited by 30.41 Current limit at speed 5. |
| 11 | Min firing angle | 1 | Firing angle is limited by 30.44 Minimum firing angle. |
| 12 | Max firing angle | 1 | Firing angle is limited by 30.45 Maximum firing angle. |
| 13 | Min EMF controller | 1 | EMF controller output is limited by 30.49 Minimum EMF limit. |
| 14 | Max EMF controller | 1 | EMF controller output is limited by 30.50 Maximum EMF limit. |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**30.02** **Torque limit status**

Torque limit word.
Displays the torque word of the drive.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Min 2-Q operation | 1 | Torque/current reference is limited by 2-Q operation. See 07.61 Drive block bridge 2 set = Block bridge 2. |
| 1 | Min speed controller | 1 | Speed controller output is limited by 30.13 Speed control min torque. |
| 2 | Max speed controller | 1 | Speed controller output is limited by 30.14 Speed control max torque. |
| 3 | Min external | 1 | External torque reference is limited by 30.15 Minimum torque reference. |
| 4 | Max external | 1 | External torque reference is limited by 30.16 Maximum torque reference. |
| 5 | Min 1 | 1 | Torque reference is limited by 30.19 Minimum torque 1. |
| 6 | Max 1 | 1 | Torque reference is limited by 30.20 Maximum torque 1. |
| 7 | Min 2 | 1 | Torque reference is limited by 30.23 Minimum torque 2. |
| 8 | Max 2 | 1 | Torque reference is limited by 30.24 Maximum torque 2. |
| 9 | Max regenerating | 1 | Torque reference is limited by 30.27 Max torque during regenerating. |
| 10 | Min emergency stop | 1 | Speed controller output is limited by 30.30 Minimum torque emergency stop. |
| 11 | Max emergency stop | 1 | Speed controller output is limited by 30.31 Maximum torque emergency stop. |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | reserved | | |
| 15 | reserved | | |

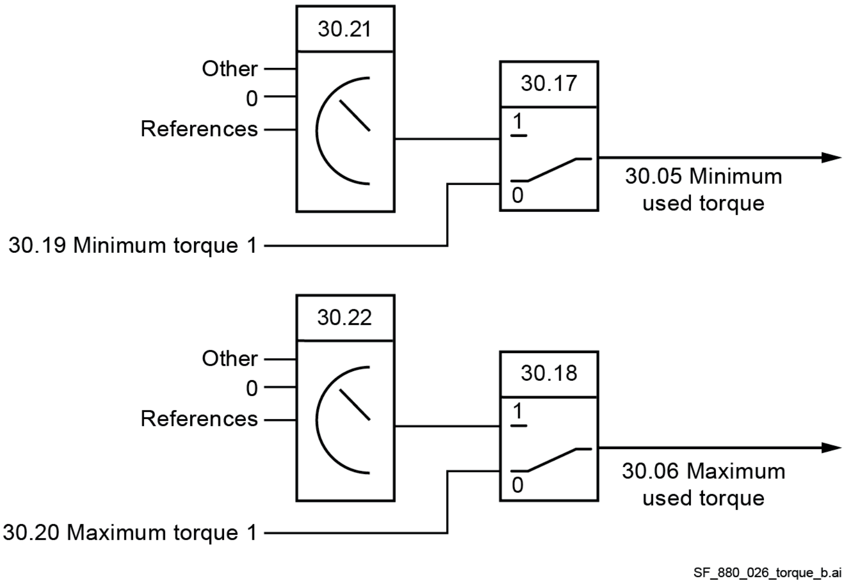
| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**30.03** **Minimum torque all limits**

Combination of all minimum torque/current limits.
Largest of all minimum torque/current limits in percent of 99.02 M1 nominal torque. Evaluated from 07.61 Drive block bridge 2 set, 30.06 Maximum used torque and 30.34 M1 current limit bridge 2.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| -325.00 … 325.00 | - | % | See 46.04 | y | n | Signal |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>30.04</b></td><td colspan="7"><b>Maximum torque all limits</b></td></tr>
<tr><td colspan="7">Combination of all maximum torque/current limits.<br>Smallest of all maximum torque/current limits in percent of 99.02 M1 nominal torque. Evaluated from 30.06 Maximum used torque and 30.35 M1 current limit bridge 1.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>30.05</b></td><td colspan="7"><b>Minimum used torque</b></td></tr>
<tr><td colspan="7">Minimum used torque reference limit.<br>Minimum torque limit in percent of 99.02 M1 nominal torque. The source is selected with 30.17 Minimum torque sel.<br>Connected to the torque limiter after 26.01 Torque reference to limitation.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>30.06</b></td><td colspan="7"><b>Maximum used torque</b></td></tr>
<tr><td colspan="7">Maximum used torque reference limit.<br>Maximum torque limit in percent of 99.02 M1 nominal torque. The source is selected with 30.18 Maximum torque sel.<br>Connected to the torque limiter after 26.01 Torque reference to limitation.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-</td><td>%</td><td>See 46.04</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>30.11</b></td><td colspan="7"><b>M1 minimum speed</b></td></tr>
<tr><td colspan="7">Motor 1 minimum speed limit.<br>Motor 1 minimum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference.<br><b>Notes</b>:<br>– 30.11 M1 minimum speed is applied to 24.01 Used speed reference to avoid exceeding the speed limits by means of 24.11 Speed correction.<br>– To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 6.10.b02 Auxiliary control word 1.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.12</b></td><td colspan="7"><b>M1 maximum speed</b></td></tr>
<tr><td colspan="7">Motor 1 maximum speed limit.<br>Motor 1 maximum speed reference limit in rpm for 23.01 Speed reference ramp input and 24.01 Used speed reference.<br><b>Notes</b>:<br>– 30.12 M1 maximum speed is applied to 24.01 Used speed reference to avoid exceeding the speed limits by means of 24.11 Speed correction.<br>– To be able to overspeed the drive (e.g. for winders) it is possible to switch off the speed limit for 24.01 Used speed reference by means of 6.10.b02 Auxiliary control word 1.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.13</b></td><td colspan="7"><b>Speed control min torque</b></td></tr>
<tr><td colspan="7">Minimum speed controller output torque limit.<br>Minimum speed controller output torque limit in percent of 99.02 M1 nominal torque. See 25.01 Torque reference speed control.<br><b>Notes</b>:<br>– The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.<br>– No need to change the default setting of 30.13 Speed control min torque for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.14</b></td><td colspan="7"><b>Speed control max torque</b></td></tr>
<tr><td colspan="7">Maximum speed controller output torque limit.<br>Maximum speed controller output torque limit in percent of 99.02 M1 nominal torque. See 25.01 Torque reference speed control.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | **Note**: The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid. | | | | | | |
| | -325.00 … 325.00 | 325.00 | % | See 46.04 | n | y | Parameter |
| **30.15** | **Minimum torque reference** | | | | | | |
| | Minimum external torque reference limit.<br>Minimum external torque reference limit in percent of 99.02 M1 nominal torque for external references. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source.<br>**Notes**:<br>– The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.<br>– No need to change the default setting of 30.13 Speed control min torque for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2. | | | | | | |
| | -325.00 … 325.00 | -325.00 | % | See 46.04 | n | y | Parameter |
| **30.16** | **Maximum torque reference** | | | | | | |
| | Maximum external torque reference limit.<br>Maximum external torque reference limit in percent of 99.02 M1 nominal torque for external references. See 26.11 Torque reference 1 source and 26.12 Torque reference 2 source.<br>**Note**: The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid. | | | | | | |
| | -325.00 … 325.00 | 325.00 | % | See 46.04 | n | y | Parameter |
| **30.17** | **Minimum torque sel** | | | | | | |
| | Minimum torque reference limit selector.<br>Selects a source that switches between two different predefined minimum torque limits. The user can define two sets of torque limits and switch between the sets using a binary source such as a digital input.<br>30.17 Minimum torque sel is independent of 30.18 Maximum torque sel.<br>The first set of limits is defined by 30.19 Minimum torque 1 and 30.20 Maximum torque 1.<br>The second set has selector parameters for both minimum and maximum limit. See 30.21 Minimum torque 2 source and 30.22 Maximum torque 2 source. Thus, it is possible to select e.g. analog inputs.<br>0 = Minimum torque 1.<br>1 = Minimum torque 2.<br><br> <br>**Other [bit]**; source selection. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0: <b>Minimum torque 1</b>; 30.19 Minimum torque 1 is active. Normal operation.<br>1: <b>Minimum torque 2</b>; the source selected by 30.21 Minimum torque 2 source is active.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Minimum torque 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.18</b></td><td colspan="7"><b>Maximum torque sel</b></td></tr>
<tr><td colspan="7">Maximum torque reference limit selector.<br>Selects a source that switches between two different predefined minimum torque limits. See 30.17 Minimum torque sel.<br>0 = Maximum torque 1.<br>1 = Maximum torque 2.<br><b>Other [bit]</b>; source selection.<br>0: <b>Maximum torque 1</b>; 30.20 Maximum torque 1 is active. Normal operation.<br>1: <b>Maximum torque 2</b>; the source selected by 30.22 Maximum torque 2 source is active.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.<br>7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Maximum torque 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.19</b></td><td colspan="7"><b>Minimum torque 1</b></td></tr>
<tr><td colspan="7">Minimum torque reference limit 1.<br>Minimum torque reference limit 1 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.<br><b>Notes</b>:<br>– The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.<br>– No need to change the default setting of 30.19 Minimum torque 1 for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.20</b></td><td colspan="7"><b>Maximum torque 1</b></td></tr>
<tr><td colspan="7">Maximum torque reference limit 1.<br>Maximum torque reference limit 1 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.<br><b>Note</b>: The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.21</b></td><td colspan="7"><b>Minimum torque 2 source</b></td></tr>
<tr><td colspan="7">Minimum torque reference limit 2 source.</td></tr>
</table>

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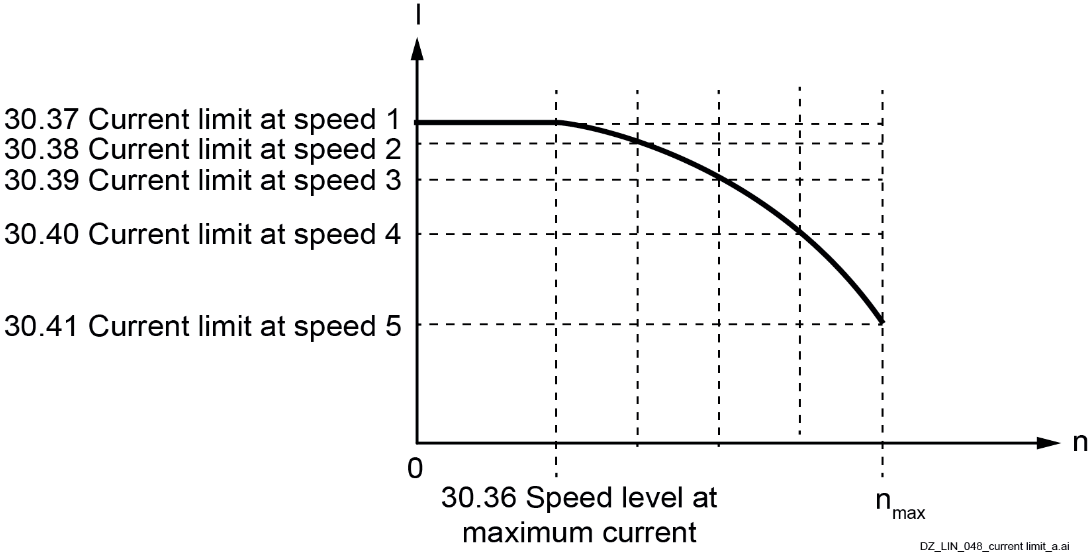
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the source for the minimum torque reference limit 2 in percent 99.02 M1 nominal torque. See 30.17 Minimum torque sel.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0, not in use.<br>1: <b>Minimum torque 2</b>; 30.23 Minimum torque 2.<br>2: <b>Negate maximum torque 2</b>; 30.24 Maximum torque 2 multiplied with -1.<br>4: <b>AI1 scaled</b>; 12.12 AI1 scaled value.<br>5: <b>AI2 scaled</b>; 12.22 AI2 scaled value.<br>6: <b>AI3 scaled</b>; 12.32 AI3 scaled value.<br>18: <b>Process PID output actual</b>; 40.01 Process PID output actual.</td></tr>
<tr><td>0 … 18</td><td>Minimum torque 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.22</b></td><td colspan="7"><b>Maximum torque 2 source</b></td></tr>
<tr><td colspan="7">Maximum torque reference limit 2 source.<br>Selects the source for the Maximum torque reference limit 2 in percent 99.02 M1 nominal torque. See 30.17 Minimum torque sel.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0, not in use.<br>1: <b>Maximum torque 2</b>; 30.24 Maximum torque 2.<br>2: <b>Negate minimum torque 2</b>; 30.23 Minimum torque 2 multiplied with -1.<br>4: <b>AI1 scaled</b>; 12.12 AI1 scaled value.<br>5: <b>AI2 scaled</b>; 12.22 AI2 scaled value.<br>6: <b>AI3 scaled</b>; 12.32 AI3 scaled value.<br>18: <b>Process PID output actual</b>; 40.01 Process PID output actual.</td></tr>
<tr><td>0 … 18</td><td>Maximum torque 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.23</b></td><td colspan="7"><b>Minimum torque 2</b></td></tr>
<tr><td colspan="7">Minimum torque reference limit 2.<br>Minimum torque reference limit 2 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.<br><b>Notes</b>:<br>– The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.<br>– No need to change the default setting of 30.23 Minimum torque 2 for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>-325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.24</b></td><td colspan="7"><b>Maximum torque 2</b></td></tr>
<tr><td colspan="7">Maximum torque reference limit 2.<br>Maximum torque reference limit 2 in percent of 99.02 M1 nominal torque for the torque limiter. See 30.17 Minimum torque sel.<br><b>Note</b>: The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.27</b></td><td colspan="7"><b>Max torque during regenerating</b></td></tr>
<tr><td colspan="7">Maximum torque limit during regeneration.<br>Maximum and torque limit in percent of 99.02 M1 nominal torque only during regenerating.<br><b>Note</b>: The used torque limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening).</td></tr>
<tr><td>-325.00 … 325.00</td><td>325.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.30</b></td><td colspan="7"><b>Minimum torque emergency stop</b></td></tr>
<tr><td colspan="7">Minimum speed controller output torque limit for a ramped Off3 (emergency stop) command.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Minimum speed controller output torque limit when a ramped Off3 (emergency stop) command is active and 30.30 Minimum torque emergency stop is ≠ zero. Otherwise the value of 30.13 Speed control min torque is taken. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.<br><b>Notes</b>:<br>– The emergency stop torque limit overrides all other minimum torque limits. Minimum current limits remain valid.<br>– No need to change the default setting of 30.30 Minimum torque emergency stop for 2-Q operation, because the minimum torque limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.31</b></td><td colspan="7"><b>Maximum torque emergency stop</b></td></tr>
<tr><td colspan="7">Maximum speed controller output torque limit for a ramped Off3 (emergency stop) command.<br>Maximum speed controller output torque limit when a ramped Off3 (emergency stop) command is active and 30.31 Maximum torque emergency stop is ≠ zero. Otherwise the value of 30.14 Speed control max torque is taken. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.<br><b>Note</b>: The emergency stop torque limit overrides all other Maximum torque limits. Maximum current limits remain valid.</td></tr>
<tr><td>-325.00 … 325.00</td><td>0.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.34</b></td><td colspan="7"><b>M1 current limit bridge 2</b></td></tr>
<tr><td colspan="7">Motor 1 armature current limit for bridge 2.<br>Current limit bridge 2 in percent of 99.11 M1 nominal current. Setting 30.34 M1 current limit bridge 2 = 0 % disables bridge 2.<br><b>Notes</b>:<br>– The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the largest value is valid.<br>– No need to change the default setting of 30.34 M1 current limit bridge 2for 2-Q operation, because the minimum current limit is internally set to -1 %. See 07.61 Drive block bridge 2 set = Block bridge 2.</td></tr>
<tr><td>-325.00 … 0.00</td><td>-100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.35</b></td><td colspan="7"><b>M1 current limit bridge 1</b></td></tr>
<tr><td colspan="7">Motor 1 armature current limit for bridge 1.<br>Current limit bridge 1 in percent of 99.11 M1 nominal current. Setting 30.35 M1 current limit bridge 1 = 0 % disables bridge 1.<br><b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.36</b></td><td colspan="7"><b>Speed level at maximum current</b></td></tr>
<tr><td colspan="7">Speed level for the speed depending current limit.<br>Speed level where the armature current reduction begins.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">


$n_{max}$ = maximum absolute value of 30.11 M1 minimum speed and 30.12 M1 maximum speed</td></tr>
<tr><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.37</b></td><td colspan="7"><b>Current limit at speed 1</b></td></tr>
<tr><td colspan="7">Speed depending current limit at speed 1.
Armature current limit in percent of 99.11 M1 nominal current at 30.36 Speed level at maximum current. Should be set to the maximum absolute value of 30.34 M1 current limit bridge 2 and 30.35 M1 current limit bridge.

<b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.38</b></td><td colspan="7"><b>Current limit at speed 2</b></td></tr>
<tr><td colspan="7">Speed depending current limit at speed 2.
Armature current limit in percent of 99.11 M1 nominal current at speed:

$$(30.36) + \frac{1}{4} \times [n_{max} - (30.36)]$$
$$With: n_{max} = Max[|(30.11)|, |(30.12)|]$$

<b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.39</b></td><td colspan="7"><b>Current limit at speed 3</b></td></tr>
<tr><td colspan="7">Speed depending current limit at speed 3.
Armature current limit in percent of 99.11 M1 nominal current at speed:

$$(30.36) + \frac{1}{2} \times [n_{max} - (30.36)]$$
$$With: n_{max} = Max[|(30.11)|, |(30.12)|]$$

<b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.40</b></td><td colspan="7"><b>Current limit at speed 4</b></td></tr>
<tr><td colspan="7">Speed depending current limit at speed 4.</td></tr>
</table>

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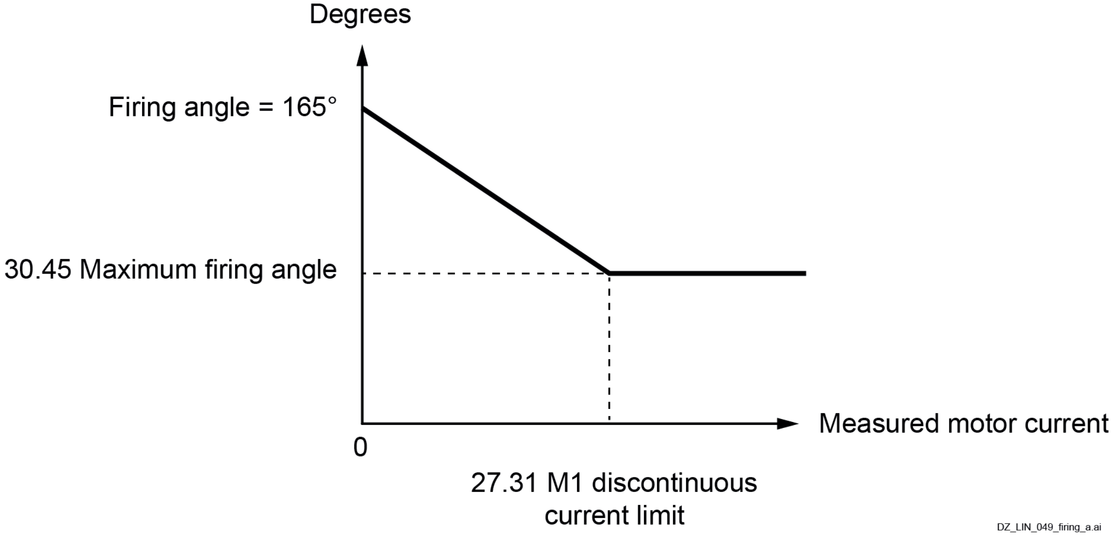
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Armature current limit in percent of 99.11 M1 nominal current at speed:<br><br>$(30.36) + \frac{3}{4} \times [n_{max} - (30.36)]$<br>$With: n_{max} = Max[|(30.11)|, |(30.12)|]$<br><br><b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.41</b></td><td colspan="7"><b>Current limit at speed 5</b></td></tr>
<tr><td colspan="7">Speed depending current limit at speed 5.<br>Armature current limit in percent of 99.11 M1 nominal current at $n_{max}$.<br><br>$With: n_{max} = Max[|(30.11)|, |(30.12)|]$<br><br><b>Note</b>: The used current limit depends also on the drives actual limitation situation (other torque limits, current limits and field weakening). The limit with the smallest value is valid.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.44</b></td><td colspan="7"><b>Minimum firing angle</b></td></tr>
<tr><td colspan="7">Minimum firing angle.<br>Minimum firing angle in degrees.</td></tr>
<tr><td>0.00 … 165.00</td><td>15.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>30.45</b></td><td colspan="7"><b>Maximum firing angle</b></td></tr>
<tr><td colspan="7">Maximum firing angle.<br>Maximum firing angle in degrees. The maximum firing angel can be forced using 06.10.b10 Auxiliary control word 1.</td></tr>
<tr><td>0.00 … 172.00</td><td>150.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>30.46</b></td><td colspan="7"><b>Maximum firing angle mode</b></td></tr>
<tr><td colspan="7">Maximum firing angle mode.<br>Selects the strategy for the maximum firing angle.<br>0: <b>Fix</b>; the maximum firing angle limit is defined by 30.45 Maximum firing angle.<br>1: <b>Fix + single</b>; the maximum firing angle limit is defined by 30.45 Maximum firing angle. When the maximum firing angle is reached, single firing pulses to suppress the DC current are fired.<br>2: <b>Calculated</b>; the maximum firing limit is automatically reduced from 165° to 30.45 Maximum firing angle depending on the measured motor current and 27.31 M1 discontinuous current limit.<br>3: <b>Calculated + single</b>; same function as Calculated, but single pulses fired are given, when the maximum firing angle is reached.</td></tr>
</table>

| **Index** | **Name**<br>**Text**<br>**Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
|---|---|---|---|---|---|---|---|
| |  <br>**Note**: Single firing pulses force discontinuous current automatically to zero. | | | | | | |
| | 0 … 3 | Fix + single | - | 1 = 1 | n | y | Parameter |
| **30.49** | **Minimum EMF limit** | | | | | | |
| | Minimum EMF limit.<br>Negative limit for EMF controller in percent of nominal flux. | | | | | | |
| | -100.00 … 0.00 | -100.00 | % | 100 = 1 % | n | y | Parameter |
| **30.50** | **Maximum EMF limit** | | | | | | |
| | Maximum EMF limit.<br>Positive limit for EMF controller in percent of nominal flux. | | | | | | |
| | 0.00 … 100.00 | 5.00 | % | 100 = 1 % | n | y | Parameter |

## 31 Fault functions and fault levels

Configuration of external events. Selection of the drive behavior in fault situations.

| **Index** | **Name**<br>**Text**<br>**Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
|---|---|---|---|---|---|---|---|
| **31.01** | **External event 1 source** | | | | | | |
| | Source of external event 1.<br>Defines the source of external event 1. See 31.02 External event 1 type.<br>0 = Active.<br>1 = Inactive.<br>**Other [bit]**; source selection.<br>0: **Active (false)**; trigger event.<br>1: **Inactive (true)**; no trigger event. Normal operation.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | Inactive (true) | - | 1 = 1 | n | y | Parameter |
| **31.02** | **External event 1 type** | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Type of external event 1.<br>Selects the type of external event 1.<br>0: <b>No action</b>; none, disable external event 1.<br>1: <b>Fault</b>; the event generates fault 9081 External fault 1.<br>2: <b>Warning</b>; the event generates warning A981 External warning 1.<br>3: <b>Warning or fault</b>; if the drive is in state Ready reference, the event generates fault 9081 External fault 1. Otherwise, the event generates warning A981 External warning 1.<br>4: <b>No action or fault</b>; if the drive is in state Ready reference, the event generates fault 9081 External fault 1. Otherwise, the event is inactive.<br>5: <b>Inactive or warning</b>; if the drive is in state Ready reference, the event generates warning A981 External warning 1. Otherwise, the event is inactive.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.03</b></td><td colspan="7"><b>External event 2 source</b></td></tr>
<tr><td colspan="7">Source of external event 2.<br>Defines the source of external event 2. See 31.04 External event 2 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.04</b></td><td colspan="7"><b>External event 2 type</b></td></tr>
<tr><td colspan="7">Type of external event 2.<br>Selects the type of external event 2. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.05</b></td><td colspan="7"><b>External event 3 source</b></td></tr>
<tr><td colspan="7">Source of external event 3.<br>Defines the source of external event 3. See 31.06 External event 3 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.06</b></td><td colspan="7"><b>External event 3 type</b></td></tr>
<tr><td colspan="7">Type of external event 3.<br>Selects the type of external event 3. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.07</b></td><td colspan="7"><b>External event 4 source</b></td></tr>
<tr><td colspan="7">Source of external event 4.<br>Defines the source of external event 4. See 31.08 External event 4 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.08</b></td><td colspan="7"><b>External event 4 type</b></td></tr>
<tr><td colspan="7">Type of external event 4.<br>Selects the type of external event 4. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.09</b></td><td colspan="7"><b>External event 5 source</b></td></tr>
<tr><td colspan="7">Source of external event 5.<br>Defines the source of external event 5. See 31.10 External event 5 type and 31.01 External event 1 source.</td></tr>
<tr><td>0 … 19</td><td>Inactive (true)</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.10</b></td><td colspan="7"><b>External event 5 type</b></td></tr>
<tr><td colspan="7">Type of external event 4.<br>Selects the type of external event 4. See 31.02 External event 1 type.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>31.13</b></td><td colspan="7"><b>Fault stop mode communication</b></td></tr>
<tr><td colspan="7">Stop mode for communication losses.</td></tr>
</table>

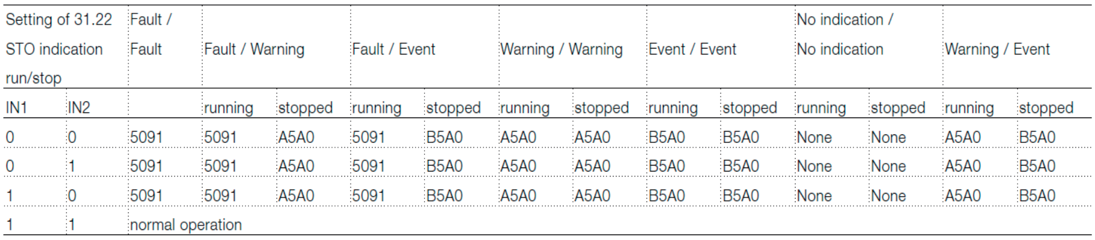
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the way the motor is stopped for all communication losses (local, fieldbus communication, master-follower, DDCS and DCSLink) causing a fault.<br>0: <b>Coast stop</b>; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>1: <b>Ramp stop</b>; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>3: <b>Torque limit</b>; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>4: <b>Dynamic braking</b>; the motor stops by means of dynamic braking.</td></tr>
<tr><td>0 … 4</td><td>Ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.14</b></td><td colspan="7"><b>Fault stop mode fault level 3</b></td></tr>
<tr><td colspan="7">Stop mode for faults with fault level 3.<br>Selects the way the motor is stopped for all faults with fault level 3.<br><b>Note</b>: 31.14 Fault stop mode fault level 3 does not apply to communication faults.<br>0: <b>Coast stop</b>; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>4: <b>Dynamic braking</b>; the motor stops by means of dynamic braking.</td></tr>
<tr><td>0 … 4</td><td>Coast stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.15</b></td><td colspan="7"><b>Fault stop mode fault level 4</b></td></tr>
<tr><td colspan="7">Stop mode for faults with fault level 4.<br>Selects the way the motor is stopped for all faults with fault level 4.<br><b>Note</b>: 31.15 Fault stop mode fault level 4 does not apply to communication faults. See 31.13 Fault stop mode communication.<br>0: <b>Coast stop</b>; the motor coasts to a stop. The firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current as fast as possible. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>1: <b>Ramp stop</b>; the input of the drive ramp is set to zero. Thus, the motor stops along the emergency stop ramp. See 23.23 Emergency stop time. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>3: <b>Torque limit</b>; the output of the drive ramp is set to zero. Thus, the motor stops at the active torque limit. When reaching 21.08 M1 zero speed level the firing angle is forced to the value of 30.45 Maximum firing angle to decrease the armature current. When the armature current is zero the firing pulses are blocked. The breakers are opened. Field exciter and fans are stopped.<br>In case 19.20 Follower force ramp stop = Force speed control the torque selector is bypassed and the drive is forced to speed control.<br>4: <b>Dynamic braking</b>; the motor stops by means of dynamic braking.</td></tr>
<tr><td>0 … 4</td><td>Ramp stop</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>31.16</b></td><td colspan="7"><b>Residual current detection source</b></td></tr>
<tr><td colspan="7">Source of the residual current detection.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Defines the source of the residual current detection. The drive reacts according to 31.18 Residual current detection type if the earth current exceeds 31.19 Residual current detection level for 31.20 Residual current detection delay.<br>0 = No current.<br>1 = Current detected.<br>**Note**: If the residual current detection source is connected to a digital input only 31.20 Residual current detection delay remains valid. The residual current detection level is adjusted at the external device.<br>**Other [bit]**; source selection.<br>0: **No current**; no residual current detected. Normal operation.<br>1: **Current detected**; residual current detected.<br>3: **DI1**; 10.02.b00 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>4: **DI2**; 10.02.b01 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>5: **DI3**; 10.02.b02 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>6: **DI4**; 10.02.b03 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>7: **DI5**; 10.02.b04 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>8: **DI6**; 10.02.b05 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>11: **DIO1**; 11.02.b00 DIO delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>12: **DIO2**; 11.02.b01 DIO delayed status. The residual current is measured by means of an external device (e.g. Bender relays).<br>19: **DIL**; 10.02.b15 DI delayed status. The residual current is measured by means of an external device (e.g. Bender relays). | | | | | | |
| | 0 … 19 | No current | - | 1 = 1 | n | y | Parameter |
| **31.18** | **Residual current detection type** | | | | | | |
| | Type of event residual current detection.<br>Selects the type of event residual current detection.<br>0: **No action**; none, disable residual current detection.<br>1: **Fault**; the event generates fault 2330 Residual current detected.<br>2: **Warning**; the event generates warning A2B3 Residual current detected. | | | | | | |
| | 0 … 2 | No action | - | 1 = 1 | n | y | Parameter |
| **31.19** | **Residual current detection level** | | | | | | |
| | Residual current detection level.<br>Residual current detection tripping level in amperes. The value is calculated to the primary side of the current transformer. Thus, the current transformer ratio must be 400 to 1.<br>**Note**: If the residual current detection source is connected to a digital input 31.19 Residual current detection level is deactivated. The residual current detection level is adjusted at the external device. | | | | | | |
| | 0.00 … 20.00 | 4.00 | A | 100 = 1 A | n | y | Parameter |
| **31.20** | **Residual current detection delay** | | | | | | |
| | Delay of the residual current detection.<br>Time delay for the residual current detection event. | | | | | | |
| | 0 … 32500 | 10 | ms | 1 = 1 ms | n | y | Parameter |
| **31.21** | **Mains phase loss** | | | | | | |
| | Type of event mains phase loss.<br>Selects the type of event mains phase loss.<br>0: **No action**; none, disable mains phase loss.<br>1: **Fault**; the event generates fault 3130 Mains phase loss. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 2: **Warning**; the event generates warning A130 Mains phase loss. | | | | | | |
| | 0 … 2 | Warning | - | 1 = 1 | n | y | Parameter |
| **31.22** | **STO indication run/stop** | | | | | | |

Type of event STO indication.
Selects which indications are given when one or both Safe torque off (STO) signals are switched off or are lost. The indications also depend on whether the drive is running or stopped, when this occurs.
The tables at each selection below show the indications generated with that particular setting.
**Notes**:

- This parameter does not affect the operation of the STO function itself. The STO function will operate regardless of the setting of this parameter. A running drive will stop upon removal of one or both STO signals. It will not start until both STO signals are restored and all faults are reset. The loss of only one STO signal is interpreted as a malfunction. This event generates either fault FA81 Safe torque off 1 loss or FA82 Safe torque off 2 loss.
- For more information on the STO, see safety supplement for functional safety converter DCS880 (3ADW000452).



| Setting of 31.22 STO indication run/stop | | Fault / Fault | Fault / Warning | | Fault / Event | | Warning / Warning | | Event / Event | | No indication / No indication | | Warning / Event | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IN1 | IN2 | | running | stopped | running | stopped | running | stopped | running | stopped | running | stopped | running | stopped |
| 0 | 0 | 5091 | 5091 | A5A0 | 5091 | B5A0 | A5A0 | A5A0 | B5A0 | B5A0 | None | None | A5A0 | B5A0 |
| 0 | 1 | 5091 | 5091 | A5A0 | 5091 | B5A0 | A5A0 | A5A0 | B5A0 | B5A0 | None | None | A5A0 | B5A0 |
| 1 | 0 | 5091 | 5091 | A5A0 | 5091 | B5A0 | A5A0 | A5A0 | B5A0 | B5A0 | None | None | A5A0 | B5A0 |
| 1 | 1 | normal operation | | | | | | | | | | | | |

- The normal STO operation (IN1 = IN2 = 0) has different, selectable indications.

0: **Fault/Fault**;

| **Inputs** | | **Indication (running or stopped)** |
|---|---|---|
| **IN1** | **IN2** | |
| 0 | 0 | Fault 5091 Safe torque off. |
| 0 | 1 | Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. |

1: **Fault/Warning**;

| **Inputs** | | **Indication** | |
|---|---|---|---|
| **IN1** | **IN2** | **Running** | **Stopped** |
| 0 | 0 | Fault 5091 Safe torque off. | Warning A5A0 Safe torque off. |
| 0 | 1 | Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault. | Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault. | Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. | |

2: **Fault/Event**;

| **Inputs** | | **Indication** | |
|---|---|---|---|
| **IN1** | **IN2** | **Running** | **Stopped** |
| 0 | 0 | Fault 5091 Safe torque off. | Event B5A0 Safe torque off. |
| 0 | 1 | Faults 5091 Safe torque off and FA81 Safe torque off 1 loss fault. | Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Faults 5091 Safe torque off and FA82 Safe torque off 2 loss fault. | Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. | |

3: **Warning/Warning**;

| **Inputs** | | **Indication (running or stopped)** |
|---|---|---|
| **IN1** | **IN2** | |
| 0 | 0 | Warning A5A0 Safe torque off. |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 0 | 1 | Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. |

4: **Event/Event**;

| **Inputs** | | **Indication (running or stopped)** |
|---|---|---|
| **IN1** | **IN2** | |
| 0 | 0 | Event B5A0 Safe torque off. |
| 0 | 1 | Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. |

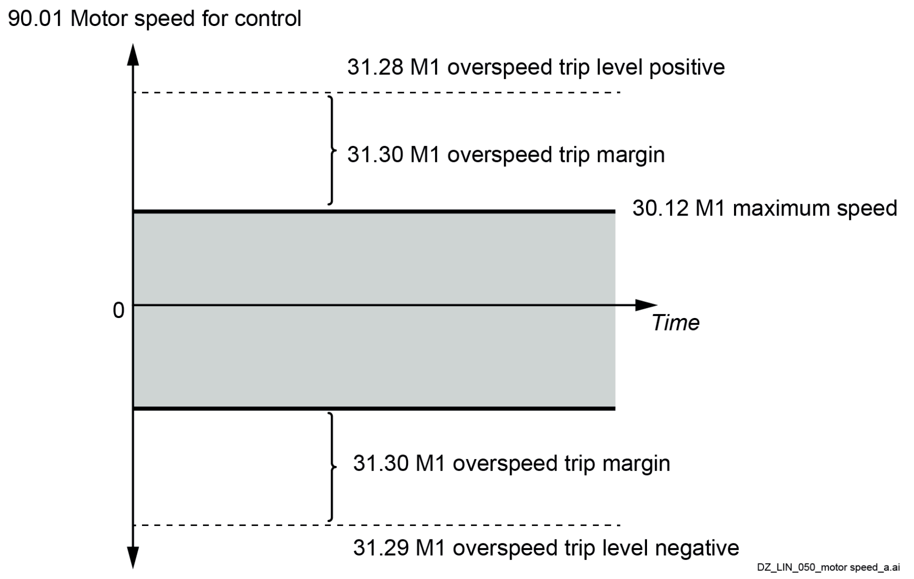
5: **No indication/No indication**;

| **Inputs** | | **Indication (running or stopped)** |
|---|---|---|
| **IN1** | **IN2** | |
| 0 | 0 | STO is performed, but not indicated. |
| 0 | 1 | FA81 Safe torque off 1 loss fault. |
| 1 | 0 | FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. |

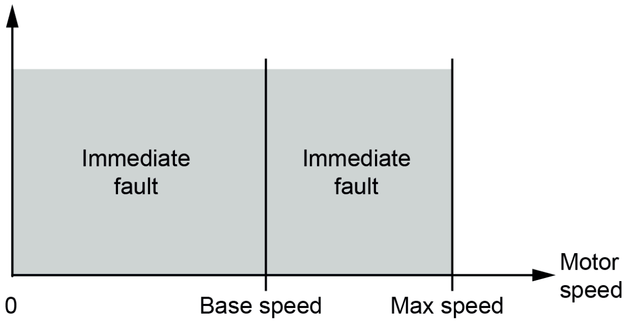
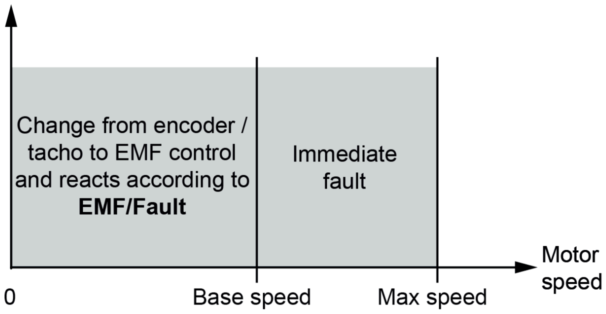
6: **Warning/Event**;

| **Inputs** | | **Indication** | |
|---|---|---|---|
| **IN1** | **IN2** | **Running** | **Stopped** |
| 0 | 0 | Warning A5A0 Safe torque off. | Event B5A0 Safe torque off. |
| 0 | 1 | Warning A5A0 Safe torque off and FA81 Safe torque off 1 loss fault. | Event B5A0 Safe torque off and FA81 Safe torque off 1 loss fault. |
| 1 | 0 | Warning A5A0 Safe torque off and FA82 Safe torque off 2 loss fault. | Event B5A0 Safe torque off and FA82 Safe torque off 2 loss fault. |
| 1 | 1 | Normal operation. | |

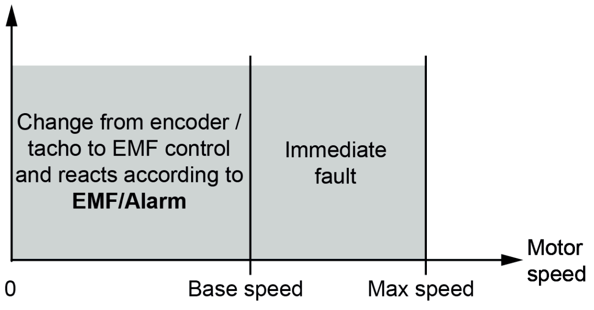
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 … 6 | Fault/Fault | - | 1 = 1 | n | n | Parameter |
| **31.24** | **Stall function** | | | | | | |
| | Stall, function.<br>Selects the type of event stall. The drive reacts according to 31.24 Stall function if the torque exceeds 31.25 Stall torque level and undershoots 31.26 Stall speed level for 31.28 Stall time.<br>0: **No action**; none, disable stall supervision.<br>1: **Fault**; the event generates fault 7121 Motor stall.<br>2: **Warning**; the event generates warning A780 Motor stall. | | | | | | |
| | 0 … 2 | No action | - | 1 = 1 | n | y | Parameter |
| **31.25** | **Stall torque level** | | | | | | |
| | Stall, torque level.<br>Stall torque level in percent of 99.02 M1 nominal torque. | | | | | | |
| | 0.00 … 325.00 | 75.00 | % | See 46.04 | n | y | Parameter |
| **31.26** | **Stall speed level** | | | | | | |
| | Stall, speed level.<br>Stall speed level. | | | | | | |
| | 0.00 … 30000.00 | 5.00 | rpm | See 46.02 | n | y | Parameter |
| **31.27** | **Stall time** | | | | | | |
| | Stall, delay.<br>Time delay for the stall function event. | | | | | | |
| | 0.0 … 3250.0 | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **31.28** | **M1 overspeed trip level positive** | | | | | | |
| | Motor 1 overspeed trip level positive.<br>If the positive (maximum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">**Example**: If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 31.30 M1 overspeed trip margin.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**31.29**</td><td colspan="7">**M1 overspeed trip level negative**</td></tr>
<tr><td colspan="7">Motor 1 overspeed trip level negative.<br>If the negative (minimum) trip level for overspeed is exceeded, fault 7310 Overspeed is generated.<br>**Example**: If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 31.30 M1 overspeed trip margin.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**31.30**</td><td colspan="7">**M1 overspeed trip margin**</td></tr>
<tr><td colspan="7">Motor 1 overspeed trip margin.<br>Defines, together with 30.11 M1 minimum speed and 30.12 M1 maximum speed, the maximum allowed speed of the motor (overspeed protection). The event generates fault 7310 Overspeed, if the speed feedback, see 90.01 Motor speed for control, exceeds the speed limit defined by 30.11 M1 minimum speed or 30.12 M1 maximum speed by more than the overspeed trip margin.<br>It is recommended to set 31.30 M1 overspeed trip margin at least 20 % higher than the maximum motor speed.<br>**Examples**:<br>– If the maximum speed is 1100 rpm and overspeed trip margin is 300 rpm, the drive trips at 1400 rpm. See 31.28 M1 overspeed trip level positive.<br>– If the minimum speed is -1420 rpm and overspeed trip margin is 300 rpm, the drive trips at -1720 rpm. See 31.29 M1 overspeed trip level negative.<br>**Note**: The overspeed fault for motor 1 is inactive, if 31.30 M1 overspeed trip margin = 0.<br> </td></tr>
<tr><td>0.00 … 30000.00</td><td>300.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**31.31**</td><td colspan="7">**Emergency ramp supervision**</td></tr>
<tr><td colspan="7">Maximum deviation from the expected deceleration rate.<br>31.32 Emergency ramp supervision, 31.33 Emergency ramp supervision delay and 01.07 Speed change rate, provide a supervision function for a ramped Off3 (emergency stop) command. See 21.03 Emergency stop mode, 06.20.b11 Run inhibit status word and 06.20.b13 Run inhibit status word.<br>The supervision is based on either observing the time within which the motor stops or comparing the actual and expected deceleration rates.<br>**Maximum ramp-down time**</td></tr>
</table>

| Index | Name<br>Text<br>Range | | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|---|
| | If 31.31 Emergency ramp supervision = 0.00 %, the maximum stop time is directly set in 31.32 Emergency ramp supervision delay.<br>**Comparing deceleration rates**<br>Otherwise, 31.31 Emergency ramp supervision defines the maximum allowed deviation from the expected deceleration rate, which is calculated from parameters 23.11 … 23.19 for Off3 stop mode 1 (21.03 Emergency stop mode = Ramp stop) or 23.23 Emergency stop time for Off3 stop mode 2 (21.03 Emergency stop mode = Emergency ramp stop). If 1.07 Speed change rate deviates too much from the expected rate, the event generates fault 73B0 Emergency ramp stop. Additionally 06.17.b08 Drive status word 2 is set and the motor coasts to a stop.<br>**Note:** The emergency stop ramp supervision is disabled, if 31.31 Emergency ramp supervision = 0.00 % and 31.32 Emergency ramp supervision delay = 0.0 s. | | | | | | | |
| | 0.00 … 325.00 | | 0.00 | % | 100 = 1 % | n | y | Parameter |
| **31.32** | **Emergency ramp supervision delay** | | | | | | | |
| | Maximum ramp-down time or supervision activation delay.<br>**Maximum ramp-down time**<br>If 31.31 Emergency ramp supervision = 0.00 %, 31.32 Emergency ramp supervision delay defines the maximum time a ramped Off3 (emergency stop) command is allowed to take. If the motor has not stopped when the time elapses, the event generates fault 73B0 Emergency ramp stop, sets 06.17.b08 Drive status word 2 and the motor coasts to a stop.<br>**Supervision activation delay**<br>If 31.31 Emergency ramp supervision > 0.00 %, 31.32 Emergency ramp supervision delay defines a delay between the receipt of a ramped Off3 (emergency stop) command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize.<br>**Note:** The emergency stop ramp supervision is disabled, if 31.31 Emergency ramp supervision = 0.00 % and 31.32 Emergency ramp supervision delay = 0.0 s. | | | | | | | |
| | 0.0 … 3250.0 | | 0.0 | s | 10 = 1 s | n | y | Parameter |
| **31.33** | **Ramp stop supervision** | | | | | | | |
| | Maximum deviation the from expected deceleration rate.<br>31.33 Ramp stop supervision, 31.34 Ramp stop supervision delay and 01.07 Speed change rate, provide a supervision function for a normal (non-emergency) ramp stop. See 06.09.b03 Used main control word.<br>The supervision is based on either observing the time within which the motor stops, or comparing the actual and expected deceleration rates.<br>**Maximum ramp-down time**<br>If 31.33 Ramp stop supervision = 0.00 %, the maximum stop time is directly set in 31.34 Ramp stop supervision delay.<br>**Comparing deceleration rates**<br>Otherwise, 31.33 Ramp stop supervision defines the maximum allowed deviation from the expected deceleration rate, which is calculated from parameters 23.11 … 23.19. If 1.07 Speed change rate deviates too much from the expected rate, the event generates fault 73B1 Normal ramp stop. Additionally 06.17.b14 Drive status word 2 is set and the motor coasts to a stop.<br>**Note:** The ramp stop supervision is disabled, if 31.33 Ramp stop supervision = 0.00 % and 31.34 Ramp stop supervision delay = 0.0 s. | | | | | | | |
| | 0.00 … 325.00 | | 0.00 | % | 100 = 1 % | n | y | Parameter |
| **31.34** | **Ramp stop supervision delay** | | | | | | | |
| | Maximum ramp-down time or supervision activation delay.<br>**Maximum ramp-down time**<br>If 31.33 Ramp stop supervision = 0.00 %, 31.34 Ramp stop supervision delay defines the maximum time a normal ramp stop is allowed to take. If the motor has not stopped when the time elapses, the event generates fault 73B1 Normal ramp stop, sets 06.17.b14 Drive status word 2 and the motor coasts to a stop.<br>**Supervision activation delay** | | | | | | | |

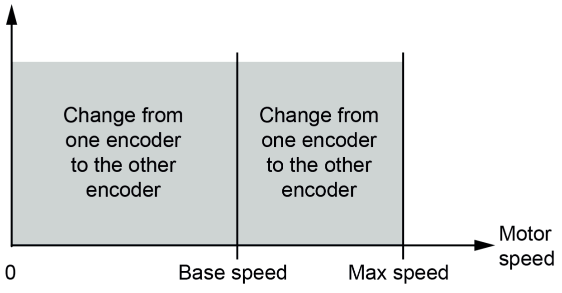
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">If 31.33 Ramp stop supervision > 0.00 %, 31.34 Ramp stop supervision delay defines a delay between the receipt of the stop command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize.<br><b>Note:</b> The ramp stop supervision is disabled, if 31.33 Ramp stop supervision = 0.00 % and 31.34 Ramp stop supervision delay = 0.0 s.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>31.35</b></td><td colspan="7"><b>Motor feedback fault</b></td></tr>
<tr><td colspan="7">Motor feedback fault.<br>Selects how the drive reacts to a loss of a speed feedback measured with an encoder or tacho. See 90.41 M1 feedback selection.<br>0: <b>No action</b>; none, disable motor feedback fault.<br>1: <b>Fault</b>; the event generates fault 7301 Motor speed feedback or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.<br><br> <br>DZ_LIN_050_motor speed_a.ai<br>2: <b>EMF/Fault</b>; the event changes the speed feedback to EMF and stops the motor at the emergency stop ramp. Then the event generates fault 7301 Motor speed feedback or 7381 Speed feedback device.<br>In case speed actual is greater than base speed the event generates fault 7301 Motor speed feedback or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.<br><br> <br>DZ_LIN_050_motor speed_a.ai<br>3: <b>EMF/Warning</b>; the event changes the speed feedback to EMF and generates warning A798 Encoder interface communication, A7B0 Motor speed feedback or A7E1 Speed feedback device.<br><b>Attention:</b> The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.<br>In case speed actual is greater than base speed the event generates fault 7301 Motor speed feedback or 7381 Speed feedback device and the motor stops according to 31.14 Fault stop mode fault level 3.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|



DZ_LIN_050_motor speed_a.ai

4: **Encoder/Warning**; This selection is only valid if 2 pulse encoders are connected. Depending on the setting of 90.41 M1 feedback selection, the speed feedback is changed from one encoder to the other encoder, in case of a problem. Additionally the event generates warning A798 Encoder interface communication, A7B0 Motor speed feedback or A7E1 Speed feedback device.
**Attention:** The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.

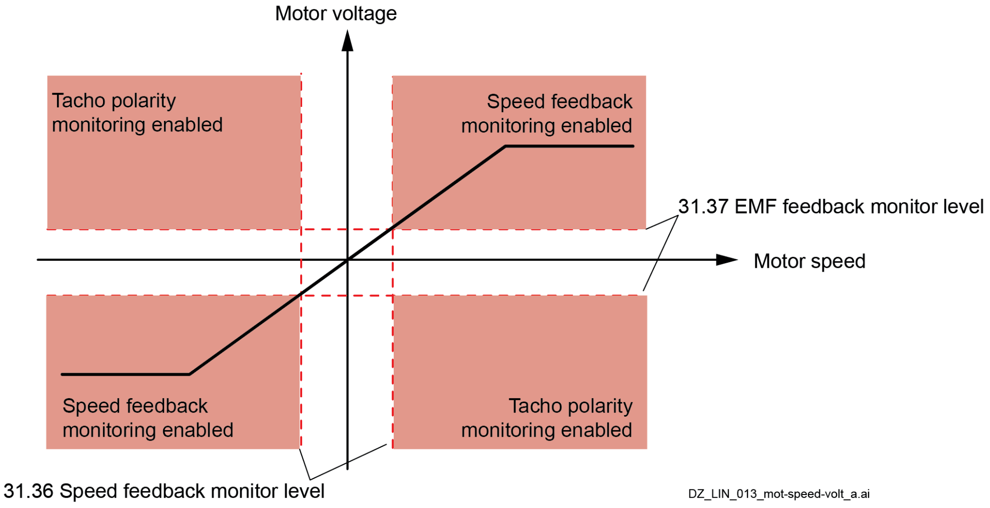


DZ_LIN_050_motor speed_a.ai

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 4 | Fault | - | 1 = 1 | n | y | Parameter |

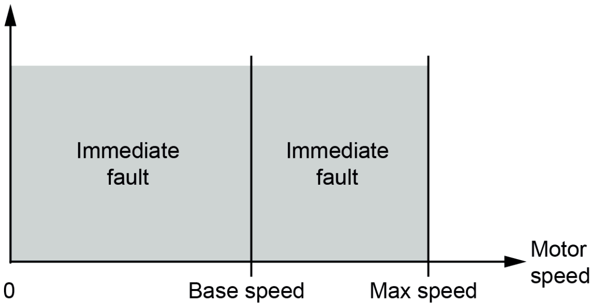
**31.36** **Speed feedback monitor level**

Speed feedback monitor level.
The drive reacts according to 31.35 Motor feedback fault or generates fault 7381 Speed feedback device, if the measured speed feedback does not exceed 31.36 Speed feedback monitor level while the measured EMF exceeds 31.37 EMF feedback monitor level. See 90.01 Motor speed for control and 28.06 EMF voltage.
**Example**: With 31.36 Speed feedback monitor level = 15 rpm and 31.37 EMF feedback monitor level = 50 $V_{DC}$ the drive trips when the EMF is > 50 $V_{DC}$, while the speed feedback is ≤ 15 rpm.

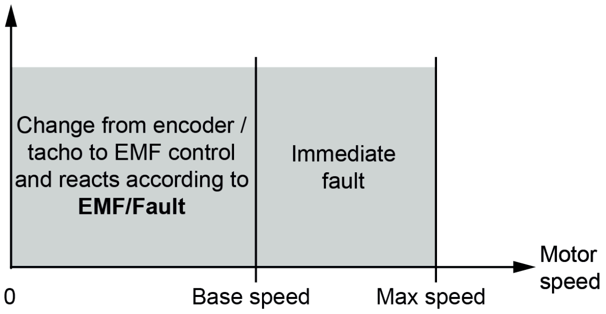


DZ_LIN_013_mot-speed-volt_a.ai

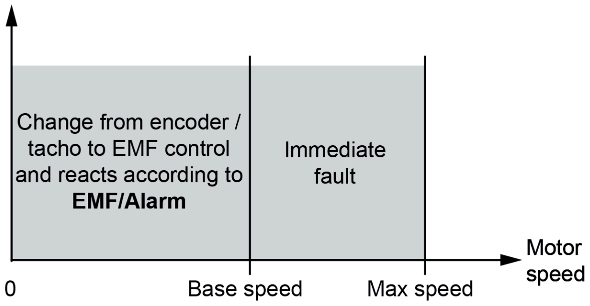
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0.00 … 30000.00</td><td>15.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.37</b></td><td colspan="7"><b>EMF feedback monitor level</b></td></tr>
<tr><td colspan="7">EMF feedback monitor level.<br>See 31.36 Speed feedback monitor level.</td></tr>
<tr><td>0.0 … 3250.0</td><td>50.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>31.38</b></td><td colspan="7"><b>Load feedback fault</b></td></tr>
<tr><td colspan="7">Load feedback fault.<br>Selects how the drive reacts to a loss of a load feedback. See 90.51 Load feedback selection.<br>0: <b>No action</b>; none, disable load feedback fault.<br>1: <b>Fault</b>; the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.



DZ_LIN_050_motor speed_a.ai<br>2: <b>EMF/Fault</b>; the event changes the speed feedback to EMF and stops the motor at the emergency stop ramp. Then the event generates fault 73A1 Load speed feedback.<br>In case speed actual is greater than base speed the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.

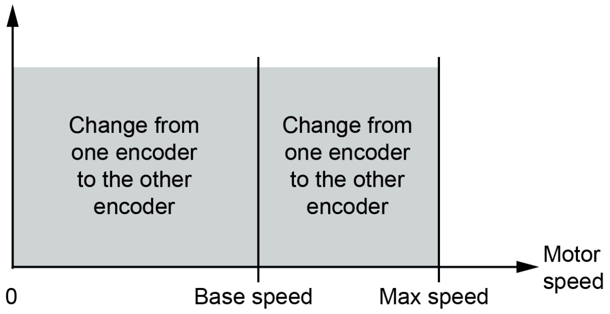


DZ_LIN_050_motor speed_a.ai<br>3: <b>EMF/Warning</b>; the event changes the speed feedback to EMF and generates warning A798 Encoder interface communication or A7B1 Load speed feedback.<br><b>Attention:</b> The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.<br>In case speed actual is greater than base speed the event generates fault 73A1 Load speed feedback and the motor stops according to 31.14 Fault stop mode fault level 3.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">


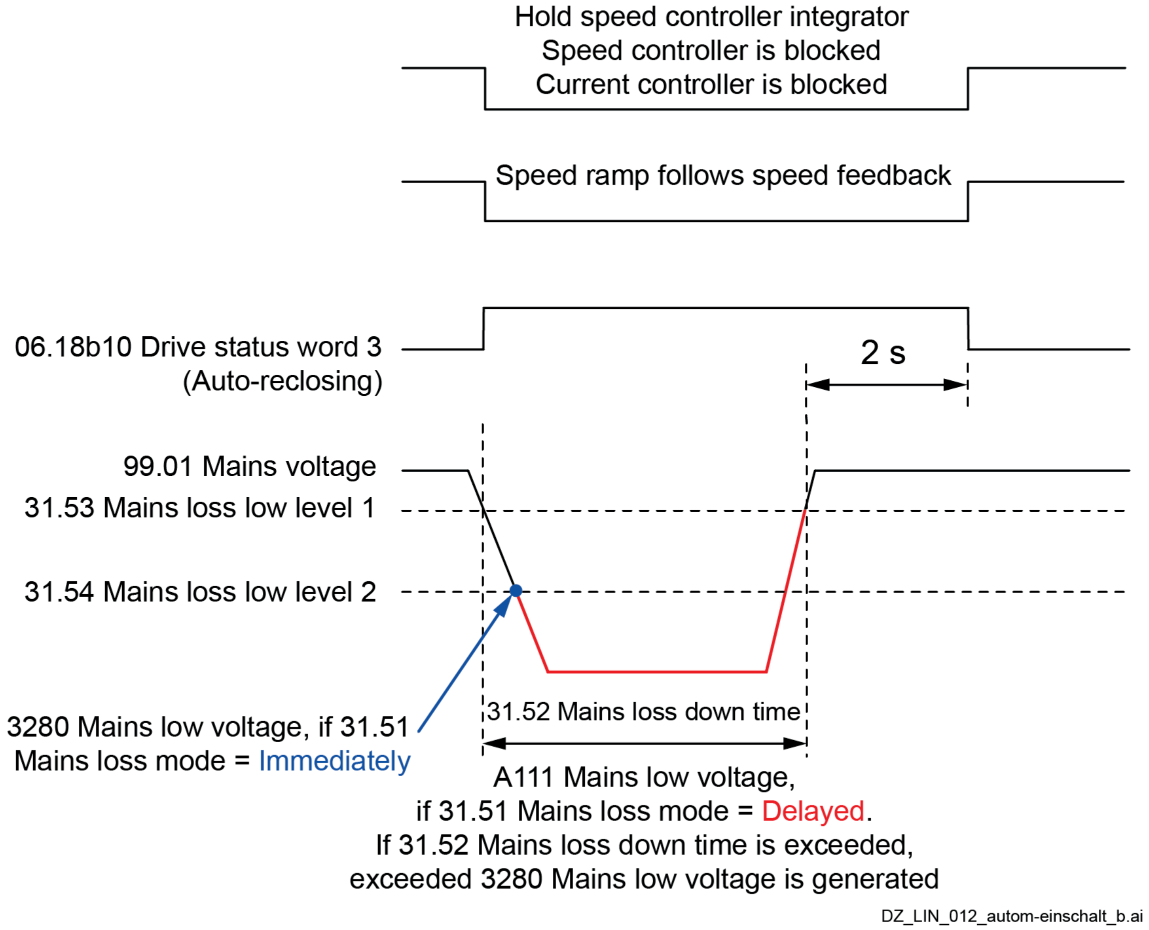
DZ_LIN_050_motor speed_a.ai

4: **Encoder/Warning**; This selection is only valid if 2 pulse encoders are connected. Depending on the setting of 90.41 M1 feedback selection, the speed feedback is changed from one encoder to the other encoder, in case of a problem. Additionally the event generates warning A798 Encoder interface communication or A7B1 Load speed feedback.<br>
**Attention:** The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.



DZ_LIN_050_motor speed_a.ai
</td></tr>
<tr><td>0 … 4</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**31.41**</td><td colspan="7">**Drive fan fault function**</td></tr>
<tr><td colspan="7">Type of event drive cooling fan fault.<br>Selects the type of event drive cooling fan fault. See also 20.38 Drive fan acknowledge source.<br>0: **No action**; none, disable drive cooling fan fault.<br>1: **Fault**; the event generates fault 5080 Drive fan acknowledge.<br>2: **Warning**; the event generates warning A581 Drive fan acknowledge.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**31.44**</td><td colspan="7">**Armature overcurrent level**</td></tr>
<tr><td colspan="7">Armature overcurrent level.<br>The event generates fault 2310 Armature overcurrent, if 31.44 Overcurrent level in percent of 99.11 M1 nominal current is exceeded. It is recommended to set 31.44 Overcurrent level at least 25 % higher than 99.11 M1 nominal current.<br>**Example**: With 99.11 M1 nominal current = 850 $A_{DC}$ and 31.44 Overcurrent level = 250 % the drive trips with armature currents > 2125 $A_{DC}$.</td></tr>
<tr><td>0.00 … 400.00</td><td>250.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**31.45**</td><td colspan="7">**Maximum current rise level**</td></tr>
<tr><td colspan="7">Maximum armature current rise level.<br>The event generates fault F539 Fast current rise, if 31.45 Maximum current rise level in percent of 99.11 M1 nominal current per 1 ms is exceeded.<br>**Note**: This trip opens the mains contactor and the DC-breaker, if present.</td></tr>
<tr><td>0.00 … 325.00</td><td>325.00</td><td>%/ms</td><td>100 = 1 %/ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**31.46**</td><td colspan="7">**Current ripple function**</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Type of event armature current ripple.<br>Selects the type of event armature current ripple, if 31.47 Current ripple level is reached. The current ripple function detects broken fuses, thyristors, current transformers (T51, T52) or a too high gain of the current controller.<br>0: **No action**; none, disable current ripple.<br>1: **Fault**; the event generates fault F517 Armature current ripple.<br>2: **Warning**; the event generates warning A117 Armature current ripple. | | | | | | |
| | 0 … 2 | Fault | - | 1 = 1 | n | y | Parameter |
| **31.47** | **Current ripple level** | | | | | | |
| | Level for armature current ripple level.<br>Threshold for 31.46 Current ripple function in percent of 99.11 M1 nominal current.<br>Typical values when a thyristor is missing.<br>– About 300 % for an armature drive.<br>– About 90 % for high inductive loads (e.g. field exciter). | | | | | | |
| | 0.0 … 1000.0 | 150.0 | % | 10 = 1 % | n | y | Parameter |
| **31.50** | **Armature overvoltage level** | | | | | | |
| | Armature overvoltage level.<br>The event generates fault F503 Armature overvoltage, if 31.50 Overvoltage level in percent of 99.12 M1 nominal voltage is exceeded. It is recommended to set 31.50 Overvoltage level at least 20 % higher than 99.12 M1 nominal voltage.<br>**Example**: With 99.12 M1 nominal voltage = 525 $V_{DC}$ and 31.50 Overvoltage level = 120 % the drive trips with armature voltages > 630 $V_{DC}$.<br>The overvoltage supervision is inactive, if 31.50 Overvoltage level = 1000.0 %. | | | | | | |
| | 0.0 … 1000.0 | 120.0 | % | 10 = 1 % | n | y | Parameter |
| **31.51** | **Mains loss mode** | | | | | | |
| | Type of event mains loss (ride through).<br>Selects the type of event mains loss.<br>0: **Immediately**;<br>– The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.<br>– The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time.<br>– The event immediately generates fault 3280 Mains low voltage, if 31.54 Mains loss low level 2 is undershoot.<br>1: **Delayed**;<br>– The event generates warning A111 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.<br>– The event generates fault 3280 Mains low voltage, if 31.53 Mains loss low level 1 and/or 31.54 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.<br>– Thus, undershooting 31.54 Mains loss low level 2 generates **no** immediate fault. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| |  | | | | | | |
| | 0 … 1 | Immediately | - | 1 = 1 | n | y | Parameter |
| **31.52** | **Mains loss down time** | | | | | | |
| | Down time of event mains loss (ride through).<br>The mains voltage must recover over both levels within 31.52 Mains loss down time. Otherwise, the event generates fault 3280 Mains low voltage. | | | | | | |
| | 0 … 32500 | 500 | ms | 1 = 1 ms | n | y | Parameter |
| **31.53** | **Mains loss low level 1** | | | | | | |
| | Low level 1 of event mains loss (ride through).<br>1st (upper) level for the mains undervoltage monitoring in percent of 99.10 Nominal mains voltage. If the mains voltage undershoots 31.53 Mains loss low level 1 following actions take place.<br>– The firing angle is set to 30.45 Maximum firing angle.<br>– Single firing pulses are applied in order to extinguish the DC current as fast as possible.<br>– The controllers are frozen.<br>– The speed ramp output is updated from the speed feedback.<br>– Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.<br>– Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 1 is undershoot for longer than 31.52 Mains loss down time.<br>**Notes**:<br>– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is generated. If the problem persist for longer than 10 s 3280 Mains low voltage is generated. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– 31.54 Mains loss low level 2 is not monitored, unless the mains voltage drops below 31.53 Mains loss low level 1 first. Thus for a proper function of the mains undervoltage monitoring 31.53 Mains loss low level 1 has to be higher than 31.54 Mains loss low level 2.</td></tr>
<tr><td>0.00 … 150.00</td><td>80.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.54</b></td><td colspan="7"><b>Mains loss low level 2</b></td></tr>
<tr><td colspan="7">Low level 2 of event mains loss (ride through).<br>2nd (lower) limit for the mains undervoltage monitoring in percent of 99.10 Nominal mains voltage. If the mains voltage undershoots 31.54 Mains loss low level 2 following actions take place:<br>– If 31.51 Mains loss mode = Immediately:<br>  – Fault 3280 Mains low voltage is generated immediately.<br>– If 31.51 Mains loss mode = Delayed:<br>  – The field acknowledge signals are ignored.<br>  – The firing angle is set to 30.45 Maximum firing angle.<br>  – Single firing pulses are applied in order to extinguish the DC current as fast as possible.<br>  – The controllers are frozen.<br>  – The speed ramp output is from the speed feedback.<br>  – Warning A111 Mains low voltage is generated. The warning is removed when the mains voltage recovers before 31.52 Mains loss down time elapses.<br>  – Fault 3280 Mains low voltage is generated, if 31.53 Mains loss low level 2 is undershoot for longer than 31.52 Mains loss down time.<br>  – Thus, undershooting 31.54 Mains loss low level 2 generates <b>no</b> immediate fault.<br><b>Notes</b>:<br>– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is generated. If the problem persist for longer than 10 s 3280 Mains low voltage is generated.<br>– 31.54 Mains loss low level 2 is not monitored, unless the mains voltage drops below 31.53 Mains loss low level 1 first. Thus for a proper function of the mains undervoltage monitoring 31.53 Mains loss low level 1 has to be higher than 31.54 Mains loss low level 2.</td></tr>
<tr><td>0.00 … 150.00</td><td>60.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.57</b></td><td colspan="7"><b>Minimum field current trip delay</b></td></tr>
<tr><td colspan="7">Delay time of event minimum field current.<br>31.57 Minimum field current trip delay delays F541 M1 field exciter low current. If the field current recovers before the delay elapses, F541 M1 field exciter low current will be disregarded. See 31.58 M1 field current low level.<br><b>Note</b>: 31.57 Minimum field current trip delay is blocked when 99.06 Operation mode = Field exciter.</td></tr>
<tr><td>0 … 32500</td><td>2000</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>31.58</b></td><td colspan="7"><b>M1 field current low level</b></td></tr>
<tr><td colspan="7">Motor 1 field current low level.<br>The event generated fault F541 M1 field exciter low current, if 31.58 M1 field current low level in percent of 99.13 M1 nominal field current is still undershot when 31.57 Minimum field current trip delay elapses.<br><b>Notes</b>:<br>– 31.58 M1 field current low level is not valid during field heating and field economy. In these cases, the fault level is automatically set to 50 % of 28.37 M1 field heating reference. The event generates fault F541 M1 field exciter low current, if 50 % of 28.37 M1 field heating reference is still undershot when 31.57 Minimum field current trip delay elapses.<br>– 31.58 M1 field current low level is not valid for 28.43 M1 EMF/field control mode = Fix/optitorque, EMF/optitorque, Fix/reversal/optitorque and EMF/reversal/optitorque. In these cases, the fault level is automatically set to 50 % of 28.14 M1 field current reference. The event generates fault F541 M1 field exciter low current, if 50 % of 28.14 M1 field current reference is still undershot when 31.57 Minimum field current trip delay elapses.</td></tr>
<tr><td>0.00 … 325.00</td><td>50.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **31.59** | **M1 field overcurrent level** | | | | | | |
| | Motor 1 field overcurrent level.<br>The event generates fault F515 M1 field exciter overcurrent, if 31.59 M1 field overcurrent level in percent of 99.13 M1 nominal field current is exceeded. It is recommended to set 31.59 M1 field overcurrent level at least 25 % higher than 99.13 M1 nominal field current.<br>**Notes**:<br>– The field overcurrent fault is inactive, if 31.59 M1 field overcurrent level = 325 %.<br>– During field boost, the internal field overcurrent level is set to field overcurrent level plus field boost current. | | | | | | |
| | 0.00 … 325.00 | 125.00 | % | 100 = 1 % | n | y | Parameter |
| **31.80** | **Power units STO status word** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **31.81** | **Power units XSMC:STO status word** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **31.82** | **Ch1 power unit STO time 1** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.83** | **Ch1 power unit STO time 2** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.84** | **Ch2 power unit STO time 1** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.85** | **Ch2 power unit STO time 2** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.86** | **Ch3 power unit STO time 1** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.87** | **Ch3 power unit STO time 2** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.88** | **Ch4 power unit STO time 1** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.89** | **Ch4 power unit STO time 2** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.90** | **XSMC:STO indication** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 2 | Fault | - | 1 = 1 | n | y | Parameter |
| **31.91** | **STO status word** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **31.94** | **STO time 1** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **31.95** | **STO time 2** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 65535 | - | ms | 1 = 1 | y | n | Signal |
| **31.98** | **STO actual status** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **31.99** | **STO fault diagnostic** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **31.100** | **STO test mode** | | | | | | |
| | See safety supplement for functional safety converter DCS880 (3ADW000452). | | | | | | |
| | 0 … 2 | None | - | 1 = 1 | y | y | Parameter |

## 32 Supervision

Configuration of signal supervision functions 1 … 3. Three values can be monitored. A warning or fault is generated whenever predefined limits are exceeded.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **32.xx** | **Not jet part of the manual.** | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **32.xx** | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## 33 Generic timer & counter

Configuration of maintenance timers/counters.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **33.xx** | **Not jet part of the manual.** | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **33.xx** | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## 35 Motor thermal protection

Motor thermal protection settings such as temperature measurement configuration and load curve definition.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| **35.01** | **Estimated temperature 1** | | | | | | |
| | Estimated motor temperature 1.<br>Displays the motor temperature as estimated by the internal motor thermal protection model. See parameters 35.50 … 35.55. The unit is selected by 96.02 Unit selection. | | | | | | |
| | -80.0 … 1000.0 | - | °C or °F | 1 = 1°C or °F | n | n | Signal |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**35.02**</td><td colspan="7">**Measured temperature 1**</td></tr>
<tr><td colspan="7">Measured motor temperature 1.<br>Displays the motor temperature received through the source defined by 35.11 Temperature 1 source. The unit is selected by 96.02 Unit selection.<br>**Note**: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000</td><td>-</td><td>°C,<br>°F or<br>Ohm</td><td>1 = 1°C,<br>°F or<br>Ohm</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**35.03**</td><td colspan="7">**Estimated temperature 2**</td></tr>
<tr><td colspan="7">Estimated motor temperature 2.<br>Displays the motor temperature as estimated by the internal motor thermal protection model. See parameters 35.58 … 35.63. The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>-</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**35.04**</td><td colspan="7">**Measured temperature 2**</td></tr>
<tr><td colspan="7">Measured motor temperature 2.<br>Displays the motor temperature received through the source defined by 35.21 Temperature 2 source. The unit is selected by 96.02 Unit selection.<br>**Note**: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000</td><td>-</td><td>°C,<br>°F or<br>Ohm</td><td>1 = 1°C,<br>°F or<br>Ohm</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">**35.11**</td><td colspan="7">**Temperature 1 source**</td></tr>
<tr><td colspan="7">Motor temperature monitoring function 1 source.<br>Selects the source for 35.02 Measured temperature 1.<br>Connection possibilities KTY84 sensors:<br>– Maximum one KTY84 sensor for motor temperature monitoring function 1 and maximum one KTY84 sensor for motor temperature monitoring function 2.<br>Connection possibilities for PT100 sensors:<br>– Maximum 3 PT100 sensors for motor temperature monitoring function 1 and maximum 3 PT100 sensors for motor temperature monitoring function 2.<br>Connection possibilities PTC sensors:<br>– Maximum one PTC sensor for motor temperature monitoring function 1 and maximum one PTC sensor for motor temperature monitoring function 2.<br>Connection possibilities for PT1000 sensors:<br>– Maximum 3 PT1000 sensors for motor temperature monitoring function 1 and maximum 3 PT1000 sensors for motor temperature monitoring function 2.<br>For wiring examples, see chapter *Motor thermal protection* of this manual.<br>Usually this source is from a sensor connected to the motor controlled by the drive, but it could be used to measure and monitor a temperature from other parts of the process as long as a suitable sensor is used as per the selection list.<br>0: **Disable**; disable motor temperature monitoring function 1.<br>1: **Estimated temperature 1**; Estimated motor temperature 1. See 35.01 Motor estimated temperature 1. The temperature is estimated by the drive calculation. It is important to set up the ambient temperature of the motor in 35.50 Motor ambient temperature 1.<br>2: **KTY84 analog I/O**; KTY84 sensor connected to the analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The following settings are required:<br>– Set the unit selection parameter of the analog input to volts.<br>– Set the hardware jumper or switch related to the analog input to volts. Any change must be validated by either cycling the power or through 96.27 Control board boot.<br>– Set the source selection parameter of the analog output to Force KTY84 excitation.<br>– Select the analog input in 35.14 Temperature 1 AI source. In case the input is located on an I/O extension module, use Other to connect to e.g. 14.26 AI1 actual value.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">The analog output feeds a constant current through the sensor. As the resistance of the sensor changes along with its temperature, the voltage over the sensor changes. The voltage is read by the analog input and converted into degrees.<br>3: <b>KTY84 encoder module 1</b>; KTY84 sensor connected to encoder module 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time.<br>4: <b>KTY84 encoder module 2</b>; KTY84 sensor connected to encoder module 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time.<br>5: <b>1 × PT100 analog I/O</b>; PT100 sensor connected to a standard analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PT100 excitation.<br>6: <b>2 × PT100 analog I/O</b>; as selection 1 × PT100 analog I/O, but with two sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.<br>7: <b>3 × PT100 analog I/O</b>; as selection 1 × PT100 analog I/O, but with three sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.<br>8: <b>PTC DI6</b>; PTC sensor connected to digital input DI6.<br>Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.02 Measured temperature 1.<br>9: <b>PTC encoder module 1</b>; PTC sensor connected to encoder interface 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time.<br>10: <b>PTC encoder module 2</b>; PTC sensor connected to encoder interface 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time.<br>11: <b>Direct temperature</b>; the temperature is taken from the source selected by 35.14 Temperature 1 AI source. The value of the source is assumed to be in the unit of temperature specified by 96.02 Unit selection.<br>13: <b>1 × PT1000 analog I/O</b>; PT1000 sensor connected to a standard analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PT1000 excitation.<br>14: <b>2 × PT1000 analog I/O</b>; as selection 1 × PT1000 analog I/O, but with two sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.<br>15: <b>3 × PT1000 analog I/O</b>; as selection 1 × PT1000 analog I/O, but with three sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.<br>20: <b>PTC analog I/O</b>; PTC sensor connected to a standard analog input selected by 35.14 Temperature 1 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PTC excitation.<br>Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.02 Measured temperature 1.</td></tr>
<tr><td>0 … 20</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.12</b></td><td colspan="7"><b>Temperature 1 fault level</b></td></tr>
<tr><td colspan="7">Fault level for motor temperature monitoring function 1.<br>Defines the fault level for motor temperature monitoring function 1. When the measured motor temperature 1 exceeds the level, the event generates fault 4981 Motor temperature 1 measured/estimated.<br>The unit is selected by 96.02 Unit selection.<br><b>Note</b>: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000</td><td>130,<br>266 or<br>4500</td><td>°C,<br>°F or<br>Ohm</td><td>1 = 1°C,<br>°F or<br>Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>35.13</b></td><td colspan="7"><b>Temperature 1 warning level</b></td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Warning level for motor temperature monitoring function 1.<br>Defines the warning level for motor temperature monitoring function 1. When the measured motor temperature 1 exceeds the level, the event generates warning A491 Motor temperature 1 measured/estimated.<br>The unit is selected by 96.02 Unit selection.<br>**Note**: With a PTC sensor, the unit is Ω. | | | | | | |
| | -80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000 | 130,<br>266 or<br>4500 | °C,<br>°F or<br>Ohm | 1 = 1°C,<br>°F or<br>Ohm | n | y | Parameter |
| **35.14** | **Temperature 1 AI source** | | | | | | |
| | Analog input source for motor temperature monitoring function 1.<br>Specifies an analog input when required by 35.11 Temperature 1 source. In case the input is located on an I/O extension module, use Other to connect to e.g. 14.26 AI1 actual value.<br>**Other**; source selection.<br>0: **Not selected**; not in use.<br>1: **AI1 actual value**; analog input AI1 on the control unit.<br>2: **AI2 actual value**; Analog input AI2 on the control unit.<br>3: **AI3 actual value**; Analog input AI3 on the control unit. | | | | | | |
| | 0 … 3 | Not selected | - | 1 = 1 | n | y | Parameter |
| **35.15** | **Supervision 1 klixon source** | | | | | | |
| | Klixon source for motor temperature monitoring function 1.<br>The event generates fault 4981 Motor temperature 1 measured/estimated if a digital input is selected and the klixon is open.<br>0 = Klixon open.<br>1 = Klixon closed.<br>**Note**: It is possible to connect several klixons in series.<br>0: **Klixon open**; klixon is open. Generates fault 4981 Motor temperature 1 measured/estimated.<br>1: **Klixon closed**; klixon is closed. Normal operation.<br>2: **None**; inactive. Supervision 1 klixon is disabled.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status. | | | | | | |
| | 0 … 19 | None | - | 1 = 1 | n | y | Parameter |
| **35.21** | **Temperature 2 source** | | | | | | |
| | Motor temperature monitoring function 2 source.<br>Selects the source for 35.04 Measured temperature 2.<br>Connection possibilities KTY84 sensors:<br>– Maximum one KTY84 sensor for motor temperature monitoring function 1 and maximum one KTY84 sensor for motor temperature monitoring function 2.<br>Connection possibilities for PT100 sensors:<br>– Maximum 3 PT100 sensors for motor temperature monitoring function 1 and maximum 3 PT100 sensors for motor temperature monitoring function 2.<br>Connection possibilities PTC sensors:<br>– Maximum one PTC sensor for motor temperature monitoring function 1 and maximum one PTC sensor for motor temperature monitoring function 2.<br>Connection possibilities for PT1000 sensors: | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |

- Maximum 3 PT1000 sensors for motor temperature monitoring function 1 and maximum 3 PT1000 sensors for motor temperature monitoring function 2.

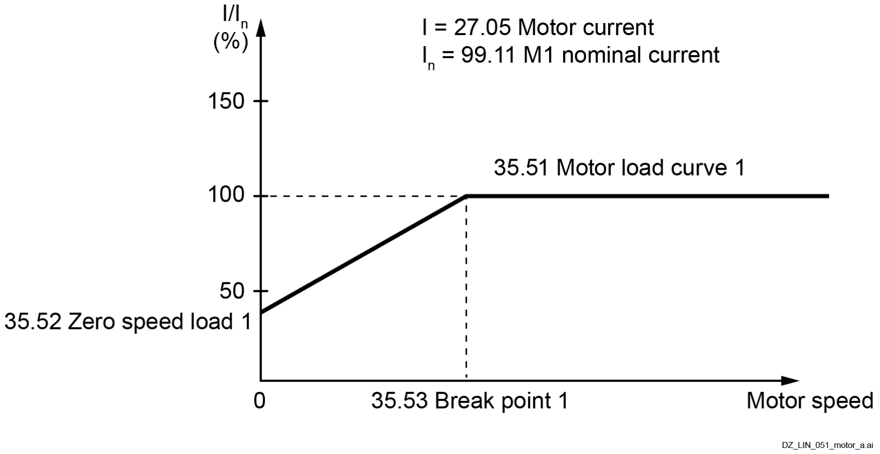
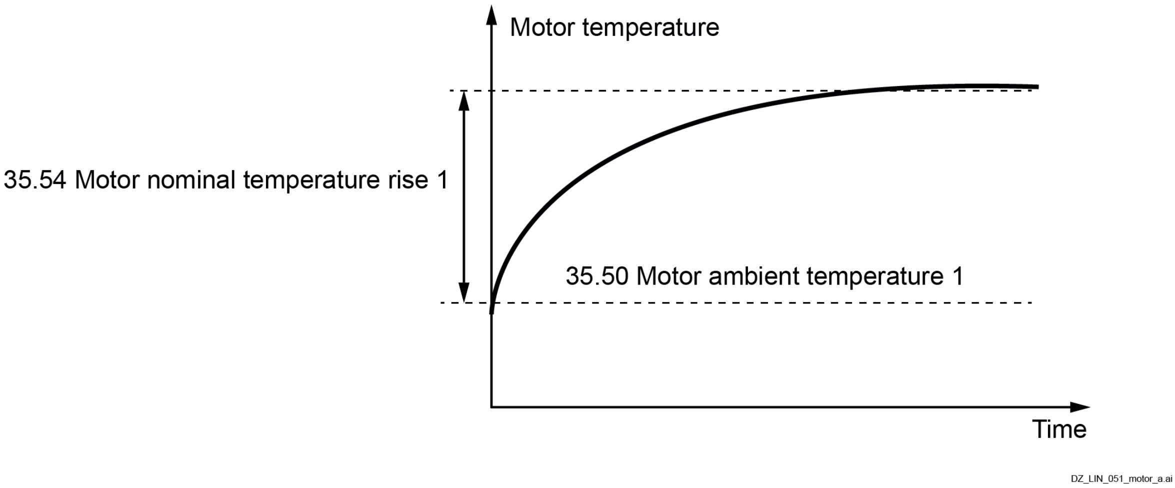
For wiring examples, see chapter *Motor thermal protection* of this manual.
Usually this source is from a sensor connected to the motor controlled by the drive, but it could be used to measure and monitor a temperature from other parts of the process as long as a suitable sensor is used as per the selection list.
0: **Disable**; disable motor temperature monitoring function 2.
1: **Estimated temperature 2**; Estimated motor temperature 2. See 35.03 Motor estimated temperature 2. The temperature is estimated by the drive calculation. It is important to set up the ambient temperature of the motor in 35.58 Motor ambient temperature 2.
2: **KTY84 analog I/O**; KTY84 sensor connected to the analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The following settings are required:

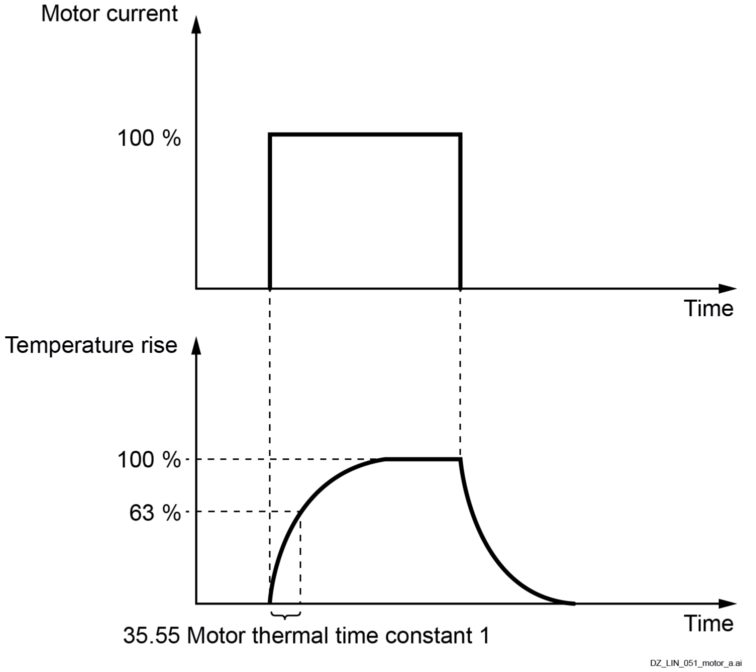
- Set the unit selection parameter of the analog input to volts.
- Set the hardware jumper or switch related to the analog input to volts. Any change must be validated by either cycling the power or through 96.27 Control board boot.
- Set the source selection parameter of the analog output to Force KTY84 excitation.
- Select the analog input in 35.24 Temperature 2 AI source. In case the input is located on an I/O extension module, use Other to connect to e.g. 14.26 AI1 actual value.

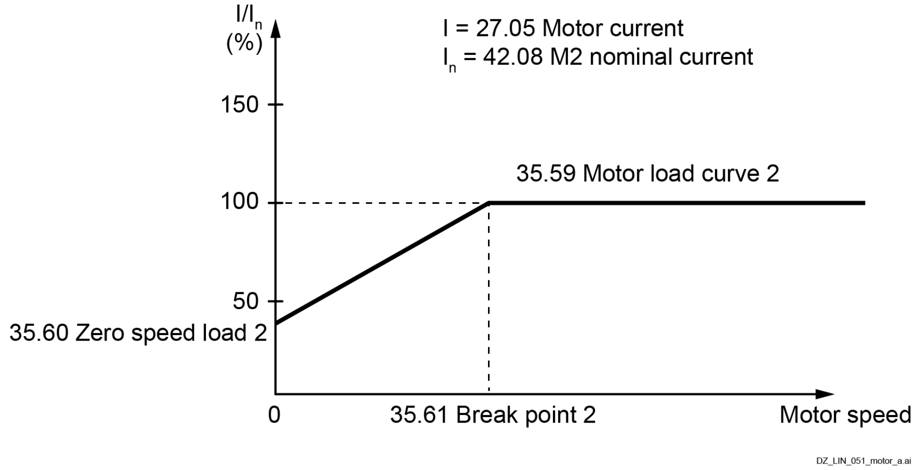
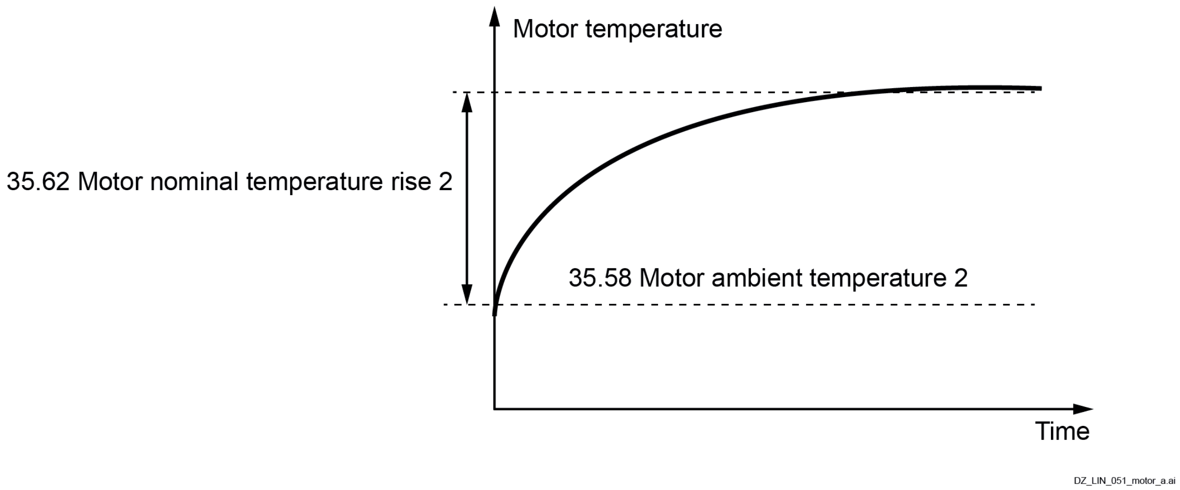
The analog output feeds a constant current through the sensor. As the resistance of the sensor changes along with its temperature, the voltage over the sensor changes. The voltage is read by the analog input and converted into degrees.
3: **KTY84 encoder module 1**; KTY84 sensor connected to encoder module 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time.
4: **KTY84 encoder module 2**; KTY84 sensor connected to encoder module 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time.
5: **1 × PT100 analog I/O**; PT100 sensor connected to a standard analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PT100 excitation.
6: **2 × PT100 analog I/O**; as selection 1 × PT100 analog I/O, but with two sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.
7: **3 × PT100 analog I/O**; as selection 1 × PT100 analog I/O, but with three sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.
8: **PTC DI6**; PTC sensor connected to digital input DI6.
Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.04 Measured temperature 2.
9: **PTC encoder module 1**; PTC sensor connected to encoder interface 1. See 91.21 Module 1 temp sensor type and 91.22 Module 1 temp filter time.
10: **PTC encoder module 2**; PTC sensor connected to encoder interface 2. See 91.24 Module 2 temp sensor type and 91.25 Module 2 temp filter time.
11: **Direct temperature**; the temperature is taken from the source selected by 35.24 Temperature 2 AI source. The value of the source is assumed to be in the unit of temperature specified by 96.02 Unit selection.
13: **1 × PT1000 analog I/O**; PT1000 sensor connected to a standard analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PT1000 excitation.
14: **2 × PT1000 analog I/O**; as selection 1 × PT1000 analog I/O, but with two sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.
15: **3 × PT1000 analog I/O**; as selection 1 × PT1000 analog I/O, but with three sensors connected in series. Using multiple sensors improves the measurement accuracy significantly.

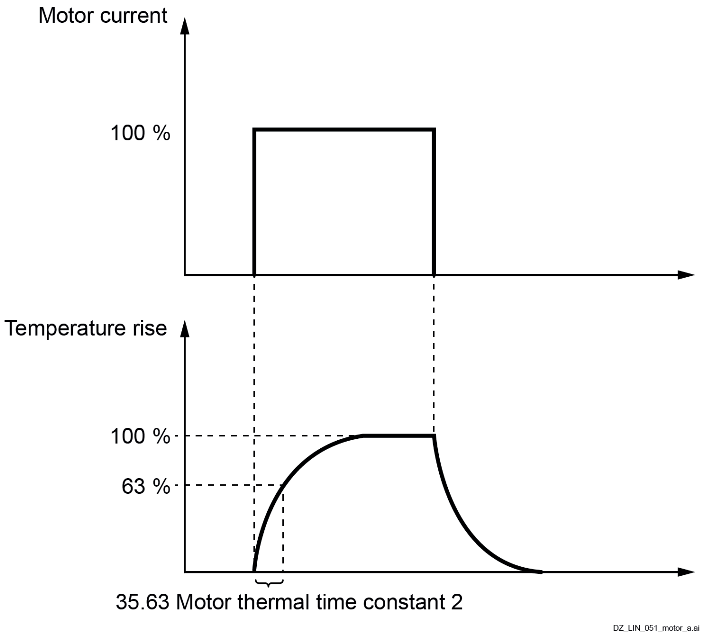
<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">20: <b>PTC analog I/O</b>; PTC sensor connected to a standard analog input selected by 35.24 Temperature 2 AI source and an analog output. The input and output can be on the SDCS-CON-H01 or on an I/O extension module. The required settings are the same as with selection KTY84 analog I/O, except that the source selection parameter of the analog output must be set to Force PTC excitation.<br>Either 0 Ω, normal temperature, or 4000 Ω, excessive temperature, will be shown in 35.04 Measured temperature 2.</td></tr>
<tr><td>0 … 20</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.22</b></td><td colspan="7"><b>Temperature 2 fault level</b></td></tr>
<tr><td colspan="7">Fault level for motor temperature monitoring function 2.<br>Defines the fault level for motor temperature monitoring function 2. When the measured motor temperature 2 exceeds the level, the event generates fault 4982 Motor temperature 2 measured/estimated.<br>The unit is selected by 96.02 Unit selection.<br><b>Note</b>: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000</td><td>130,<br>266 or<br>4500</td><td>°C,<br>°F or<br>Ohm</td><td>1 = 1°C,<br>°F or<br>Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.23</b></td><td colspan="7"><b>Temperature 2 warning level</b></td></tr>
<tr><td colspan="7">Warning level for motor temperature monitoring function 2.<br>Defines the warning level for motor temperature monitoring function 2. When the measured motor temperature 2 exceeds the level, the event generates warning A492 Motor temperature 2 measured/estimated.<br>The unit is selected by 96.02 Unit selection.<br><b>Note</b>: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>-80.0 … 1000.0<br>-76 … 1832 or<br>0 … 5000</td><td>130,<br>266 or<br>4500</td><td>°C,<br>°F or<br>Ohm</td><td>1 = 1°C,<br>°F or<br>Ohm</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.24</b></td><td colspan="7"><b>Temperature 2 AI source</b></td></tr>
<tr><td colspan="7">Analog input source for motor temperature monitoring function 2.<br>Specifies an analog input when required by 35.21 Temperature 2 source. In case the input is located on an I/O extension module, use Other to connect to e.g. 14.26 AI1 actual value.<br><b>Other</b>; source selection.<br>0: <b>Not selected</b>; not in use.<br>1: <b>AI1 actual value</b>; analog input AI1 on the control unit.<br>2: <b>AI2 actual value</b>; analog input AI2 on the control unit.<br>3: <b>AI3 actual value</b>; analog input AI3 on the control unit.</td></tr>
<tr><td>0 … 3</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>35.25</b></td><td colspan="7"><b>Supervision 2 klixon source</b></td></tr>
<tr><td colspan="7">Klixon source for motor temperature monitoring function 2.<br>The event generates fault 4982 Motor temperature 2 measured/estimated if a digital input is selected and the klixon is open.<br>0 = Klixon open.<br>1 = Klixon closed.<br><b>Note</b>: It is possible to connect several klixons in series.<br>0: <b>Klixon open</b>; klixon is open. Generates fault 4982 Motor temperature 2 measured/estimated.<br>1: <b>Klixon closed</b>; klixon is closed. Normal operation.<br>2: <b>None</b>; inactive. Supervision 2 klixon is disabled.<br>3: <b>DI1</b>; 10.02.b00 DI delayed status.<br>4: <b>DI2</b>; 10.02.b01 DI delayed status.<br>5: <b>DI3</b>; 10.02.b02 DI delayed status.<br>6: <b>DI4</b>; 10.02.b03 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">7: <b>DI5</b>; 10.02.b04 DI delayed status.<br>8: <b>DI6</b>; 10.02.b05 DI delayed status.<br>11: <b>DIO1</b>; 11.02.b00 DIO delayed status.<br>12: <b>DIO2</b>; 11.02.b01 DIO delayed status.<br>19: <b>DIL</b>; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.30</b></td><td colspan="7"><b>FPTC configuration word</b></td></tr>
<tr><td colspan="7">FPTC-xx module configuration word.<br>Activates the FPTC-xx thermistor protection modules. With this word, it is possible to suppress the warnings, but not the faults, of each module.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Module in slot 1</td><td>1</td><td>A module is installed in slot 1.</td></tr>
<tr><td>0</td><td>No Module is installed in slot 1.</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Disable slot 1 warning</td><td>1</td><td>Warnings from module in slot 1 are inactive.</td></tr>
<tr><td>0</td><td>Warnings from module in slot 1 are active.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Module in slot 2</td><td>1</td><td>A module is installed in slot 2.</td></tr>
<tr><td>0</td><td>No Module is installed in slot 2.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Disable slot 2 warning</td><td>1</td><td>Warnings from module in slot 2 are inactive.</td></tr>
<tr><td>0</td><td>Warnings from module in slot 2 are active.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Module in slot 3</td><td>1</td><td>A module is installed in slot 3.</td></tr>
<tr><td>0</td><td>No Module is installed in slot 3.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Disable slot 3 warning</td><td>1</td><td>Warnings from module in slot 3 are inactive.</td></tr>
<tr><td>0</td><td>Warnings from module in slot 3 are active.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>2Ah</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.50</b></td><td colspan="7"><b>Motor ambient temperature 1</b></td></tr>
<tr><td colspan="7">Ambient temperature for motor thermal protection model 1.<br>Defines the ambient temperature of the motor from the motor thermal protection model.<br>The unit is selected by 96.02 Unit selection.<br>The motor thermal protection model estimates the motor temperature based on parameters 35.50 … 35.55. The motor temperature increases if it operates in the region above the load curve, and decreases if it operates in the region below the load curve.<br><b>WARNING!</b><br>The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>20 or 68</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>35.51</b></td><td colspan="7"><b>Motor load curve 1</b></td></tr>
<tr><td colspan="7">Maximum load for motor thermal protection model 1.<br>Defines the motor load curve in percent of 99.11 M1 nominal current together with 35.52 Zero speed load 1 and 35.53 Break point 1. The load curve is used by the motor thermal protection model to estimate the motor temperature.<br>When the motor load curve = 100 %, the maximum load equals the value of 99.11 M1 nominal current. Higher loads will ‘heat up’ the motor.<br><b>Note</b>: The load curve level should be adjusted, if the ambient temperature differs from 35.50 Motor ambient temperature 1.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| |  | | | | | | |
| | 0.00 … 325.00 | 100.00 | % | 100 = 1 % | n | y | Parameter |
| **35.52** | **Zero speed load 1** | | | | | | |
| | Zero speed load for motor thermal protection model 1.<br>Defines the maximum motor load at zero speed in percent of 99.11 M1 nominal current for the motor load curve. See 35.51 Motor load curve 1 and 35.53 Break point 1. A higher value can be used if the motor has an external motor fan to boost the cooling. See the motor manufacturer's recommendations. | | | | | | |
| | 0.00 … 325.00 | 100.00 | % | 100 = 1 % | n | y | Parameter |
| **35.53** | **Break point 1** | | | | | | |
| | Break point for motor thermal protection model 1.<br>Defines the break point speed in percent of 99.11 M1 nominal current for the load curve. This is the point at which the motor load curve begins to decrease from 35.51 Motor load curve 1 towards 35.52 Zero speed load 1. | | | | | | |
| | 0.00 … 30000.00 | 1500.00 | rpm | See 46.02 | n | y | Parameter |
| **35.54** | **Motor nominal temperature rise 1** | | | | | | |
| | Temperature rise for motor thermal protection model 1.<br>Defines the temperature rise of the motor above 35.50 Motor ambient temperature 1, when the motor is loaded with 99.11 M1 nominal current. See the motor manufacturer's recommendations.<br>The unit is selected by parameter 96.02 Unit selection.<br> | | | | | | |
| | -80.0 … 1000.0 | 80 or 176 | °C or °F | 1 = 1°C or °F | n | y | Parameter |
| **35.55** | **Motor thermal time constant 1** | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Motor thermal time constant for motor thermal protection model 1.<br>Defines the thermal time constant for the motor thermal protection model. It is the time to reach 63 % of nominal motor temperature. See the motor manufacturer's recommendations.<br><br> </td></tr>
<tr><td></td><td>0 … 32500</td><td>256</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>35.58</b></td><td colspan="7"><b>Motor ambient temperature 2</b></td></tr>
<tr><td></td><td colspan="7">Ambient temperature for motor thermal protection model 2.<br>Defines the ambient temperature of the motor from the motor thermal protection model.<br>The unit is selected by 96.02 Unit selection.<br>The motor thermal protection model estimates the motor temperature based on parameters 35.58 … 35.63. The motor temperature increases if it operates in the region above the load curve, and decreases if it operates in the region below the load curve.<br><b>WARNING!</b><br>The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.</td></tr>
<tr><td></td><td>-80.0 … 1000.0</td><td>20 or 68</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>35.59</b></td><td colspan="7"><b>Motor load curve 2</b></td></tr>
<tr><td></td><td colspan="7">Maximum load for motor thermal protection model 2.<br>Defines the motor load curve in percent of 42.08 M2 nominal current together with 35.60 Zero speed load 2 and 35.61 Break point 2. The load curve is used by the motor thermal protection model to estimate the motor temperature.<br>When the motor load curve = 100 %, the maximum load equals the value of 42.08 M2 nominal current. Higher loads will ‘heat up’ the motor.<br><b>Note</b>: The load curve level should be adjusted, if the ambient temperature differs from 35.58 Motor ambient temperature 2.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.60</b></td><td colspan="7"><b>Zero speed load 2</b></td></tr>
<tr><td colspan="7">Zero speed load for motor thermal protection model 2.<br>Defines the maximum motor load at zero speed in percent of 42.08 M2 nominal current for the motor load curve. See 35.59 Motor load curve 2 and 35.61 Break point 2. A higher value can be used if the motor has an external motor fan to boost the cooling. See the motor manufacturer's recommendations.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>100 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.61</b></td><td colspan="7"><b>Break point 2</b></td></tr>
<tr><td colspan="7">Break point for motor thermal protection model 2.<br>Defines the break point speed in percent of 42.08 M2 nominal current for the load curve. This is the point at which the motor load curve begins to decrease from 35.59 Motor load curve 2 towards 35.60 Zero speed load 2.</td></tr>
<tr><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>35.62</b></td><td colspan="7"><b>Motor nominal temperature rise 2</b></td></tr>
<tr><td colspan="7">Temperature rise for motor thermal protection model 2.<br>Defines the temperature rise of the motor above 35.58 Motor ambient temperature 2, when the motor is loaded with 42.08 M2 nominal current. See the motor manufacturer's recommendations.<br>The unit is selected by parameter 96.02 Unit selection.<br>
</td></tr>
<tr><td>-80.0 … 1000.0</td><td>80 or 176</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>35.63</b></td><td colspan="7"><b>Motor thermal time constant 2</b></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Motor thermal time constant for motor thermal protection model 2.<br>Defines the thermal time constant for the motor thermal protection model. It is the time to reach 63 % of nominal motor temperature. See the motor manufacturer's recommendations.<br> </td></tr>
<tr><td>0 … 32500</td><td>256</td><td>s</td><td>1 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 36 Load analyzer

Peak value and amplitude logger settings.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **36.xx** | **Not jet part of the manual.** | | | | | | |
| **36.xx** | | | | | | | |

## 37 User load curve

Settings for user load curve.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **37.xx** | **Not jet part of the manual.** | | | | | | |
| **37.xx** | | | | | | | |

## 40 Process PID

Parameter values for process PID controller.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **40.xx** | **Not jet part of the manual.** | | | | | | |
| **40.xx** | | | | | | | |

## 42 Shared motion (2nd motor)

Configuration of 2nd motor.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **42.xx** | **Not jet part of the manual.** | | | | | | |
| **42.xx** | | | | | | | |

## 44 Mechanical brake control

Configuration of mechanical brake.

<table>
<tr><td rowspan="3">**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale/ Fbeq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td rowspan="3">**44.xx**</td><td colspan="7">**Not jet part of the manual.**</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">**44.xx**</td><td colspan="7"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

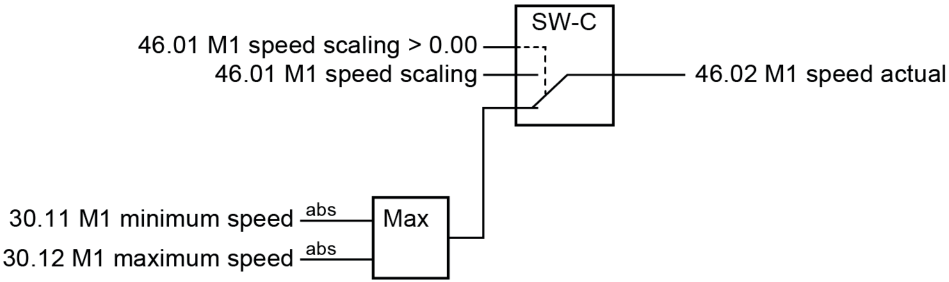
## 45 Energy efficiency

Settings for the energy saving calculators.

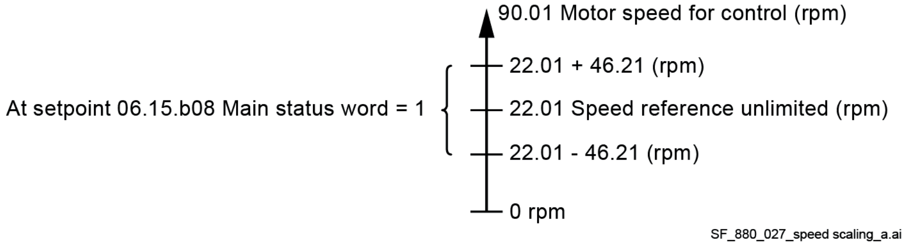
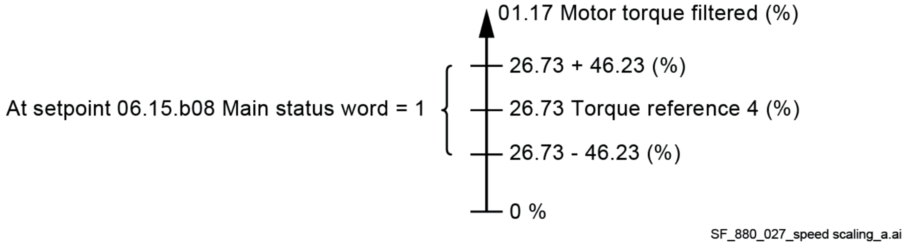
<table>
<tr><td rowspan="3">**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale/ Fbeq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td rowspan="3">**45.xx**</td><td colspan="7">**Not jet part of the manual.**</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">**45.xx**</td><td colspan="7"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

## 46 Monitoring/Scaling settings

Speed supervision settings, signal filtering and general scaling settings.

<table>
<tr><td rowspan="3">**Index**</td><td colspan="7">**Name**</td></tr>
<tr><td colspan="7">**Text**</td></tr>
<tr><td>**Range**</td><td>**Default**</td><td>**Unit**</td><td>**Scale/ Fbeq16**</td><td>**Volatile**</td><td>**Change running**</td><td>**Type**</td></tr>
<tr><td rowspan="2">**46.01**</td><td colspan="7">**M1 speed scaling**</td></tr>
<tr><td colspan="7">Motor 1 speed scaling.<br>Sets the 16-bit scaling of all speed related parameters in rpm. The set scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower communication.<br>46.01 M1 speed scaling is valid for values greater than 0 rpm. For a value equal to 0 rpm, the maximum absolute value of 30.11 M1 minimum speed and 30.12 M1 maximum speed is taken.<br>See 46.02 M1 speed scaling actual.<br><br> <br>SF_880_027_speed scaling_b.ai<br>**Notes**:<br>– 46.01 M1 speed scaling has to be set in case the speed is read or written by means of an overriding control (e.g. fieldbus).<br>– The maximum amount of speed units is 32000.<br>**Commissioning hints:**<br>– Set 99.14 M1 nominal (base) speed to the base speed of motor 1.<br>– Set 30.11 M1 minimum speed and 30.12 M1 maximum speed to ± maximum speed.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– Set 46.01 M1 speed scaling to the maximum absolute speed value of 30.11 M1 minimum speed and 30.12 M1 maximum speed.<br>– Make sure that the settings of:<br>30.11 M1 minimum speed.<br>30.12 M1 maximum speed.<br>31.30 M1 overspeed trip margin.<br>46.01 M1 speed scaling.<br>99.14 M1 nominal (base) speed.<br>– Are less than or equal to 1.6 • 46.02 M1 speed scaling actual (1.6 = 32000/20000).<br>– If the scaling is out of range A124 Speed scaling is generated.</td></tr>
<tr><td>0.0 … 30000.0</td><td>0.0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.02</b></td><td colspan="7"><b>M1 speed scaling actual</b></td></tr>
<tr><td colspan="7">Motor 1 speed scaling actual and acceleration/deceleration ramp rate.<br>Shows the 16-bit scaling of all speed related parameters in rpm. The scaling value corresponds to 20000 speed units in e.g. fieldbus or master-follower communication. See 46.01 M1 speed scaling.<br>Defines the acceleration/ deceleration ramp rate. See 23.12 Acceleration time 1 and 23.13 Deceleration time 1. The speed acceleration and deceleration ramp times are therefore related to 46.02 M1 speed scaling actual and not to 30.11 M1 minimum speed or 30.12 Maximum speed.</td></tr>
<tr><td>0.0 … 30000.0</td><td>-</td><td>rpm</td><td>1 = 1 rpm</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>46.03</b></td><td colspan="7"><b>M1 torque scaling</b></td></tr>
<tr><td colspan="7">Motor 1 torque scaling.<br>Sets the 16-bit scaling of all torque related parameters in % of 99.02 M1 nominal torque. The set scaling value corresponds to 10000 in e.g. fieldbus or master-follower communication.</td></tr>
<tr><td>0.00 … 325.00</td><td>100.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.04</b></td><td colspan="7"><b>M1 torque scaling actual</b></td></tr>
<tr><td colspan="7">Motor 1 torque scaling actual.<br>Shows the 16-bit scaling of all torque related parameters in % of 99.02 M1 nominal torque. The scaling value corresponds to 10000 in e.g. fieldbus or master-follower communication. See 46.03 M1 torque scaling.<br>Motor 1 nominal torque in Nm or lb ft can be seen in 99.02 M1 nominal torque.</td></tr>
<tr><td>0.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>46.06</b></td><td colspan="7"><b>Speed reference zero scaling</b></td></tr>
<tr><td colspan="7">Speed corresponding to minimum fieldbus reference.<br>Defines a speed corresponding to a zero reference received from a fieldbus. For example, with a setting of 500, the fieldbus reference range from 0 … 20000 speed units would correspond to a speed range from 500 rpm … 46.02 M1 speed scaling actual.<br><b>Note</b>: This parameter is effective only with the ABB Drives communication profile.</td></tr>
<tr><td>0.0 … 30000.0</td><td>0.0</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.11</b></td><td colspan="7"><b>Filter time motor speed</b></td></tr>
<tr><td colspan="7">Motor speed feedback filter time constant.<br>Filter time constant for 01.01 Used motor speed filtered, 01.02 EMF speed filtered, 01.03 OnBoard tacho speed filtered, 01.04 OnBoard encoder speed filtered, 01.05 Encoder 1 speed filtered and 01.06 Encoder 2 speed filtered.<br><b>Note</b>: This filter is used for speed feedback signals to be displayed e.g. in door meters. It does not influence the speed feedback for the drive control.</td></tr>
<tr><td>0 … 32500</td><td>500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.13</b></td><td colspan="7"><b>Filter time motor torque</b></td></tr>
<tr><td colspan="7">Motor torque signal filter time constant.<br>Filter time constant for 01.17 Motor torque filtered. Is used for the EMF controller and the EMF feed forward.</td></tr>
<tr><td>0 … 32500</td><td>1000</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>46.14</b></td><td colspan="7"><b>Filter time power output</b></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Output power signal filter time constant.<br>Filter time constant for signal 01.24 Output power in kW.</td></tr>
<tr><td>0 … 32500</td><td>500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.21</b></td><td colspan="7"><b>At speed hysteresis</b></td></tr>
<tr><td colspan="7">Levels for At setpoint indication in speed control.<br>Defines the At setpoint levels for a speed controlled drive.<br>When the absolute difference between 22.01 Speed reference unlimited and 90.01 Motor speed for control is in the 46.21 At speed hysteresis, the drive sets 06.15.b08 Main status word.<br> </td></tr>
<tr><td>0.00 … 30000.00</td><td>20.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.23</b></td><td colspan="7"><b>At torque hysteresis</b></td></tr>
<tr><td colspan="7">Levels for At setpoint indication in torque control.<br>Defines the At setpoint levels for a torque controlled drive.<br>When the absolute difference between 26.73 Torque reference 4 and 01.17 Motor torque filtered is in the 46.23 At torque hysteresis, the drive sets 06.15.b08 Main status word.<br> </td></tr>
<tr><td>0.00 … 325.00</td><td>10.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.31</b></td><td colspan="7"><b>Above speed level</b></td></tr>
<tr><td colspan="7">Above level indication for speed control.<br>Defines the level for the Above level indication in a speed controlled drive. When 90.01 Motor speed for control exceeds the level, the drive sets 06.17.b10 Drive status word 2.<br><b>Note</b>: With 46.31 Above speed level it is possible to automatically switch between two 2 sets of acceleration/deceleration times for the speed ramp or two sets of proportional gain and integration time for the speed controller. See 23.11 Ramp set selection = Speed level and 25.13 Speed controller set selection = Speed level or Speed error.</td></tr>
<tr><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>46.33</b></td><td colspan="7"><b>Above torque level</b></td></tr>
<tr><td colspan="7">Above level indication for torque control.<br>Defines the level for the Above level indication in a torque controlled drive. When 01.17 Motor torque filtered exceeds the level, the drive sets 06.17.b10 Drive status word 2.</td></tr>
<tr><td>0.00 … 325.00</td><td>300.00</td><td>%</td><td>See 46.04</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 47 Data storage

Data storage parameters that can be written to and read from using other parameters' source and target settings.

**Note**: There are different storage parameters for different data types. Integer-type storage parameters 47.11 … 47.28 cannot be used as source for other parameters. No Other; source selection possible.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **47.01** | **Data storage 1 real32** | | | | | | |
| | Data storage parameter 1.<br>Storage parameters 47.01 … 47.08:<br>– Are 32-bit real (floating-point) numbers that can be used as source values for other parameters, e.g. as Other; source selection.<br>– Can be used as the target for received 16-bit data. See group 62 D2D and DDCS receive data.<br>– Can be used as the source of transmitted 16-bit data. See group 61 D2D and DDCS transmit data.<br>– Scaling and range are defined by parameters 47.31 … 47.38.<br>This data storage parameter is of is of the type retain. Its value will be saved when the drive is de-energized. Thus, it will not lose its value. | | | | | | |
| | See 47.31 | 0.000 | - | See 47.31 | n | y | Parameter |
| **47.02** | **Data storage 2 real32** | | | | | | |
| | Data storage parameter 2.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.32 | 0.000 | - | See 47.32 | n | y | Parameter |
| **47.03** | **Data storage 3 real32** | | | | | | |
| | Data storage parameter 3.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.33 | 0.000 | - | See 47.33 | n | y | Parameter |
| **47.04** | **Data storage 4 real32** | | | | | | |
| | Data storage parameter 4.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.34 | 0.000 | - | See 47.34 | n | y | Parameter |
| **47.05** | **Data storage 5 real32** | | | | | | |
| | Data storage parameter 5.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.35 | 0.000 | - | See 47.35 | n | y | Parameter |
| **47.06** | **Data storage 6 real32** | | | | | | |
| | Data storage parameter 6.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.36 | 0.000 | - | See 47.36 | n | y | Parameter |
| **47.07** | **Data storage 7 real32** | | | | | | |
| | Data storage parameter 7.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.37 | 0.000 | - | See 47.37 | n | y | Parameter |
| **47.08** | **Data storage 8 real32** | | | | | | |
| | Data storage parameter 8.<br>See 47.01 Data storage 1 real32. | | | | | | |
| | See 47.38 | 0.000 | - | See 47.38 | n | y | Parameter |
| **47.11** | **Data storage 1 int32** | | | | | | |
| | Data storage parameter 9.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.12** | **Data storage 2 int32** | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Data storage parameter 10.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.13** | **Data storage 3 int32** | | | | | | |
| | Data storage parameter 11.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.14** | **Data storage 4 int32** | | | | | | |
| | Data storage parameter 12.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.15** | **Data storage 5 int32** | | | | | | |
| | Data storage parameter 13.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.16** | **Data storage 6 int32** | | | | | | |
| | Data storage parameter 14.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.17** | **Data storage 7 int32** | | | | | | |
| | Data storage parameter 15.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.18** | **Data storage 8 int32** | | | | | | |
| | Data storage parameter 16.<br>32-bit integer. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | - | n | y | Parameter |
| **47.21** | **Data storage 1 int16** | | | | | | |
| | Data storage parameter 17.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| **47.22** | **Data storage 2 int16** | | | | | | |
| | Data storage parameter 18.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| **47.23** | **Data storage 3 int16** | | | | | | |
| | Data storage parameter 19.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| **47.24** | **Data storage 4 int16** | | | | | | |
| | Data storage parameter 20.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |

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| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| 47.25 | **Data storage 5 int16** | | | | | | |
| | Data storage parameter 21.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| 47.26 | **Data storage 6 int16** | | | | | | |
| | Data storage parameter 22.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| 47.27 | **Data storage 7 int16** | | | | | | |
| | Data storage parameter 23.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| 47.28 | **Data storage 8 int16** | | | | | | |
| | Data storage parameter 24.<br>16-bit integer. | | | | | | |
| | -32768 … 32767 | 0 | - | 1 = 1 | n | y | Parameter |
| 47.31 | **Data storage 1 real32 type** | | | | | | |
| | Data type for 47.01 Data storage 1 real32.<br>Defines the scaling and range of 47.01 Data storage 1 real32. The scaling is used when the data storage parameter:<br>– Receives 16-bit data. See group 62 D2D and DDCS receive data.<br>– Transmits 16-bit data. See group 61 D2D and DDCS transmit data.<br>0: **Unscaled**; data storage only. Range: -2147483.264 … 2147473.264.<br>1: **Transparent**; Scaling: 1 = 1. Range: -32768 … 32767.<br>2: **General**; Scaling: 100 = 1. Range: -327.68 … 327.67.<br>3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. Range: -325.00 … 325.00.<br>4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. Range: -30000.00 … 30000.00.<br>5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %. Range: -325.00 … 325.00. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |
| 47.32 | **Data storage 2 real32 type** | | | | | | |
| | Data type for 47.02 Data storage 2 real32.<br>Defines the scaling and range of 47.02 Data storage 2 real32. See 47.31 Data storage 1 real32 type. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |
| 47.33 | **Data storage 3 real32 type** | | | | | | |
| | Data type for 47.03 Data storage 3 real32.<br>Defines the scaling and range of 47.03 Data storage 3 real32. See 47.31 Data storage 1 real32 type. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |
| 47.34 | **Data storage 4 real32 type** | | | | | | |
| | Data type for 47.04 Data storage 4 real32.<br>Defines the scaling and range of 47.04 Data storage 4 real32. See 47.31 Data storage 1 real32 type. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |
| 47.35 | **Data storage 5 real32 type** | | | | | | |
| | Data type for 47.05 Data storage 5 real32.<br>Defines the scaling and range of 47.05 Data storage 5 real32. See 47.31 Data storage 1 real32 type. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |
| 47.36 | **Data storage 6 real32 type** | | | | | | |
| | Data type for 47.06 Data storage 6 real32.<br>Defines the scaling and range of 47.06 Data storage 6 real32. See 47.31 Data storage 1 real32 type. | | | | | | |
| | 0 … 5 | Unscaled | - | 1 = 1 | n | y | Parameter |

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<tr><td rowspan="3"><b>47.37</b></td><td colspan="7"><b>Data storage 7 real32 type</b></td></tr>
<tr><td colspan="7">Data type for 47.07 Data storage 7 real32.<br>Defines the scaling and range of 47.07 Data storage 7 real32. See 47.31 Data storage 1 real32 type.</td></tr>
<tr><td>0 … 5</td><td>Unscaled</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>47.38</b></td><td colspan="7"><b>Data storage 8 real32 type</b></td></tr>
<tr><td colspan="7">Data type for 47.08 Data storage 8 real32.<br>Defines the scaling and range of 47.08 Data storage 8 real32. See 47.31 Data storage 1 real32 type.</td></tr>
<tr><td>0 … 5</td><td>Unscaled</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
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## 49 Panel port communication

Communication settings for the control panel port on the drive.

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<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>49.01</b></td><td colspan="7"><b>Node ID number</b></td></tr>
<tr><td colspan="7">Control panel/PC tool link node ID number.<br>Defines the node ID of the drive. All drives connected to the network (panel bus) must have a unique node ID.<br><b>Note</b>: For drives in a network, it is advisable to reserve 49.01 Network ID number = 1 for spare/replacement drives.</td></tr>
<tr><td>1 … 32</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>49.03</b></td><td colspan="7"><b>Baud rate</b></td></tr>
<tr><td colspan="7">Control panel/PC tool link speed.<br>Defines the transfer rate of the control panel/PC tool link.<br>0: <b>9.6 kbps</b>; 9.6 kbit/s.<br>1: <b>38.4 kbps</b>; 38.4 kbit/s.<br>2: <b>57.6 kbps</b>; 57.6 kbit/s.<br>3: <b>86.4 kbps</b>; 86.4 kbit/s.<br>4: <b>115.2 kbps</b>; 115.2 kbit/s.<br>5: <b>230.4 kbps</b>; 230.4 kbit/s.<br>6: <b>460.8 kbps</b>; 460.8 kbit/s.<br>7: <b>921.6 kbps</b>; 921.6 kbit/s.</td></tr>
<tr><td>0 … 7</td><td>230.4 kbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>49.04</b></td><td colspan="7"><b>Communication loss time</b></td></tr>
<tr><td colspan="7">Control panel/PC tool link communication loss timeout.<br>Defines the time delay for the control panel/PC tool communication before the action defined in 49.05 Communication loss action is executed. Time count starts when the communication link fails to update the message.</td></tr>
<tr><td>0 … 32500</td><td>1000</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>49.05</b></td><td colspan="7"><b>Communication loss action</b></td></tr>
<tr><td colspan="7">Control panel/PC tool link communication loss action.<br>Selects how the drive reacts to a control panel/PC tool communication loss.<br>0: <b>No action</b>; none, disable communication loss function.<br>1: <b>Fault</b>; the event generates fault 7081 Control panel/PC tool link communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the control panel/PC tool (local mode).<br>2: <b>Warning</b>; the event generates warning A7EE Control panel/PC tool link communication. This occurs even though no control is expected from the control panel/PC tool.<br><b>WARNING!</b><br>Make sure that it is safe to continue operation in case of a communication break.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 3: **Last speed**; the evet generates warning A7EE Control panel/PC tool link communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>4: **Speed reference safe**; the event generates warning A7EE Control panel/PC tool link communication and sets the speed to the value defined in 22.46 Speed reference safe.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break. | | | | | | |
| | 0 … 4 | Fault | - | 1 = 1 | n | y | Parameter |
| **49.06** | **Refresh settings** | | | | | | |
| | Control panel/PC tool link communication refresh command.<br>Applies the settings of parameters 49.01 … 49.05. The value reverts automatically to Done, when the refresh is done.<br>**Note**: Refreshing may cause a communication break, so reconnecting the drive may be required.<br>0: **Done**; 0, normal operation or refreshing done.<br>1: **Refresh**; 1, refresh parameters 49.01 … 49.05. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | y | y | Parameter |

## 50 Fieldbus adapter (FBA)

Fieldbus communication configuration.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **50.01** | **FBA A enable** | | | | | | |
| | Fieldbus adapter A enable/disable.<br>Enables/Disables communication between the drive and fieldbus adapter A. Specifies the location of the adapter in slot 1 … slot 3.<br>0: **Disable**; disable communication between drive and fieldbus adapter A.<br>1: **Option slot 1**; enable communication between drive and fieldbus adapter A. The adapter is located in slot 1.<br>2: **Option slot 2**; enable communication between drive and fieldbus adapter A. The adapter is located in slot 2.<br>3: **Option slot 3**; enable communication between drive and fieldbus adapter A. The adapter is located in slot 3. | | | | | | |
| | 0 … 3 | Disable | - | 1 = 1 | n | n | Parameter |
| **50.02** | **FBA A comm loss func** | | | | | | |
| | Fieldbus adapter A communication loss action.<br>Selects how the drive reacts to a fieldbus communication loss.<br>0: **No action**; none, disable communication loss function.<br>1: **Fault**; the event generates fault 7510 FBA A communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus.<br>2: **Warning**; the event generates warning A7C1 FBA A communication. This occurs even though no control is expected from the fieldbus.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>3: **Last speed**; the evet generates warning A7C1 FBA A communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">4: <b>Speed reference safe</b>; the event generates warning A7C1 FBA A communication and sets the speed to the value defined in 22.46 Speed reference safe.<br><b>WARNING!</b><br>Make sure that it is safe to continue operation in case of a communication break.<br>5: <b>Fault always</b>; the event generates fault 7510 FBA A communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.03</b></td><td colspan="7"><b>FBA A comm loss timeout</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A communication loss timeout.<br>Defines the time delay for the fieldbus communication before the action defined in 50.02 FBA A comm loss func is executed. Time count starts when the communication link fails to update the message.</td></tr>
<tr><td>0 … 32500</td><td>300</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.04</b></td><td colspan="7"><b>FBA A ref1 type</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A reference 1 type.<br>Selects the type and scaling of 03.05 FBA A reference 1 sent by the master (e.g. PLC) to fieldbus adapter A.<br>0: <b>Auto</b>; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.
<table>
<tr><th>Parameter</th><th>Auto type and scaling</th></tr>
<tr><td>22.11 Speed reference 1 source</td><td rowspan="3">Speed</td></tr>
<tr><td>22.12 Speed reference 2 source</td></tr>
<tr><td>23.32 Direct speed reference</td></tr>
<tr><td>26.11 Torque reference 1 source</td><td rowspan="2">Torque</td></tr>
<tr><td>26.12 Torque reference 2 source</td></tr>
<tr><td>27.22 Current reference source</td><td>Current</td></tr>
<tr><td>28.18 EMF reference source</td><td rowspan="3">General</td></tr>
<tr><td>28.20 EMF voltage correction source</td></tr>
<tr><td>28.29 Flux correction source</td></tr>
</table>
1: <b>Transparent</b>; no scaling is applied.<br>2: <b>General</b>; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).<br>3: <b>Torque</b>; the scaling is defined by 46.04 M1 torque scaling actual.<br>4: <b>Speed</b>; the scaling is defined by 46.02 M1 speed scaling actual.<br>5: <b>Current</b>; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.05</b></td><td colspan="7"><b>FBA A ref2 type</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A reference 2 type.<br>Selects the type and scaling of 03.06 FBA A reference 2 sent by the master (e.g. PLC) to fieldbus adapter A. See 50.04 FBA A ref1 type.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>50.07</b></td><td colspan="7"><b>FBA A act1 type</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A actual value 1 type.<br>Selects the type/source and scaling of actual value 1 sent by fieldbus adapter A to the master (e.g. PLC).<br>0: <b>Auto</b>; type/source and scaling follow the type of reference 1 selected by 50.04 FBA A ref1 type. For individual settings see below.<br>1: <b>Transparent</b>; the value selected by 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied. The 16-bit scaling is 1 = 1 unit.<br>2: <b>General</b>; the value selected by 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (e.g. integer and two decimals).</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: <b>Torque</b>; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual.<br>4: <b>Speed</b>; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual.<br>5: <b>Current</b>; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current.<br>6: <b>Position</b>; the motor position is sent as actual value 1. See 90.06 Motor position scaled.</td></tr>
<tr><td>0 … 6</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.08</b></td><td colspan="7"><b>FBA A act2 type</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A actual value 2 type.<br>Selects the type/source and scaling of actual value 2 sent by fieldbus adapter A to the master (e.g. PLC). See 50.07 FBA A act1 type.</td></tr>
<tr><td>0 … 6</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.09</b></td><td colspan="7"><b>FBA A SW transparent source</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A status word transparent source.<br>Selects the source of the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 51. The parameter to be used is fieldbus dependent.<br><b>Other</b>; source selection e.g. 06.88 FBA A profile status word.<br>0: <b>Not selected</b>; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.10</b></td><td colspan="7"><b>FBA A act1 transparent source</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A actual value 1 transparent source.<br>Selects the source of actual value 1 sent by fieldbus adapter A to the master (e.g. PLC), when 50.07 FBA A actual 1 type = Transparent or General.<br><b>Other</b>; source selection e.g. a value from group 1.<br>0: <b>Not selected</b>; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.11</b></td><td colspan="7"><b>FBA A act2 transparent source</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A actual value 2 transparent source.<br>Selects the source of actual value 2 sent by fieldbus adapter A to the master (e.g. PLC), when 50.08 FBA A actual 2 type = Transparent or General.<br><b>Other</b>; source selection e.g. a value from group 1.<br>0: <b>Not selected</b>; no source selected.</td></tr>
<tr><td>0 … 0</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.12</b></td><td colspan="7"><b>FBA A debug mode</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A debug mode.<br>Enables the display of the raw (unmodified) data received from and sent to fieldbus adapter A. The data are displayed in parameters 50.13 … 50.18.<br><b>Note</b>: This functionality should only be used for debugging.<br>0: <b>Disable</b>; disable the display of raw data from fieldbus adapter A.<br>1: <b>Enable</b>; enable the display of raw data from fieldbus adapter A.</td></tr>
<tr><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>50.13</b></td><td colspan="7"><b>FBA A control word</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw control word.<br>Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>50.14</b></td><td colspan="7"><b>FBA A reference 1</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw reference 1.</td></tr>
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<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>50.15</b></td><td colspan="7"><b>FBA A reference 2</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw reference 2.<br>Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter A if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>50.16</b></td><td colspan="7"><b>FBA A status word</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw status word.<br>Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>50.17</b></td><td colspan="7"><b>FBA A actual value 1</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw actual value 1.<br>Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>50.18</b></td><td colspan="7"><b>FBA A actual value 2</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A raw actual value 2.<br>Displays the raw (unmodified) actual value 2 (ACT2) sent by fieldbus adapter A to the master (e.g. PLC) if 50.12 FBA A debug mode = Enable.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>50.21</b></td><td colspan="7"><b>FBA A timelevel sel</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A communication time levels.<br>In general, lower time levels of read/write services reduce the CPU load. The table below shows the time levels of read/write services for cyclic high and cyclic low data depending on 50.21 FBA A timelevel sel:
<table>
<tr><th>50.21 FBA A timelevel sel</th><th>Cyclic high*</th><th>Cyclic low**</th></tr>
<tr><td>Normal</td><td>2 ms</td><td>10 ms</td></tr>
<tr><td>Fast</td><td>500 µs</td><td>2 ms</td></tr>
<tr><td>Very fast</td><td>250 µs</td><td>2 ms</td></tr>
<tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></tr>
</table>
*Cyclic high data consist of status word, ACT1 and ACT2 from the fieldbus.<br>**Cyclic low data consist of the parameter data mapped in groups 52 FBA A data in, 53 FBA A data out and acyclic data.<br>Control word, REF1 and REF2 from the fieldbus are handled as interrupts generated on receipt of cyclic high messages.<br>0: <b>Normal</b>; normal speed.<br>1: <b>Fast</b>; fast speed.<br>2: <b>Very fast</b>; very fast speed.<br>3: <b>Monitoring</b>; low speed. Optimized for PC tool communication and monitoring usage.</td></tr>
<tr><td>0 … 3</td><td>Normal</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>50.29</b></td><td colspan="7"><b>FBA A profile</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A profile.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
|  | The DCS880 only supports transparent16 profile, so profile adaption according to bus specific profile, ABB Drive profile or others are handled using 50.29 FBA A profile.<br>0: **ABB Drive profile**; speed: value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000.<br>1: **ODVA basic**; **NOT** supported.<br>2: **ODVA extended**; **NOT** supported.<br>3: **Profidrive**; speed: value in 46.02 == 4000h. Any other: 100.00 % == 10000. **NOT** supported.<br>4: **CIA 402**; **NOT** supported.<br>10: **DCP**; **NOT** supported. |  |  |  |  |  |  |
|  | 0 … 10 | ABB Drive profile | - | 1 = 1 | n | n | Parameter |
| **50.31** | **FBA B enable** |  |  |  |  |  |  |
|  | Fieldbus adapter B enable/disable.<br>Enables/Disables communication between the drive and fieldbus adapter B. Specifies the location of the adapter in slot 1 … slot 3.<br>0: **Disable**; disable communication between drive and fieldbus adapter B.<br>1: **Option slot 1**; enable communication between drive and fieldbus adapter B. The adapter is located in slot 1.<br>2: **Option slot 2**; enable communication between drive and fieldbus adapter B. The adapter is located in slot 2.<br>3: **Option slot 3**; enable communication between drive and fieldbus adapter B. The adapter is located in slot 3. |  |  |  |  |  |  |
|  | 0 … 3 | Disable | - | 1 = 1 | n | n | Parameter |
| **50.32** | **FBA B comm loss func** |  |  |  |  |  |  |
|  | Fieldbus adapter B communication loss action.<br>Selects how the drive reacts to a fieldbus communication loss.<br>0: **No action**; none, disable communication loss function.<br>1: **Fault**; the event generates fault 7520 FBA B communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus.<br>2: **Warning**; the event generates warning A7C2 FBA B communication. This occurs even though no control is expected from the fieldbus.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>3: **Last speed**; the evet generates warning A7C2 FBA B communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>4: **Speed reference safe**; the event generates warning A7C2 FBA B communication and sets the speed to the value defined in 22.46 Speed reference safe.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>5: **Fault always**; the event generates fault 7520 FBA B communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus. |  |  |  |  |  |  |
|  | 0 … 5 | No action | - | 1 = 1 | n | y | Parameter |
| **50.33** | **FBA B comm loss timeout** |  |  |  |  |  |  |
|  | Fieldbus adapter B communication loss timeout.<br>Defines the time delay for the fieldbus communication before the action defined in 50.32 FBA B comm loss func is executed. Time count starts when the communication link fails to update the message. |  |  |  |  |  |  |
|  | 0 … 32500 | 300 | ms | 1 = 1 ms | n | y | Parameter |
| **50.34** | **FBA B ref1 type** |  |  |  |  |  |  |
|  | Fieldbus adapter B reference 1 type. |  |  |  |  |  |  |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Selects the type and scaling of 03.07 FBA B reference 1 sent by the master (e.g. PLC) to fieldbus adapter B. See 50.04 FBA A ref1 type. | | | | | | |
| | 0 … 5 | Auto | - | 1 = 1 | n | y | Parameter |
| **50.35** | **FBA B ref2 type** | | | | | | |
| | Fieldbus adapter B reference 2 type.<br>Selects the type and scaling of 03.08 FBA B reference 2 sent by the master (e.g. PLC) to fieldbus adapter A. See 50.04 FBA A ref1 type. | | | | | | |
| | 0 … 5 | Auto | - | 1 = 1 | n | y | Parameter |
| **50.37** | **FBA B act1 type** | | | | | | |
| | Fieldbus adapter B actual value 1 type.<br>Selects the type/source and scaling of actual value 1 sent by fieldbus adapter B to the master (e.g. PLC). See 50.07 FBA A act1 type. | | | | | | |
| | 0 … 6 | Auto | - | 1 = 1 | n | y | Parameter |
| **50.38** | **FBA B act2 type** | | | | | | |
| | Fieldbus adapter B actual value 2 type.<br>Selects the type/source and scaling of actual value 2 sent by fieldbus adapter B to the master (e.g. PLC). See 50.07 FBA A act1 type. | | | | | | |
| | 0 … 6 | Auto | - | 1 = 1 | n | y | Parameter |
| **50.39** | **FBA B SW transparent source** | | | | | | |
| | Fieldbus adapter B status word transparent source.<br>Selects the source of the status word when the fieldbus adapter is set to a transparent communication profile e.g. by its configuration parameters in group 54. The parameter to be used is fieldbus dependent.<br>**Other**; source selection e.g. 06.15 Main Status Word.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **50.40** | **FBA B act1 transparent source** | | | | | | |
| | Fieldbus adapter B actual value 1 transparent source.<br>Selects the source of actual value 1 sent by fieldbus adapter B to the master (e.g. PLC), when 50.37 FBA B actual 1 type = Transparent or General.<br>**Other**; source selection e.g. a value from group 1.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **50.41** | **FBA B act2 transparent source** | | | | | | |
| | Fieldbus adapter B actual value 2 transparent source.<br>Selects the source of actual value 2 sent by fieldbus adapter B to the master (e.g. PLC), when 50.38 FBA B actual 2 type = Transparent or General.<br>**Other**; source selection e.g. a value from group 1.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **50.42** | **FBA B debug mode** | | | | | | |
| | Fieldbus adapter B debug mode.<br>Enables the display of the raw (unmodified) data received from and sent to fieldbus adapter B. The data are displayed in parameters 50.43 … 50.48.<br>**Note**: This functionality should only be used for debugging.<br>0: **Disable**; disable the display of raw data from fieldbus adapter B.<br>1: **Enable**; enable the display of raw data from fieldbus adapter B. | | | | | | |
| | 0 … 1 | Disable | - | 1 = 1 | n | n | Parameter |
| **50.43** | **FBA B control word** | | | | | | |
| | Fieldbus adapter B raw control word. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Displays the raw (unmodified) control word sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.44</b></td><td colspan="7"><b>FBA B reference 1</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B raw reference 1.<br>Displays the raw (unmodified) reference 1 (REF1) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.45</b></td><td colspan="7"><b>FBA B reference 2</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B raw reference 2.<br>Displays the raw (unmodified) reference 2 (REF2) sent by the master (e.g. PLC) to fieldbus adapter B if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.46</b></td><td colspan="7"><b>FBA B status word</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B raw status word.<br>Displays the raw (unmodified) status word sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.47</b></td><td colspan="7"><b>FBA B actual value 1</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B raw actual value 1.<br>Displays the raw (unmodified) actual value 1 (ACT1) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.48</b></td><td colspan="7"><b>FBA B actual value 2</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B raw actual value 2.<br>Displays the raw (unmodified) actual value 2 (ACT2) sent by fieldbus adapter B to the master (e.g. PLC) if 50.42 FBA B debug mode = Enable.</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>50.51</b></td><td colspan="7"><b>FBA B timelevel sel</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B communication time levels.<br>See 50.21 FBA A timelevel sel.</td></tr>
<tr><td></td><td>0 … 3</td><td>Normal</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td><b>50.59</b></td><td colspan="7"><b>FBA B profile</b></td></tr>
<tr><td></td><td colspan="7">Fieldbus adapter B profile.<br>The DCS880 only supports transparent16 profile, so profile adaption according to bus specific profile, ABB Drive profile or others are handled using 50.59 FBA B profile.<br>0: <b>ABB Drive profile</b>; speed: value in 46.02 == 20000 speed units. Any other: 100.00 % == 10000.<br>1: <b>ODVA basic</b>; <b>NOT</b> supported.<br>2: <b>ODVA extended</b>; <b>NOT</b> supported.<br>3: <b>ProfiDrive</b>; speed: value in 46.02 == 4000h. Any other: 100.00 % == 10000. <b>NOT</b> supported.<br>4: <b>CIA 402</b>; <b>NOT</b> supported.<br>10: <b>DCP</b>; <b>NOT</b> supported.</td></tr>
<tr><td></td><td>0 … 10</td><td>ABB drive profile</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
</table>

## 51 FBA A settings

Fieldbus adapter A configuration.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| 51.01 | **FBA A type** | | | | | | |
| | Fieldbus adapter A type.<br>Displays the type of the connected fieldbus adapter A module.<br>0: **None**; module is not found or is not properly connected or is disabled by 50.01 FBA A enable.<br>1: **FPBA**;<br>32: **FCAN**;<br>37: **FDNA**;<br>101: **FCNA**;<br>128: **FENA-11/21**;<br>135: **FECA**;<br>136: **FEPL**;<br>485: **FSCA**; | | | | | | |
| | 0 … 485 | - | - | 1 = 1 | y | n | Signal |
| 51.02 to 51.26 | **FBA A Par2 … FBA A Par26** | | | | | | |
| | Fieldbus adapter A configuration parameter.<br>Parameters 51.02 … 51.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module.<br>**Note**: Not all of these parameters are necessarily in use. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | n | y | Parameter |
| 51.27 | **FBA A par refresh** | | | | | | |
| | Fieldbus adapter A refresh.<br>Validates any changed fieldbus adapter A module configuration settings. The value reverts to Done automatically, when the refresh is done.<br>0: **Done**; 0, refreshing done.<br>1: **Refresh**; 1, refreshing. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | y | n | Parameter |
| 51.28 | **FBA A par table ver** | | | | | | |
| | Fieldbus adapter A parameter table revision.<br>Displays the parameter table revision of the fieldbus adapter A module-mapping file (stored in the memory of the drive) in format axyz, where ax = major table revision number and yz = minor table revision number. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| 51.29 | **FBA A drive type code** | | | | | | |
| | Fieldbus adapter A drive type code.<br>Displays the drive type code in the fieldbus adapter A module-mapping file (stored in the memory of the drive). | | | | | | |
| | 0 … 65535 | - | - | 1 = 1 | y | n | Signal |
| 51.30 | **FBA A mapping file ver** | | | | | | |
| | Fieldbus adapter A mapping file revision.<br>Displays the fieldbus adapter A module-mapping file revision stored in the memory of the drive in decimal format. | | | | | | |
| | 0 … 65535 | - | - | 1 = 1 | y | n | Signal |
| 51.31 | **D2FBA A comm status** | | | | | | |
| | Fieldbus adapter A communication status.<br>Displays the status of the fieldbus adapter A module communication.<br>0: **Not configured**; fieldbus adapter A is not configured.<br>1: **Initializing**; fieldbus adapter A is initializing.<br>2: **Time out**; a timeout has occurred in the communication between fieldbus adapter A and the drive. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">3: <b>Configuration error</b>; fieldbus adapter A configuration error. Mapping file is not found in the file system of the drive or mapping file upload has failed more than three times.<br>4: <b>Off-line</b>; fieldbus adapter A communication is off-line.<br>5: <b>On-line</b>; fieldbus adapter A communication is on-line or fieldbus adapter A has been configured not to detect a communication break. For more information, see the documentation of the fieldbus adapter.<br>6: <b>Reset</b>; fieldbus adapter A is performing a hardware reset.</td></tr>
<tr><td>0 … 6</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>51.32</b></td><td colspan="7"><b>FBA A comm SW ver</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A, firmware patch and build versions.<br>Displays the patch and build versions of the adapter module A firmware in format xxyy, where xx = patch version number and yy = build version number.<br><b>Example</b>: C802 = 200.02 (patch version 200, build version 2).</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>51.33</b></td><td colspan="7"><b>FBA A appl SW ver</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A, firmware major and minor versions.<br>Displays the major and minor versions of the adapter module A firmware in format xyy, where x = major revision number and yy = minor revision number.<br><b>Example</b>: 300 = 3.00 (major version 3, minor version 00).</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

## 52 FBA A data in

Selection of data sent by fieldbus adapter A to the master (e.g. PLC).

**Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>52.01 to 52.12</b></td><td colspan="7"><b>FBA A data in1 … FBA A data in12</b></td></tr>
<tr><td colspan="7">Fieldbus adapter A data from the drive to the master (e.g. PLC).<br>Parameters 52.01 … 52.12 select data sent from the drive by fieldbus adapter A to the master (e.g. PLC).<br><b>Other</b>; source selection (10 ms update).<br>0: <b>None</b>; inactive. FBA A data in is disabled.<br>4: <b>SW 16bit</b>; status word (16-bit) (2 ms update). Taken from 06.88 FBA A profile status word.<br>5: <b>Act1 16bit</b>; actual value 1 ACT1 (16-bit) (2 ms update). Depending on 50.07 FBA A actual 1 type.<br>6: <b>Act2 16bit</b>; actual value 2 ACT2 (16-bit) (2 ms update). Depending on 50.08 FBA A actual 2 type.<br>15: <b>Act1 32bit</b>; actual value 1 ACT1 (32-bit) (2 ms update). Depending on 50.07 FBA A actual 1 type.<br>16: <b>Act2 32bit</b>; actual value 2 ACT2 (32-bit) (2 ms update). Depending on 50.08 FBA A actual 2 type.</td></tr>
<tr><td>0 … 16</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 53 FBA A data out

Selection of data sent by the master (e.g. PLC) to fieldbus adapter A.

**Note**: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **53.01 to 53.12** | **FBA A data out1 … FBA A data out12** | | | | | | |
| | Fieldbus adapter A data from the master (e.g. PLC) to the drive.<br>Parameters 53.01 … 53.12 select data sent from the master (e.g. PLC) by fieldbus adapter A to the drive.<br>**Other**; source selection (10 ms update).<br>0: **None**; inactive. FBA A data out is disabled.<br>1: **CW 16bit**; control word (16-bit) (2 ms update). Send to 06.03 FBA A transparent control word.<br>2: **Ref1 16bit**; reference REF1 (16-bit) (2 ms update). Send to 03.05 FBA A reference 1.<br>3: **Ref2 16bit**; reference REF2 (16-bit) (2 ms update). Send to 03.06 FBA A reference 2.<br>12: **Ref1 32bit**; reference REF1 (32-bit) (2 ms update). Send to 03.05 FBA A reference 1.<br>13: **Ref2 32bit**; reference REF2 (32-bit) (2 ms update). Send to 03.06 FBA A reference 2. | | | | | | |
| | 0 … 13 | None | - | 1 = 1 | n | y | Parameter |

## 54 FBA B settings

Description see group 51 FBA A settings.

## 55 FBA B data in

Description see group 52 FBA A data in.

## 56 FBA B data out

Description see group 53 FBA A data out.

## 58 Embedded fieldbus

Embedded fieldbus (EFB) configuration.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **58.01** | **Protocol enable** | | | | | | |
| | Embedded fieldbus enable/disable.<br>Enables/Disables the embedded fieldbus and selects the protocol to use.<br>**Note**: When the embedded fieldbus interface is enabled, the device-to-device link in group 60 DDCS communication is disabled.<br>0: **None**; inactive, disable communication.<br>1: **Modbus RTU**; enable Embedded fieldbus interface. Modbus RTU protocol is used. | | | | | | |
| | 0 … 1 | None | - | 1 = 1 | n | n | Parameter |
| **58.02** | **Protocol ID** | | | | | | |
| | Protocol ID and revision.<br>Displays the protocol ID and revision. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **58.03** | **Node address** | | | | | | |
| | Embedded fieldbus node address.<br>Defines the node address of the drive for the embedded fieldbus communication. All drives connected to the network must have a unique node address.<br>**Notes**:<br>– The address range for the embedded fieldbus is 1 … 247.<br>– For drives in a network, it is advisable to reserve 58.03 Node address = 1 for spare/replacement drives. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– Changes to 58.03 Node address take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.</td></tr>
<tr><td>0 … 255</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.04</b></td><td colspan="7"><b>Baud rate</b></td></tr>
<tr><td colspan="7">Embedded fieldbus link speed.<br>Defines the transfer rate of the embedded fieldbus link.<br><b>Note</b>: Changes to 58.04 Baud rate take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.<br>2: <b>9.6 kbps</b>; 9.6 kbit/s.<br>3: <b>19.2 kbps</b>; 19.2 kbit/s.<br>4: <b>38.4 kbps</b>; 38.4 kbit/s.<br>5: <b>57.6 kbps</b>; 57.6 kbit/s.<br>6: <b>76.8 kbps</b>; 76.8 kbit/s.<br>7: <b>115.2 kbps</b>; 115.2 kbit/s.</td></tr>
<tr><td>2 … 7</td><td>19.2 kbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.05</b></td><td colspan="7"><b>Parity</b></td></tr>
<tr><td colspan="7">Embedded fieldbus, parity bit and stop bits.<br>Selects the type of parity bit and the number of stop bits.<br><b>Note</b>: Changes to 58.05 Parity take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.<br>0: <b>8 NONE 1</b>; eight data bits, no parity bit, one stop bit.<br>1: <b>8 NONE 2</b>; eight data bits, no parity bit, two stop bits.<br>2: <b>8 EVEN 1</b>; eight data bits, even parity bit, one stop bit.<br>3: <b>8 ODD 1</b>; eight data bits, odd parity bit, one stop bit.</td></tr>
<tr><td>0 … 3</td><td>8 EVEN 1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.06</b></td><td colspan="7"><b>Communication control</b></td></tr>
<tr><td colspan="7">Embedded fieldbus refresh command.<br>Applies any changed embedded fieldbus settings or activates silent mode. The value reverts automatically to Enabled, when the refresh is done.<br>0: <b>Enable</b>; normal operation or refreshing done.<br>1: <b>Refresh</b>; refresh changed configuration settings of the embedded fieldbus.<br>2: <b>Silent mode</b>; activate the silent mode. No messages are transmitted. Silent mode can be terminated by setting 58.06 Communication = Refresh.</td></tr>
<tr><td>0 … 2</td><td>Enable</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>58.07</b></td><td colspan="7"><b>Communication diagnostics</b></td></tr>
<tr><td colspan="7">Embedded fieldbus, communication status word.<br>Displays the status of the embedded fieldbus communication.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Init failed</td><td>1</td><td>Embedded fieldbus initialization failed.</td></tr>
<tr><td>1</td><td>Addr config err</td><td>1</td><td>Node address not allowed by protocol.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Silent mode</td><td>1</td><td>Drive not allowed transmitting.</td></tr>
<tr><td>0</td><td>Drive allowed transmitting.</td></tr>
<tr><td>3</td><td>reserved</td><td></td><td></td></tr>
<tr><td>4</td><td>Wiring error</td><td>1</td><td>Error detected: Possibly A/B wires swapped.</td></tr>
<tr><td>5</td><td>Parity error</td><td>1</td><td>Error detected: Check 58.04 Baud rate and 58.05 Parity.</td></tr>
<tr><td>6</td><td>Baud rate error</td><td>1</td><td>Error detected: Check 58.05 Parity and 58.04 Baud rate.</td></tr>
<tr><td>7</td><td>No bus activity</td><td>1</td><td>0 bytes received during the last 5 seconds</td></tr>
<tr><td>8</td><td>No packets</td><td>1</td><td>0 packets (addressed to any device) detected during the last 5 seconds.</td></tr>
</table></td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | 9 | Noise or addressing error | 1 | Error detected: Interference or another drive with the same address is online. | | | |
| | 10 | Comm loss | 1 | 0 packets addressed to the unit received within 58.16 Communication loss time. | | | |
| | 11 | CW/Ref loss | 1 | No control word or references received within 58.16 Communication loss time. | | | |
| | 12 | reserved | | | | | |
| | 13 | reserved | | | | | |
| | 14 | reserved | | | | | |
| | 15 | reserved | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **58.08** | **Received packets** | | | | | | |
| | Embedded fieldbus, number of received packets addressed to the drive.<br>Displays a count of valid packets addressed to the drive. During normal operation, this number increases constantly.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 4294967295 | 0 | - | 1 = 1 | y | n | Signal |
| **58.09** | **Transmitted packets** | | | | | | |
| | Embedded fieldbus, number of transmitted packets.<br>Displays a count of valid packets transmitted by the drive. During normal operation, this number increases constantly.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 4294967295 | 0 | - | 1 = 1 | y | n | Signal |
| **58.10** | **All packets** | | | | | | |
| | Embedded fieldbus, number of all received packets.<br>Displays a count of valid packets addressed to any device on the bus. During normal operation, this number increases constantly.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 4294967295 | 0 | - | 1 = 1 | y | n | Signal |
| **58.11** | **UART errors** | | | | | | |
| | Embedded fieldbus, number of UART errors.<br>Displays a count of character errors received by the drive. An increasing count indicates a configuration problem on the bus.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 4294967295 | 0 | - | 1 = 1 | y | n | Signal |
| **58.12** | **CRC errors** | | | | | | |
| | Embedded fieldbus, number of CRC errors.<br>Displays a count of packets with a CRC error received by the drive. An increasing count indicates interference on the bus.<br>Can be reset from the control panel by keeping Reset depressed for over 3 seconds. | | | | | | |
| | 0 … 4294967295 | 0 | - | 1 = 1 | y | n | Signal |
| **58.14** | **Communication loss action** | | | | | | |
| | Embedded fieldbus, communication loss action.<br>Selects how the drive reacts to a fieldbus communication loss.<br>**Note**: Changes to 58.14 Communication loss action take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.<br>0: **No action**; none, disable communication loss function.<br>1: **Fault**; the event generates fault 6681 EFB communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the fieldbus.<br>2: **Warning**; the event generates warning A7CE EFB communication. This occurs even though no control is expected from the fieldbus. | | | | | | |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | **WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>3: **Last speed**; the evet generates warning A7CE EFB communication and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>4: **Speed reference safe**; the event generates warning A7CE EFB communication and sets the speed to the value defined in 22.46 Speed reference safe.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>5: **Fault always**; the event generates fault 6681 EFB communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the fieldbus. | | | | | | |
| | 0 … 5 | No action | - | 1 = 1 | n | y | Parameter |
| **58.15** | **Communication loss mode** | | | | | | |
| | Embedded fieldbus, communication loss mode.<br>Defines which message types reset the timeout counter for detecting a fieldbus communication loss. See 58.14 Communication loss action and 58.16 Communication loss time.<br>**Note**: Changes to 58.15 Communication loss mode take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.<br>1: **Any message**; any message addressed to the drive resets the timeout.<br>2: **CW / Ref1 / Ref2**; a write of the control word or a reference from the fieldbus resets the timeout. | | | | | | |
| | 1 … 2 | CW / Ref1 / Ref2 | - | 1 = 1 | n | y | Parameter |
| **58.16** | **Communication loss time** | | | | | | |
| | Embedded fieldbus communication loss timeout.<br>Defines the time delay for the fieldbus communication before the action defined in 58.14 Communication loss action is executed. See 58.15 Communication loss mode.<br>**Note**: Changes to 58.16 Communication loss time take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control. | | | | | | |
| | 0 … 32500 | 300 | ms | 1 = 1 ms | n | y | Parameter |
| **58.17** | **Transmit delay** | | | | | | |
| | Embedded fieldbus minimum response delay.<br>Defines a minimum response delay in addition to any fixed delay imposed by the protocol.<br>**Note:** Changes to 58.17 Transmit delay take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control. | | | | | | |
| | 0 … 32500 | 0 | ms | 1 = 1 | n | y | Parameter |
| **58.18** | **EFB control word** | | | | | | |
| | Embedded fieldbus raw control word.<br>Displays the raw (unmodified) control word sent by the Modbus controller (e.g. PLC) to the drive. For debugging purposes. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **58.19** | **EFB status word** | | | | | | |
| | Embedded fieldbus raw status word.<br>Displays the raw (unmodified) status word sent by the drive to the Modbus controller (e.g. PLC). For debugging purposes. | | | | | | |
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |
| **58.25** | **Control profile** | | | | | | |
| | Embedded fieldbus control profile.<br>Defines the control profile used by the protocol. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0: <b>ABB Drives</b>; ABB Drives profile (with a 16-bit control word) with registers in the classic format for backward compatibility.<br>2: <b>Transparent</b>; transparent profile (16-bit or 32-bit control word) with registers in the classic format.</td></tr>
<tr><td>0 … 2</td><td>ABB Drives</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.26</b></td><td colspan="7"><b>EFB ref1 type</b></td></tr>
<tr><td colspan="7">Embedded fieldbus reference 1 type.<br>Selects the type and scaling of 03.09 EFB reference 1 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus.<br>0: <b>Auto</b>; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.
<table>
<tr><th>Parameter</th><th>Auto type and scaling</th></tr>
<tr><td>22.11 Speed reference 1 source</td><td rowspan="3">Speed</td></tr>
<tr><td>22.12 Speed reference 2 source</td></tr>
<tr><td>23.32 Direct speed reference</td></tr>
<tr><td>26.11 Torque reference 1 source</td><td rowspan="2">Torque</td></tr>
<tr><td>26.12 Torque reference 2 source</td></tr>
<tr><td>27.22 Current reference source</td><td>Current</td></tr>
<tr><td>28.18 EMF reference source</td><td rowspan="3">General</td></tr>
<tr><td>28.20 EMF voltage correction source</td></tr>
<tr><td>28.29 Flux correction source</td></tr>
</table>
1: <b>Transparent</b>; No scaling is applied.<br>2: <b>General</b>; Generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).<br>3: <b>Torque</b>; the scaling is defined by 46.04 M1 torque scaling actual.<br>4: <b>Speed</b>; the scaling is defined by 46.02 M1 speed scaling actual.<br>5: <b>Current</b>; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.27</b></td><td colspan="7"><b>EFB ref2 type</b></td></tr>
<tr><td colspan="7">Embedded fieldbus reference 2 type.<br>Selects the type and scaling of 03.10 EFB reference 2 sent by the Modbus controller (e.g. PLC) to the embedded fieldbus. See 58.26 EFB ref1 type.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>58.28</b></td><td colspan="7"><b>EFB act1 type</b></td></tr>
<tr><td colspan="7">Embedded fieldbus actual value 1 type.<br>Selects the type/source and scaling of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC).<br>0: <b>Auto</b>; type/source and scaling follow the type of reference 1 selected by 58.26 EFB ref1 type. For individual settings see below.<br>1: <b>Transparent</b>; The value selected by 58.31 EFB act1 transparent source is sent as actual value 1. No scaling is applied. The 16-bit scaling is 1 = 1 unit.<br>2: <b>General</b>; The value selected by parameter 58.31 EFB act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (e.g. integer and two decimals).<br>3: <b>Torque</b>; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual.<br>4: <b>Speed</b>; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual.<br>5: <b>Current</b>; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current.<br>6: <b>Position</b>; Motor position is sent as actual value 1. See 90.06 Motor position scaled.</td></tr>
<tr><td>0 … 6</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>58.29</b></td><td colspan="7"><b>EFB act2 type</b></td></tr>
<tr><td colspan="7">Embedded fieldbus actual value 2 type.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Selects the type/source and scaling of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC). See 58.28 EFB act1 type. | | | | | | |
| | 0 … 6 | Auto | - | 1 = 1 | n | y | Parameter |
| **58.30** | **EFB status word transparent source** | | | | | | |
| | Embedded fieldbus status word transparent source.<br>Selects the source of the status word when 58.25 Control profile = Transparent.<br>Other; source selection e.g. 06.15 Main Status Word.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **58.31** | **EFB act1 transparent source** | | | | | | |
| | Embedded fieldbus actual value 1 transparent source.<br>Selects the source of actual value 1 sent by the embedded fieldbus to the Modbus controller (e.g. PLC), when 58.28 EFB act1 type = Transparent or General.<br>**Other**; source selection e.g. a value from group 1.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **58.32** | **EFB act2 transparent source** | | | | | | |
| | Embedded fieldbus actual value 2 transparent source.<br>Selects the source of actual value 2 sent by the embedded fieldbus to the Modbus controller (e.g. PLC), when 58.29 EFB act2 type = Transparent or General.<br>**Other**; source selection e.g. a value from group 1.<br>0: **Not selected**; no source selected. | | | | | | |
| | 0 … 0 | Not selected | - | 1 = 1 | n | y | Parameter |
| **58.33** | **Addressing mode** | | | | | | |
| | Embedded fieldbus addressing mode.<br>Defines the mapping between parameters and holding registers in the 400101 … 465535 Modbus register range.<br>**Note**: Changes to 58.33 Addressing mode take effect after the unit is rebooted or the new setting is validated by 58.06 Communication control.<br>0: **Mode 0**; 16-bit values (groups 1 … 99, indexes 1 … 99):<br>Register address = 400000 + 100 × parameter group + parameter index.<br>For example, parameter 22.80 would be mapped to register 400000 + 2200 + 80 = 402280.<br>32-bit values (groups 1 … 99, indexes 1 … 99):<br>Register address = 420000 + 200 × parameter group + 2 × parameter index.<br>For example, parameter 22.80 would be mapped to register 420000 + 4400 + 160 = 424560.<br>1: **Mode 1**; 16-bit values (groups 1 … 255, indexes 1 … 255):<br>Register address = 400000 + 256 × parameter group + parameter index.<br>For example, parameter 22.80 would be mapped to register 400000 + 5632 + 80 = 405712.<br>2: **Mode 2**; 32-bit values (groups 1 … 127, indexes 1 … 255):<br>Register address = 400000 + 512 × parameter group + 2 × parameter index.<br>For example, parameter 22.80 would be mapped to register 400000 + 11264 + 160 = 411424. | | | | | | |
| | 0 … 2 | Mode 0 | - | 1 = 1 | n | y | Parameter |
| **58.34** | **Word order** | | | | | | |
| | Embedded fieldbus word order.<br>Selects in which order 16-bit registers of 32-bit parameters are transferred. For each register, the first byte contains the high order byte and the second byte contains the low order byte.<br>**Note:** Changes to 58.34 Word order take effect after the drive is rebooted or the new setting is validated by 58.06 Communication control.<br>0: **HI-LO**; the 1st register contains the high order word. The 2nd register contains the low order word. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 1: **LO-HI**; the 1st register contains the low order word. The 2nd register contains the high order word. | | | | | | |
| | 0 … 1 | LO-HI | - | 1 = 1 | n | y | Parameter |
| **58.101 to 58.124** | **Data I/O 1 … Data I/O 24** | | | | | | |
| | Embedded fieldbus I/O data.<br>Defines the address in the drive, which the Modbus master accesses when it reads from or writes to register address 400001 … 400024.<br>The master defines the type of the data (input/output). The value is transmitted in a Modbus frame consisting of two 16- bit words. If the value is 16-bit, it is transmitted in the LSW (least significant word). If the value is 32-bit, the subsequent parameter is also reserved for it and must be set to None.<br>**Notes**:<br>– Input means data transfer from the drive to the master (e.g. PLC).<br>– Output means data from the master (e.g. PLC) to the drive.<br>**Other**; source selection (10 ms update).<br>0: **None**; inactive. Data I/O is disabled.<br>1: **CW 16bit**; control word (16-bit) (2 ms update). Taken from 06.09 Used main control word./Send to 06.01 Main control word.<br>2: **Ref1 16bit**; reference 1 REF1 (16-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1.<br>3: **Ref2 16bit**; reference 2 REF2 (16-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2.<br>4: **SW 16bit**; status word (16-bit) (2 ms update). Taken from 06.15 Main status word./NA.<br>5: **Act1 16bit**; actual value 1 ACT1 (16-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA.<br>6: **Act2 16bit**; actual value 2 ACT2 (16-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA.<br>11: **CW 32bit**; control word (32-bit) (2 ms update). Taken from 06.09 Used main control word./Send to 06.01 Main control word.<br>12: **Ref1 32bit**; reference 1 REF1 (32-bit) (2 ms update). Taken from 03.09 EFB reference 1./Send to 03.09 EFB reference 1.<br>13: **Ref2 32bit**; reference 2 REF2 (32-bit) (2 ms update). Taken from 03.10 EFB reference 2./Send to 03.10 EFB reference 2.<br>14: **SW 32bit**; status word (32-bit) (2 ms update). Taken from 06.15 Main status word.<br>15: **Act1 32bit**; actual value 1 ACT1 (32-bit) (2 ms update). Depending on 58.28 EFB act1 type./NA.<br>16: **Act2 32bit**; actual value 2 ACT2 (32-bit) (2 ms update). Depending on 58.29 EFB act2 type./NA.<br>21: **CW2 16bit**; status word 2 (16-bit) (2 ms update).<br>24: **SW2 16bit**; status word 2 (16-bit) (2 ms update).<br>31: **RO/DIO control word**; see 10.99 RO/DIO control word. Taken from 10.99 RO/DIO control word./Send to 10.99 RO/DIO control word.<br>32: **AO1 data storage**; see 13.91 AO1 data storage. Taken from 13.91 AO1 data storage./Send to 13.91 AO1 data storage.<br>33: **AO2 data storage**; see 13.92 AO2 data storage. Taken from 13.92 AO2 data storage./Send to 13.92 AO2 data storage.<br>40: **Feedback data storage**; see 40.91 Feedback data storage. Taken from 40.91 Feedback data storage./Send to 40.91 Feedback data storage.<br>41: **Setpoint data storage**; see 40.92 Setpoint data storage. Taken from 40.92 Setpoint data storage./Send to 40.92 Setpoint data storage. | | | | | | |
| | 0 … 41 | None | - | 1 = 1 | n | y | Parameter |

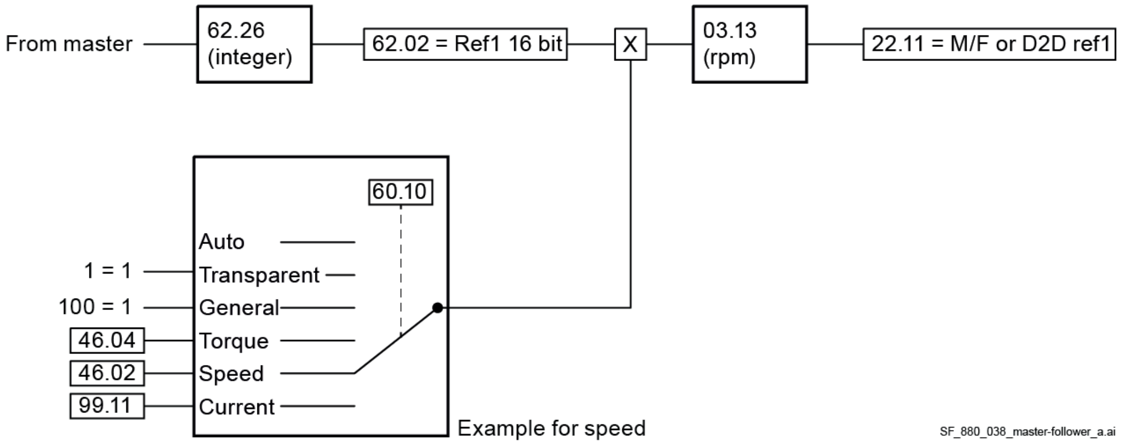
## 60 DDCS Communication

DDCS communication configuration.
The DDCS protocol is used in the communication between:
Drives in a master-follower configuration.
Drives and an external controller such as an AC 800M.
All of the above utilize a fiber optic link, which requires FDCO modules. Master-follower and external controller communication can also be implemented through shielded twisted-pair cable via connector XD2D (drive-to-drive link) of the drive.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>60.01</b></td><td colspan="7"><b>M/F communication port</b></td></tr>
<tr><td colspan="7">Master-follower link, communication port.<br>Selects the connection used by the master-follower link.<br>0: <b>Not in use</b>; not in use, communication is disabled.<br>1: <b>Slot 1A</b>; activates channel A on the FDCO-0x which is located in slot 1.<br>2: <b>Slot 2A</b>; activates channel A on the FDCO-0x which is located in slot 2.<br>3: <b>Slot 3A</b>; activates channel A on the FDCO-0x which is located in slot 3.<br>4: <b>Slot 1B</b>; activates channel B on the FDCO-0x which is located in slot 1.<br>5: <b>Slot 2B</b>; activates channel B on the FDCO-0x which is located in slot 2.<br>6: <b>Slot 3B</b>; activates channel B on the FDCO-0x which is located in slot 3.<br>7: <b>XD2D</b>; activates connector XD2D.</td></tr>
<tr><td>0 … 7</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.02</b></td><td colspan="7"><b>M/F node address</b></td></tr>
<tr><td colspan="7">Master-follower link, node address.<br>Defines the node address of the drive for the master-follower link. Two drives with the same node address are not allowed.<br><b>Notes:</b><br>– The allowable address for the master is 1.<br>– The allowable addresses for followers are 2 … 254.</td></tr>
<tr><td>1 … 254</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.03</b></td><td colspan="7"><b>M/F mode</b></td></tr>
<tr><td colspan="7">Master-follower link, mode.<br>Defines the role of the drive on the master-follower link.<br>0: <b>Not in use</b>; not in use, master-follower link is disabled.<br>1: <b>FDCO-XD2D Master</b>; the drive is the master on the master-follower link either via FDCO-0x or via connector XD2D.<br>2: <b>FDCO-XD2D Follower</b>; the drive is a follower on the master-follower link either via FDCO-0x or via connector XD2D.<br>3: <b>ApplPrg Master</b>; reserved.<br>4: <b>ApplPrg Follower</b>; reserved.<br>5: <b>FDCO-XD2D forcing</b>; the role of the drive on the master-follower link is defined by 60.15 Force master and 60.16 Force follower.<br>6: <b>ApplPrg forcing</b>; reserved.</td></tr>
<tr><td>0 … 5</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.05</b></td><td colspan="7"><b>M/F HW connection</b></td></tr>
<tr><td colspan="7">Master-follower link, hardware connection.<br>Selects the topology of the master-follower link.<br>0: <b>Ring</b>; The drives are connected in a ring topology. Forwarding of messages is enabled. Not to be set when using connector XD2D.<br>1: <b>Star</b>; The drives are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled. To be set when using connector XD2D.<br><b>Note:</b> Set to Star, if the master-follower link is made using connector XD2D.</td></tr>
<tr><td>0 … 1</td><td>Ring</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>60.08</b></td><td colspan="7"><b>M/F comm loss timeout</b></td></tr>
<tr><td colspan="7">Master-follower link, loss timeout.</td></tr>
</table>

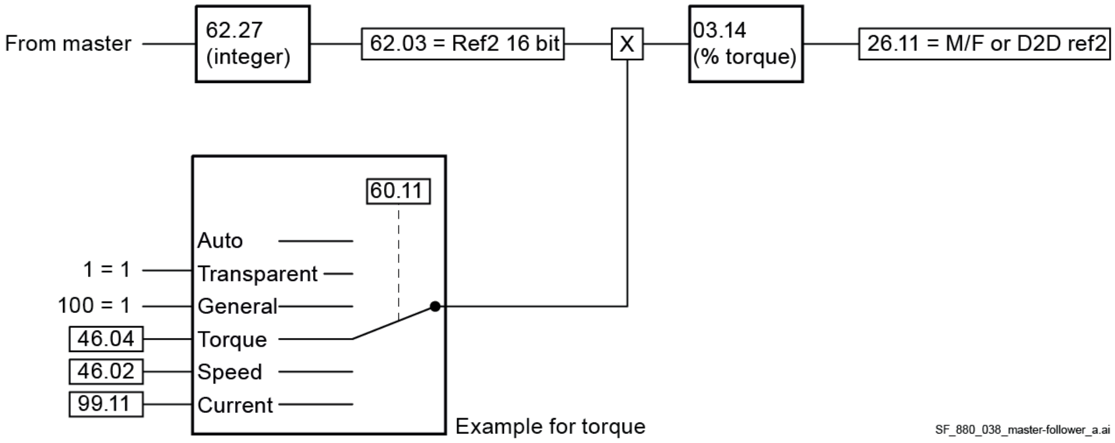
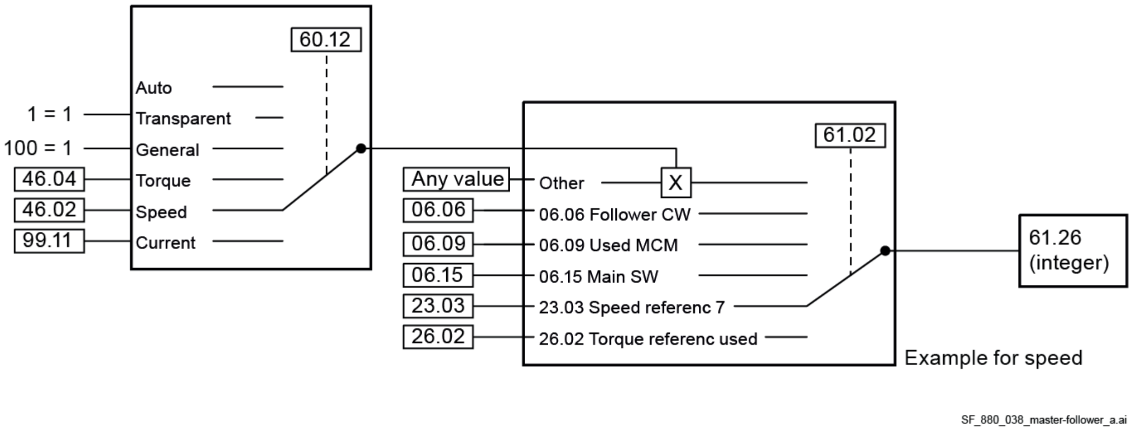
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Defines the time delay for the master-follower link before the action defined in 60.09 M/F comm loss function is executed. | | | | | | |
| | 0 … 65535 | 100 | ms | 1 = 1 ms | n | y | Parameter |
| **60.09** | **M/F comm loss function** | | | | | | |
| | Master-follower link, loss action.<br>Selects how the drive reacts to a master-follower link loss.<br>0: **No action**; none, disable communication loss function.<br>1: **Warning**; the event generates warning A7CB Master-follower communication. This occurs only when the drive is controlled from the master-follower link.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>2: **Fault**; the event generates fault 7582 Master-follower communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the master-follower link.<br>3: **Fault always**; the event generates fault 7582 Master-follower communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the master-follower link. | | | | | | |
| | 0 … 3 | Fault | - | 1 = 1 | n | y | Parameter |
| **60.10** | **M/F ref1 type** | | | | | | |

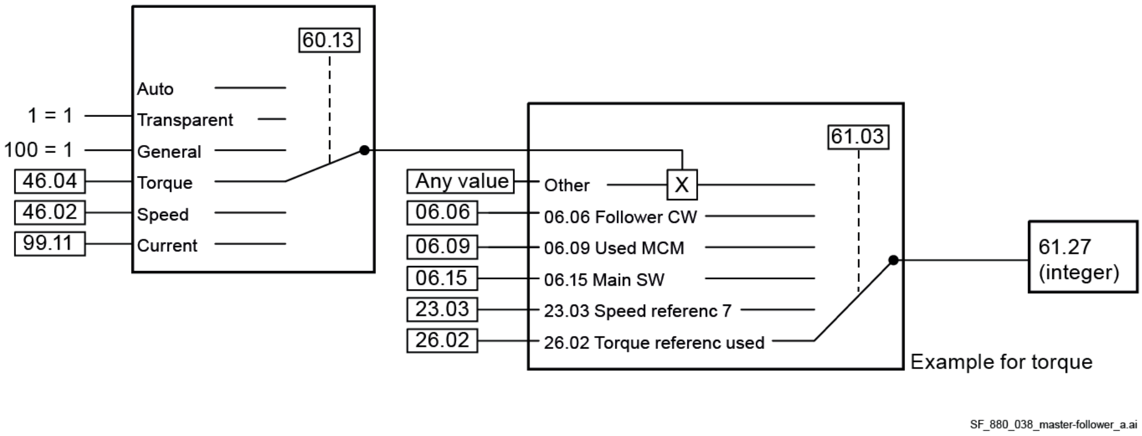
Master-follower link, reference 1 type.
Selects the type and scaling of reference 1 received from the master-follower link, if any parameter 62.01 …. 62.03 is set to Ref1 16bit. The received and scaled value is then sent to 03.13 M/F or D2D ref1.
**Example:** In the follower set 60.10 M/F ref1 type = Speed to receive a speed reference from the master:



0: **Auto**; automatic type and scaling according to which reference chain 03.13 M/F or D2D ref1 is connected to. If 03.13 M/F or D2D ref1 is not connected to any chain, setting Transparent is applied.

| Parameter | Auto type and scaling |
|---|---|
| 22.11 Speed reference 1 source | Speed |
| 22.12 Speed reference 2 source | |
| 23.32 Direct speed reference | |
| 26.11 Torque reference 1 source | Torque |
| 26.12 Torque reference 2 source | |
| 27.22 Current reference source | Current |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 1: **Transparent**; no scaling is applied.<br>2: **General**; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).<br>3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual.<br>4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual.<br>5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %. | | | | | | |
| | 0 … 5 | Speed | - | 1 = 1 | n | y | Parameter |
| **60.11** | **M/F ref2 type** | | | | | | |
| | Master-follower link, reference 2 type.<br>Selects the type and scaling of reference 2 received from the master-follower link, if any parameter 62.01 …. 62.03 is set to Ref2 16bit. The received and scaled value is then sent to 03.14 M/F or D2D ref2. See 60.10 M/F ref1 type.<br>**Example:** In the follower set 60.11 M/F ref2 type = Torque to receive a torque reference from the master:<br> | | | | | | |
| | 0 … 5 | Torque | - | 1 = 1 | n | y | Parameter |
| **60.12** | **M/F act1 type** | | | | | | |
| | Master-follower link, actual value 1 type.<br>Selects the transmit type and scaling if 61.02 M/F data 2 selection = Other.<br>**Example:** In the follower set 60.12 M/F act1 type = Speed to send a speed feedback to the master:<br> | | | | | | |

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 0: **Auto**; type/source and scaling follow the type of reference 1 selected by 60.10 M/F ref1 type. For individual settings see below.<br>1: **Transparent**; no scaling is applied. The 16-bit scaling is 1 = 1 unit. Only valid for 61.02 M/F data 2 selection = Other.<br>2: **General**; generic actual value with a scaling of 100 = 1 (e.g. integer and two decimals). Only valid for 61.02 M/F data 2 selection = Other.<br>3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual. Only valid for 61.02 M/F data 2 selection = Other.<br>4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual. Only valid for 61.02 M/F data 2 selection = Other.<br>5: **Current**; the scaling is in percent of 99.11 M1 nominal current. Only valid for 61.02 M/F data 2 selection = Other. | | | | | | |
| | 0 … 5 | Speed | - | 1 = 1 | n | y | Parameter |
| **60.13** | **M/F act2 type** | | | | | | |
| | Master-follower link, actual value 2 type.<br>Selects the transmit type and scaling if 61.03 M/F data 3 selection = Other.<br>See 60.12 M/F act1 type.<br>**Example:** In the follower set 60.13 M/F act2 type = Torque to send a torque feedback to the master:<br> | | | | | | |
| | 0 … 5 | Torque | - | 1 = 1 | n | y | Parameter |
| **60.14** | **M/F follower selection** | | | | | | |
| | Master-follower link, follower supervision selection (master only).<br>Defines the supervised followers. Reaction see 60.17 Follower fault action. Values are visible in parameters 62.28 … 62.36.<br>0: **Broadcast**; supervision is disabled.<br>2: **Follower node 2**; data is read from follower node 2, supervision is enabled.<br>4: **Follower node 3**; data is read from follower node 3, supervision is enabled.<br>6: **Follower node 2+3**; data is read from followers node 2 and 3, supervision is enabled.<br>8: **Follower node 4**; data is read from follower node 4, supervision is enabled.<br>10: **Follower node 2+4**; data is read from followers node 2 and 4, supervision is enabled.<br>12: **Follower node 3+4**; data is read from followers node 3 and 4, supervision is enabled.<br>14: **Follower node 2+3+4**; data is read from followers node 2, 3 and 4, supervision is enabled. | | | | | | |
| | 0 … 14 | Broadcast | - | 1 = 1 | n | y | Parameter |
| **60.15** | **Force master** | | | | | | |
| | Master-follower link, force master.<br>When 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.15 Force master selects a source that forces the drive to be the master on the master-follower link. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0 = Drive is not the master on the master-follower link.<br>1 = Drive is the master on the master-follower link.<br>**Other [bit]**; source selection.<br>0: **False**; 0, not the master.<br>1: **True**; 1, the master.</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.16**</td><td colspan="7">**Force follower**</td></tr>
<tr><td colspan="7">Master-follower link, force follower.<br>When 60.03 M/F mode is set to FDCO-XD2D forcing or ApplPrg forcing, 60.16 Force follower selects a source that forces the drive to be a follower on the master-follower link.<br>0 = Drive is not a follower on the master-follower link.<br>1 = Drive is a follower on the master-follower link.<br>**Other [bit]**; source selection.<br>0: **False**; 0, not a follower.<br>1: **True**; 1, a follower.</td></tr>
<tr><td>0 … 1</td><td>False</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.17**</td><td colspan="7">**Follower fault action**</td></tr>
<tr><td colspan="7">Master-follower link, follower faulty action (master only).<br>Selects how the master reacts to a faulty follower on the master-follower link.<br>0: **No action**; no action taken. Unaffected drives on the master-follower link will continue running.<br>1: **Warning**; the event generates warning AFE7 Follower in the master. Unaffected drives on the master-follower link will continue running.<br>2: **Fault**; the event generates fault FF7E Follower in the master and the motor(s) stop(s) according to 31.13 Fault stop mode communication.<br>**Note:** Each follower to be supervised must be configured to feed 06.15 Main status word back to the master. Thus:<br>– In all followers one of the three data words in parameters 62.04 … 62.12 must be set to 06.15 Main SW.<br>– In the master the corresponding target parameter 62.04 … 62.14 must be set to Follower SW node x.</td></tr>
<tr><td>0 … 2</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**60.18**</td><td colspan="7">**Follower enable**</td></tr>
<tr><td colspan="7">Master-follower link, follower enable action (master only).<br>Interlocks the starting of the master depending on the status of all followers on the master-follower link.<br>0: **MSW bit 0**; the master can only start if all followers are Ready to be switched on, see 06.15.b0 Main status word.<br>1: **MSW bit 1**; the master can only start if all followers are Ready to operate, see 06.15.b1 Main status word.<br>2: **MSW bits 0+1**; the master can only start if all followers are Ready to be switched on and Ready to operate, see 06.15.b0 Main status word and 06.15.b1 Main status word.<br>3: **Always**; the starting of the master is not interlocked by the status of any follower.<br>4: **MSW bit 12**; the master can only start if the user-definable 06.11.b12 Main status word in each follower is set. See 06.31 MSW bit 12 sel.<br>5: **MSW bits 0+12**; the master can only start if in all followers 06.11.b0 Main status word and 06.11.b12 Main status word are set.<br>6: **MSW bits 1+12**; the master can only start if in all followers 06.11.b1 Main status word and 06.11.b12 Main status word are set.<br>**Note:** Each follower to be supervised must be configured to feed 06.15 Main status word back to the master. Thus:<br>– In all followers one of the three data words in parameters 62.04 … 62.12 must be set to 06.15 Main SW.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– In the master the corresponding target parameter 62.04 … 62.14 must be set to Follower SW node x.</td></tr>
<tr><td>0 … 6</td><td>Always</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.31**</td><td colspan="7">**M/F wake up delay**</td></tr>
<tr><td colspan="7">Master-follower link, wake-up delay.<br>Defines a wake-up delay during which no master-follower communication faults or warnings can be generated. This allows all drives on the master-follower link to power up without causing nuisance events.<br>The master cannot start until the delay is elapsed or all monitored followers are Ready to be switched on, see 06.15.b0 Main status word.</td></tr>
<tr><td>0.0 … 180.0</td><td>10.0</td><td>s</td><td>10 = 1 s</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.41**</td><td colspan="7">**Extension adapter com port**</td></tr>
<tr><td colspan="7">FEA-03 extension adapter communication port.<br>Selects the connection used by the FEA-03 extension adapter.<br>0: **Not in use**; not in use, communication is disabled.<br>1: **Slot 1A**; activates channel A on the FDCO-0x which is located in slot 1.<br>2: **Slot 2A**; activates channel A on the FDCO-0x which is located in slot 2.<br>3: **Slot 3A**; activates channel A on the FDCO-0x which is located in slot 3.<br>4: **Slot 1B**; activates channel B on the FDCO-0x which is located in slot 1.<br>5: **Slot 2B**; activates channel B on the FDCO-0x which is located in slot 2.<br>6: **Slot 3B**; activates channel B on the FDCO-0x which is located in slot 3.</td></tr>
<tr><td>0 … 6</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.50**</td><td colspan="7">**DDCS controller drive type**</td></tr>
<tr><td colspan="7">DDCS controller link, communication type of drive.<br>In ModuleBus communication, defines whether the drive is of “engineered” or “standard” type.<br>0: **ABB engineered drive**; the drive is an “engineered drive” (data sets 10 … 25 are used).<br>1: **ABB standard drive**; the drive is a “standard drive” (data sets 1 … 4 are used).</td></tr>
<tr><td>0 … 1</td><td>ABB engineered drive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.51**</td><td colspan="7">**DDCS controller comm port**</td></tr>
<tr><td colspan="7">DDCS controller link, communication port.<br>Selects the connection used by a DDCS controller (such as an AC 800M).<br>0: **Not in use**; not in use, communication is disabled.<br>1: **Slot 1A**; activates channel A on the FDCO-0x which is located in slot 1.<br>2: **Slot 2A**; activates channel A on the FDCO-0x which is located in slot 2.<br>3: **Slot 3A**; activates channel A on the FDCO-0x which is located in slot 3.<br>4: **Slot 1B**; activates channel B on the FDCO-0x which is located in slot 1.<br>5: **Slot 2B**; activates channel B on the FDCO-0x which is located in slot 2.<br>6: **Slot 3B**; activates channel B on the FDCO-0x which is located in slot 3.<br>7: **XD2D**; activates connector XD2D.</td></tr>
<tr><td>0 … 7</td><td>Not in use</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2">**60.52**</td><td colspan="7">**DDCS controller node address**</td></tr>
<tr><td colspan="7">DDCS controller link, node address.<br>Defines the node address of the drive for the DDCS controller. Two drives with the same node address are not allowed.<br>DriveBus connection:<br>– AC 800M with CI858, drives must be addressed from 1 … 24.<br>– AC 80, drives must be addressed from 1 … 12.<br>Optical ModuleBus:<br>– AC 800M, drives must be addressed the following way:<br>4. Multiply the hundreds of the position value by 16.<br>5. Add the tens and ones of the position value to the result.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">Examples:<br><table><tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr><tr><td>101</td><td>16 • 1 + 01 = 17</td></tr><tr><td>712</td><td>16 • 7 + 12 = 124</td></tr></table><br>– AC 80 with TB810 or TB811, drives must be addressed the following way:<br>1. Multiply the hundreds of the position value by 16.<br>6. Add the tens and ones of the position value to the result.<br>Examples:<br><table><tr><td>Position value</td><td>60.52 DDCS controller node address</td></tr><tr><td>101</td><td>16 • 1 + 01 = 17</td></tr><tr><td>712</td><td>16 • 7 + 12 = 124</td></tr></table></td></tr>
<tr><td></td><td>1 … 254</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.55</b></td><td colspan="7"><b>DDCS controller HW connection</b></td></tr>
<tr><td colspan="7">DDCS controller link, hardware connection.<br>Selects the topology of the DDCS controller link.<br>0: <b>Ring</b>; The drives are connected in a ring topology. Forwarding of messages is enabled.<br>1: <b>Star</b>; The drives are connected in a star topology, e.g. through a branching unit. Forwarding of messages is disabled.</td></tr>
<tr><td>0 … 1</td><td>Star</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.56</b></td><td colspan="7"><b>DDCS controller baud rate</b></td></tr>
<tr><td colspan="7">DDCS controller link, link speed.<br>Selects the communication speed of the DDCS controller link channel selected by 60.51 DDCS controller comm port.<br>1: 1 <b>Mbps</b>; 1 Mbit/s.<br>2: <b>2 Mbps</b>; 2 Mbit/s.<br>4: <b>4 Mbps</b>; 4 Mbit/s.<br>8: <b>8 Mbps</b>; 8 Mbit/s.</td></tr>
<tr><td>1 … 8</td><td>4 Mbps</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>60.58</b></td><td colspan="7"><b>DDCS controller comm loss time</b></td></tr>
<tr><td colspan="7">DDCS controller link, loss timeout.<br>Defines the time delay for the DDCS controller link before the action defined in 60.59 DDCS controller comm loss function is executed.<br><b>Notes:</b><br>– 60.58 DDCS controller comm loss time should be set to at least 3 times the transmit interval of the DDCS controller.<br>– There is a 60-second boot-up delay immediately after power-up of the drive. During the delay, the communication loss function is disabled, but communication itself can be active.<br>– The AC 800M immediately detects a communication break. Re-establishing the communication is done at 9-second idle intervals.<br>– The sending interval of a data set is not the same as the execution interval of the application task. When using ModuleBus, the sending interval is defined by the DDCS controller parameter Scan Cycle Time (by default, 100 ms).</td></tr>
<tr><td>0 … 65535</td><td>100</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>60.59</b></td><td colspan="7"><b>DDCS controller comm loss function</b></td></tr>
<tr><td colspan="7">DDCS controller link, loss action.<br>Selects how the drive reacts to a DDCS controller link loss.<br>0: <b>No action</b>; none, disable communication loss function.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1: **Fault**; the event generates fault 7581 DDCS controller comm loss and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled from the DDCS controller link.<br>2: **Last speed**; the evet generates warning A7CA DDCS controller comm loss and freezes the speed to the level the drive was operating at. This occurs only when the drive is controlled from the DDCS controller link. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>3: **Speed reference safe**; the event generates warning A7CA DDCS controller comm loss and sets the speed to the value defined in 22.46 Speed reference safe. This occurs only when the drive is controlled from the DDCS controller link.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.<br>4: **Fault always**; the event generates fault 7581 DDCS controller comm loss and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected from the DDCS controller link.<br>5: **Warning**; the event generates warning A7CA DDCS controller comm loss. This occurs only when the drive is controlled from the DDCS controller link.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break.</td></tr>
<tr><td>0 … 5</td><td>No action</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.60**</td><td colspan="7">**DDCS controller ref1 type**</td></tr>
<tr><td colspan="7">DDCS controller link, reference 1 type.<br>Selects the type and scaling of 03.11 DDCS controller ref 1 send by the DDCS controller to a DDCS communication option module (FDCO-0x).<br>0: **Auto**; automatic type and scaling according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, setting Transparent is applied.
<table>
<tr><th>Parameter</th><th>Auto type and scaling</th></tr>
<tr><td>22.11 Speed reference 1 source</td><td rowspan="3">Speed</td></tr>
<tr><td>22.12 Speed reference 2 source</td></tr>
<tr><td>23.32 Direct speed reference</td></tr>
<tr><td>26.11 Torque reference 1 source</td><td rowspan="2">Torque</td></tr>
<tr><td>26.12 Torque reference 2 source</td></tr>
<tr><td>27.22 Current reference source</td><td>Current</td></tr>
<tr><td>28.18 EMF reference source</td><td rowspan="3">General</td></tr>
<tr><td>28.20 EMF voltage correction source</td></tr>
<tr><td>28.29 Flux correction source</td></tr>
</table>
1: **Transparent**; no scaling is applied.<br>2: **General**; generic reference with a scaling of 100 = 1 (e.g. integer and two decimals).<br>3: **Torque**; the scaling is defined by 46.04 M1 torque scaling actual.<br>4: **Speed**; the scaling is defined by 46.02 M1 speed scaling actual.<br>5: **Current**; the scaling is in percent of 99.11 M1 nominal current: 100 = 1 %.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.61**</td><td colspan="7">**DDCS controller ref2 type**</td></tr>
<tr><td colspan="7">DDCS controller link, reference 2 type.<br>Selects the type and scaling of 03.12 DDCS controller ref 2 send by the DDCS controller to a DDCS communication option module (FDCO-0x). See 60.60 DDCS controller ref1 type.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**60.62**</td><td colspan="7">**DDCS controller act1 type**</td></tr>
<tr><td colspan="7">DDCS controller link, actual value 1 type.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the type/source and scaling of actual value 1 sent by a DDCS communication option module (FDCO-0x) to the DDCS controller.<br>0: **Auto**; type/source and scaling follow the type of reference 1 selected by 60.60 DDCS controller ref1 type. For individual settings see below.<br>1: **Transparent**; no scaling is applied. The 16-bit scaling is 1 = 1 unit.<br>2: **General**; generic actual value with a scaling of 100 = 1 (e.g. integer and two decimals).<br>3: **Torque**; 01.17 Motor torque filtered is sent as actual value 1. The scaling is defined by 46.04 M1 torque scaling actual.<br>4: **Speed**; 01.01 Used motor speed filtered is sent as actual value 1. The scaling is defined by 46.02 M1 speed scaling actual.<br>5: **Current**; 27.05 Motor current is sent as actual value 1. The scaling is in percent of 99.11 M1 nominal current.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.63**</td><td colspan="7">**DDCS controller act2 type**</td></tr>
<tr><td colspan="7">DDCS controller link, actual value 2 type.<br>Selects the type/source and scaling of actual value 2 sent by a DDCS communication option module (FDCO-0x) to the DDCS controller. See 60.62 DDCS controller act1 type.</td></tr>
<tr><td>0 … 5</td><td>Auto</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**60.64**</td><td colspan="7">**Mailbox dataset selection**</td></tr>
<tr><td colspan="7">DDCS controller link, mailbox dataset selection.<br>Selects the pair of data sets used by the mailbox service in the DDCS controller link. See chapter *External controller interface*.<br>0: **Dataset 32/33**; data sets 32 and 33 are dedicated for the mailbox service.<br>1: **Dataset 24/25**; Data sets 24 and 25 are dedicated for the mailbox service.</td></tr>
<tr><td>0 … 1</td><td>Dataset 32/33</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 61 D2D and DDCS transmit data

Defines the data sent from the drive to the DDCS/D2D link.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**61.01**</td><td colspan="7">**M/F data 1 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 1 from the drive to the master-follower link.<br>Select data sent as word 1 from the drive to the master-follower link. The value is visible in 61.25 M/F data 1 value.<br>**Other**; source selection. Always transparent (unscaled).<br>0: **None**; inactive.<br>1542: **06.06 Follower CW**; 06.06 Follower control word.<br>1545: **06.09 Used MCW**; 06.09 Used main control word.<br>1551: **06.15 Main SW**; 06.15 Main status word.<br>5891: **23.03 Speed reference 7**; 23.03 Speed reference 7.<br>6658: **26.02 Torque reference used**; 26.02 Torque reference used.</td></tr>
<tr><td>0 … 6658</td><td>06.06 Follower CW</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**61.02**</td><td colspan="7">**M/F data 2 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 2 from the drive to the master-follower link.<br>Select data sent as word 2 from the drive to the master-follower link. The value is visible in 61.26 M/F data 2 value.<br>**Other**; source selection. Type and scaling is set by 60.12 M/F act1 type.<br>See 61.01 M/F data 1 selection.</td></tr>
<tr><td>0 … 6658</td><td>23.03 Speed reference 7</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**61.03**</td><td colspan="7">**M/F data 3 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 3 from the drive to the master-follower link.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | Select data sent as word 3 from the drive to the master-follower link. The value is visible in 61.27 M/F data 3 value.<br>**Other**; source selection. Type and scaling is set by 60.13 M/F act2 type.<br>See 61.01 M/F data 1 selection. | | | | | | |
| | 0 … 6658 | 26.02 Torque reference used | - | 1 = 1 | n | y | Parameter |
| **61.25** | **M/F data 1 value** | | | | | | |
| | Master-follower link, data 1 value from the drive to the master-follower link.<br>Shows the value sent as word 1 to the master-follower link as integer.<br>If no data has been preselected by 61.01 M/F data 1 selection, the value to be sent can be written directly into 61.25 M/F data 1 value. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **61.26** | **M/F data 2 value** | | | | | | |
| | Master-follower link, data 2 value from the drive to the master-follower link.<br>Shows the value sent as word 2 to the master-follower link as integer.<br>If no data has been preselected by 61.02 M/F data 2 selection, the value to be sent can be written directly into 61.26 M/F data 2 value. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **61.27** | **M/F data 3 value** | | | | | | |
| | Master-follower link, data 3 value from the drive to the master-follower link.<br>Shows the value sent as word 3 to the master-follower link as integer.<br>If no data has been preselected by 61.03 M/F data 3 selection, the value to be sent can be written directly into 61.27 M/F data 3 value. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **.** | Parameters 61.45 … 61.50 select data sent from the drive in data sets 2 and 4 to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive.<br>Signals 61.95 … 61.100 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals.<br>**Example:** 61.45 Data set 2 data 1 selection preselects the data for data set 2 word 1. 61.95 Data set 2 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into parameter 61.95 Data set 2 data 1 value. | | | | | | |
| **61.45** | **Data set 2 data 1 selection** | | | | | | |
| | DDCS controller link, data set 2 data 1 from the drive to the DDCS controller link.<br>Select data sent as data set 2 data 1 from the drive to the DDCS controller link. The value is visible in 61.95 Data set 2 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive. DDCS controller link data in is disabled.<br>4: **SW 16bit**; status word (16-bit). Taken from 06.15 Main status word.<br>5: **Act1 16bit**; actual value 1 ACT1 (16-bit). Depending on 60.62 DDCS controller act1 type.<br>6: **Act2 16bit**; actual value 2 ACT2 (16-bit). Depending on 60.63 DDCS controller act2 type. | | | | | | |
| | 0 … 6 | None | - | 1 = 1 | n | y | Parameter |
| **61.46** | **Data set 2 data 2 selection** | | | | | | |
| | DDCS controller link, data set 2 data 2 from the drive to the DDCS controller link.<br>Select data sent as data set 2 data 2 from the drive to the DDCS controller link. The value is visible in 61.96 Data set 2 data 2 value. See 61.45 Data set 2 data 1 selection. | | | | | | |
| | 0 … 6 | None | - | 1 = 1 | n | y | Parameter |
| **61.47 to 61.50** | **Data set 2 data 3 selection … Data set 4 data 3 selection** | | | | | | |
| | See 61.45 Data set 2 data 1 selection. | | | | | | |
| | 0 … 6 | None | - | 1 = 1 | n | y | Parameter |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td>.</td><td colspan="7">Parameters 61.51 … 61.74 select data sent from the drive in data sets 11, 13, 15, 17, 19, 21, 23 and 25 to the DDCS controller. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive.<br>Signals 61.101 … 61.124 display the data to be sent to the DDCS controller in integer format. If no data has been preselected, the value to be sent can be written directly into these signals.<br><b>Example:</b> 61.51 Data set 11 data 1 selection preselects the data for data set 11 word 1. 61.101 Data set 11 data 1 value displays the selected data in integer format. If no data is preselected, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.</td></tr>
<tr><td rowspan="3"><b>61.51</b></td><td colspan="7"><b>Data set 11 data 1 selection</b></td></tr>
<tr><td colspan="7">DDCS controller link, data set 11 data 1 from the drive to the DDCS controller link.<br>Select data sent as data set 11 data 1 from the drive to the DDCS controller link. The value is visible in 61.101 Data set 11 data 1 value.<br><b>Other</b>; source selection.<br>0: <b>None</b>; inactive. DDCS controller link data in is disabled.<br>4: <b>SW 16bit</b>; status word (16-bit). Taken from 06.15 Main status word.<br>5: <b>Act1 16bit</b>; actual value 1 ACT1 (16-bit). Depending on 60.62 DDCS controller act1 type.<br>6: <b>Act2 16bit</b>; actual value 2 ACT2 (16-bit). Depending on 60.63 DDCS controller act2 type.</td></tr>
<tr><td>0 … 6</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>61.52</b></td><td colspan="7"><b>Data set 11 data 2 selection</b></td></tr>
<tr><td colspan="7">DDCS controller link, data set 11 data 2 from the drive to the DDCS controller link.<br>Select data sent as data set 11 data 2 from the drive to the DDCS controller link. The value is visible in 61.102 Data set 11 data 2 value. See 61.51 Data set 11 data 1 selection.</td></tr>
<tr><td>0 … 6</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>61.53 to 61.74</b></td><td colspan="7"><b>Data set 11 data 3 selection … Data set 25 data 3 selection</b></td></tr>
<tr><td colspan="7">See 61.51 Data set 11 data 1 selection.</td></tr>
<tr><td>0 … 6</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>61.95</b></td><td colspan="7"><b>Data set 2 data 1 value</b></td></tr>
<tr><td colspan="7">DDCS controller link, data set 2 data 1 from the drive to the DDCS controller link.<br>Shows the value sent as data set 2 data 1 to the DDCS controller link as integer.<br>If no data has been preselected by 61.45 Data set 2 data 1 selection, the value to be sent can be written directly into 61.95 Data set 2 data 1 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>61.96</b></td><td colspan="7"><b>Data set 2 data 2 value</b></td></tr>
<tr><td colspan="7">DDCS controller link, data set 2 data 2 from the drive to the DDCS controller link.<br>Shows the value sent as data set 2 data 2 to the DDCS controller link as integer.<br>If no data has been preselected by 61.46 Data set 2 data 2 selection, the value to be sent can be written directly into 61.96 Data set 2 data 2 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>61.97 to 61.100</b></td><td colspan="7"><b>Data set 2 data 3 value … Data set 4 data 3 value</b></td></tr>
<tr><td colspan="7">See 61.95 Data set 2 data 1 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>61.101</b></td><td colspan="7"><b>Data set 11 data 1 value</b></td></tr>
<tr><td colspan="7">DDCS controller link, data set 11 data 1 from the drive to the DDCS controller link.<br>Shows the value sent as data set 11 data 1 to the DDCS controller link as integer.<br>If no data has been preselected by 61.51 Data set 11 data 1 selection, the value to be sent can be written directly into 61.101 Data set 11 data 1 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td><b>61.102</b></td><td colspan="7"><b>Data set 11 data 2 value</b></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">DDCS controller link, data set 11 data 2 from the drive to the DDCS controller link.<br>Shows the value sent as data set 11 data 2 to the DDCS controller link as integer.<br>If no data has been preselected by 61.52 Data set 11 data 2 selection, the value to be sent can be written directly into 61.102 Data set 11 data 2 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**61.103 to 61.124**</td><td colspan="7">**Data set 11 data 3 value … Data set 25 data 3 value**</td></tr>
<tr><td colspan="7">See 61.101 Data set 11 data 1 value.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

## 62 D2D and DDCS receive data

Defines the data sent from the DDCS/D2D link to the drive.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3">**62.01**</td><td colspan="7">**M/F data 1 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 1 from the master via master-follower link to the followers (followers only).<br>Select data sent as word 1 from the master via master-follower link to the followers. The value is visible in 62.25 M/F data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive.<br>1: **CW 16bit**; control word (16-bit). Send to 06.07 Follower control word received.<br>2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.13 M/F or D2D ref1. Type and scaling are set by 60.10 M/F ref1 type.<br>3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.14 M/F or D2D ref2. Type and scaling are set by 60.11 M/F ref2 type.</td></tr>
<tr><td>0 … 3</td><td>CW 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**62.02**</td><td colspan="7">**M/F data 2 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 2 from the master via master-follower link to the followers (followers only).<br>Select data sent as word 2 from the master via master-follower link to the followers. The value is visible in 62.26 M/F data 2 value. See 62.01 M/F data 1 selection.</td></tr>
<tr><td>0 … 3</td><td>Ref1 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**62.03**</td><td colspan="7">**M/F data 3 selection**</td></tr>
<tr><td colspan="7">Master-follower link, data 3 from the master via master-follower link to the followers (followers only).<br>Select data sent as word 3 from the master via master-follower link to the followers. The value is visible in 62.27 M/F data 3 value. See 62.01 M/F data 1 selection.</td></tr>
<tr><td>0 … 3</td><td>Ref2 16bit</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**62.04**</td><td colspan="7">**Follower node 2 data 1 sel**</td></tr>
<tr><td colspan="7">Master-follower link, data 1 from follower node 2 via master-follower link to the master (master only).<br>Select data sent as word 1 from follower node 2 via master-follower link to the master. The value is visible in 62.28 Follower node 2 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive.<br>26: **06.122 Follower SW node 2**; follower status word node 2 (16-bit). 06.15 Main status word received from follower node 2 and sent to 06.122 Follower status word node 2. See also 60.18 Follower enable.</td></tr>
<tr><td>0 … 26</td><td>Follower SW node 2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**62.05**</td><td colspan="7">**Follower node 2 data 2 sel**</td></tr>
<tr><td colspan="7">Master-follower link, data 2 from follower node 2 via master-follower link to the master (master only).</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Select data sent as word 2 from follower node 2 via master-follower link to the master. The value is visible in 62.29 Follower node 2 data 2 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.06** | **Follower node 2 data 3 sel** | | | | | | |
| | Master-follower link, data 3 from follower node 2 via master-follower link to the master (master only). Select data sent as word 3 from follower node 2 via master-follower link to the master. The value is visible in 62.30 Follower node 2 data 3 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.07** | **Follower node 3 data 1 sel** | | | | | | |
| | Master-follower link, data 1 from follower node 3 via master-follower link to the master (master only). Select data sent as word 1 from follower node 3 via master-follower link to the master. The value is visible in 62.31 Follower node 3 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive.<br>26: **06.123 Follower SW node 3**; follower status word node 3 (16-bit). 06.15 Main status word received from follower node 3 and sent to 06.123 Follower status word node 3. See also 60.18 Follower enable. | | | | | | |
| | 0 … 26 | Follower SW node 3 | - | 1 = 1 | n | y | Parameter |
| **62.08** | **Follower node 3 data 2 sel** | | | | | | |
| | Master-follower link, data 2 from follower node 3 via master-follower link to the master (master only). Select data sent as word 2 from follower node 3 via master-follower link to the master. The value is visible in 62.32 Follower node 3 data 2 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.09** | **Follower node 3 data 3 sel** | | | | | | |
| | Master-follower link, data 3 from follower node 3 via master-follower link to the master (master only). Select data sent as word 3 from follower node 3 via master-follower link to the master. The value is visible in 62.33 Follower node 3 data 3 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.10** | **Follower node 4 data 1 sel** | | | | | | |
| | Master-follower link, data 1 from follower node 4 via master-follower link to the master (master only). Select data sent as word 1 from follower node 4 via master-follower link to the master. The value is visible in 62.34 Follower node 4 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive.<br>26: **06.124 Follower SW node 4**; follower status word node 4 (16-bit). 06.15 Main status word received from follower node 4 and sent to 06.124 Follower status word node 4. See also 60.18 Follower enable. | | | | | | |
| | 0 … 26 | Follower SW node 4 | - | 1 = 1 | n | y | Parameter |
| **62.11** | **Follower node 4 data 2 sel** | | | | | | |
| | Master-follower link, data 2 from follower node 4 via master-follower link to the master (master only). Select data sent as word 2 from follower node 4 via master-follower link to the master. The value is visible in 62.35 Follower node 4 data 2 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.12** | **Follower node 4 data 3 sel** | | | | | | |
| | Master-follower link, data 3 from follower node 4 via master-follower link to the master (master only). Select data sent as word 3 from follower node 4 via master-follower link to the master. The value is visible in 62.36 Follower node 4 data 3 value. See 62.04 Follower node 2 data 1 sel. | | | | | | |
| | 0 … 26 | None | - | 1 = 1 | n | y | Parameter |
| **62.25** | **M/F data 1 value** | | | | | | |
| | Master-follower link, data 1 value from the master via master-follower link to the followers (followers only). | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | Shows the value sent as word 1 from the master via master-follower link to the followers as integer by 62.01 M/F data 1 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.26** | **M/F data 2 value** | | | | | | |
| | Master-follower link, data 2 value from the master via master-follower link to the followers (followers only).<br>Shows the value sent as word 2 from the master via master-follower link to the followers as integer by 62.02 M/F data 2 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.27** | **M/F data 3 value** | | | | | | |
| | Master-follower link, data 3 value from the master via master-follower link to the followers (followers only).<br>Shows the value sent as word 3 from the master via master-follower link to the followers as integer by 62.03 M/F data 3 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.28** | **Follower node 2 data 1 value** | | | | | | |
| | Master-follower link, data 1 value from follower node 2 via master-follower link to the master (master only).<br>Shows the value sent as word 1 from follower node 2 via master-follower link to the master as integer by 62.04 Follower node 2 data 1 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.29** | **Follower node 2 data 2 value** | | | | | | |
| | Master-follower link, data 2 value from follower node 2 via master-follower link to the master (master only).<br>Shows the value sent as word 2 from follower node 2 via master-follower link to the master as integer by 62.05 Follower node 2 data 2 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.30** | **Follower node 2 data 3 value** | | | | | | |
| | Master-follower link, data 3 value from follower node 2 via master-follower link to the master (master only).<br>Shows the value sent as word 3 from follower node 2 via master-follower link to the master as integer by 62.06 Follower node 2 data 3 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.31** | **Follower node 3 data 1 value** | | | | | | |
| | Master-follower link, data 1 value from follower node 3 via master-follower link to the master (master only).<br>Shows the value sent as word 1 from follower node 3 via master-follower link to the master as integer by 62.07 Follower node 3 data 1 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.32** | **Follower node 3 data 2 value** | | | | | | |
| | Master-follower link, data 2 value from follower node 3 via master-follower link to the master (master only).<br>Shows the value sent as word 2 from follower node 3 via master-follower link to the master as integer by 62.08 Follower node 3 data 2 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.33** | **Follower node 3 data 3 value** | | | | | | |
| | Master-follower link, data 3 value from follower node 3 via master-follower link to the master (master only).<br>Shows the value sent as word 3 from follower node 3 via master-follower link to the master as integer by 62.09 Follower node 3 data 3 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **62.34** | **Follower node 4 data 1 value** | | | | | | |
| | Master-follower link, data 1 value from follower node 4 via master-follower link to the master (master only).<br>Shows the value sent as word 1 from follower node 4 via master-follower link to the master as integer by 62.10 Follower node 4 data 1 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.35** | **Follower node 4 data 2 value** | | | | | | |
| | Master-follower link, data 2 value from follower node 4 via master-follower link to the master (master only).<br>Shows the value sent as word 2 from follower node 4 via master-follower link to the master as integer by 62.11 Follower node 4 data 2 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.36** | **Follower node 4 data 3 value** | | | | | | |
| | Master-follower link, data 3 value from follower node 4 via master-follower link to the master (master only).<br>Shows the value sent as word 3 from follower node 4 via master-follower link to the master as integer by 62.12 Follower node 4 data 3 sel. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **.** | Parameters 62.45 … 62.50 select targets for the data received from the DDCS controller in data sets 1 and 3. These data sets are used in communication with 60.50 DDCS controller drive type = ABB standard drive.<br>Signals 62.95 … 62.100 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters.<br>**Example:** 62.45 Data set 1 data 1 selection selects a target for data set 1 data 1. Then 62.95 Data set 1 data 1 value displays the received data in integer format and can also be used as a source by other parameters. | | | | | | |
| **62.45** | **Data set 1 data 1 selection** | | | | | | |
| | DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the drive.<br>Select data sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.95 Data set 1 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive. DDCS controller link data out is disabled.<br>1: **CW 16bit**; control word (16-bit). Send to 06.110 DDCS control word.<br>2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref 1.<br>3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref 2. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **62.46** | **Data set 1 data 2 selection** | | | | | | |
| | DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the drive.<br>Select data sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.96 Data set 1 data 2 value. See 62.45 Data set 1 data 1 selection. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **62.47 to 62.50** | **Data set 1 data 3 selection … Data set 3 data 3 selection** | | | | | | |
| | See 62.45 Data set 1 data 1 selection. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **.** | Parameters 62.51 … 62.74 select targets for the data received from the DDCS controller in data sets 10, 12, 14, 16, 18, 20, 22 and 24. These data sets are used in communication with 60.50 DDCS controller drive type = ABB engineered drive. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Signals 62.101 … 62.124 display the data received from the DDCS controller in integer format and can also be used as sources by other parameters.<br>**Example:** 62.51 Data set 10 data 1 selection selects a target for data set 10 data 1. Then 62.101 Data set 10 data 1 value displays the received data in integer format and can also be used as a source by other parameters. | | | | | | |
| **62.51** | **Data set 10 data 1 selection** | | | | | | |
| | DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the drive.<br>Select data sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.101 Data set 10 data 1 value.<br>**Other**; source selection.<br>0: **None**; inactive. DDCS controller link data out is disabled.<br>1: **CW 16bit**; control word (16-bit). Send to 06.110 DDCS control word.<br>2: **Ref1 16bit**; reference REF1 (16-bit). Send to 03.11 DDCS controller ref 1.<br>3: **Ref2 16bit**; reference REF2 (16-bit). Send to 03.12 DDCS controller ref 2. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **62.52** | **Data set 10 data 2 selection** | | | | | | |
| | DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the drive.<br>Select data sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the drive. The value is visible in 62.102 Data set 10 data 2 value. See 62.51 Data set 10 data 1 selection. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **62.53 to 62.74** | **Data set 10 data 3 selection … Data set 24 data 3 selection** | | | | | | |
| | See 62.51 Data set 10 data 1 selection. | | | | | | |
| | 0 … 3 | None | - | 1 = 1 | n | y | Parameter |
| **62.95** | **Data set 1 data 1 value** | | | | | | |
| | DDCS controller link, data set 1 data 1 from the DDCS controller via DDCS controller link to the drive.<br>Shows the value sent as data set 1 data 1 from the DDCS controller via DDCS controller link to the drive as integer by 62.45 Data set 1 data 1 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.96** | **Data set 1 data 2 value** | | | | | | |
| | DDCS controller link, data set 1 data 2 from the DDCS controller via DDCS controller link to the drive.<br>Shows the value sent as data set 1 data 2 from the DDCS controller via DDCS controller link to the drive as integer by 62.46 Data set 1 data 2 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.97 to 62.100** | **Data set 1 data 3 value … Data set 3 data 3 value** | | | | | | |
| | See 62.95 Data set 1 data 1 value. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.101** | **Data set 10 data 1 value** | | | | | | |
| | DDCS controller link, data set 10 data 1 from the DDCS controller via DDCS controller link to the drive.<br>Shows the value sent as data set 10 data 1 from the DDCS controller via DDCS controller link to the drive as integer by 62.51 Data set 10 data 1 selection. Can also be used as source by other parameters. | | | | | | |

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|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.102** | **Data set 10 data 2 value** | | | | | | |
| | DDCS controller link, data set 10 data 2 from the DDCS controller via DDCS controller link to the drive.<br>Shows the value sent as data set 10 data 2 from the DDCS controller via DDCS controller link to the drive as integer by 62.52 Data set 10 data 2 selection. Can also be used as source by other parameters. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |
| **62.102 to 62.124** | **Data set 10 data 3 value … Data set 24 data 3 value** | | | | | | |
| | See 62.101 Data set 10 data 1 value. | | | | | | |
| | 0 … 65535 | 0 | - | 1 = 1 | y | n | Signal |

## 70 DCSLink Communication

Defines the communication parameters for the DCSLink board SDCS-DSL-H1x.
For communication between the armature converter and the field exciters or 12-pulse communication only the basic communication parameters 70.05 … 70.14 have to be set.

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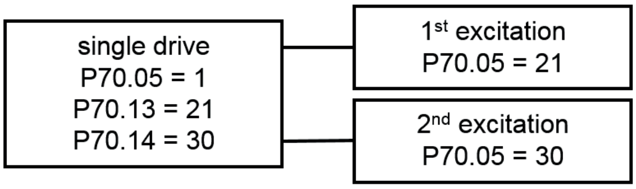
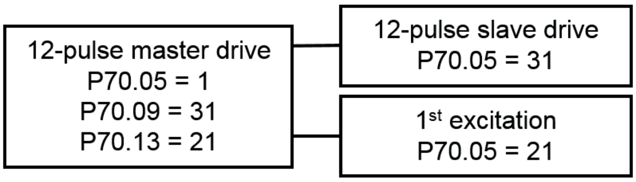
<tr><td colspan="7"><b>Text</b></td></tr>
<tr><td><b>Range</b></td><td><b>Default</b></td><td><b>Unit</b></td><td><b>Scale/ Fbeq16</b></td><td><b>Volatile</b></td><td><b>Change running</b></td><td><b>Type</b></td></tr>
<tr><td></td><td colspan="7"><b>Parameter settings for:</b>
<table>
<tr><td>Single drive with excitation</td><td>70.05 DCSLink node ID = 1.<br>70.13 M1 field exciter node ID = 21.<br>70.14 M2 field exciter node ID = 30.</td><td>See example 1.</td></tr>
<tr><td>12-pulse drive</td><td>70.05 DCSLink node ID= 1.<br>70.09 12-pulse slave node ID = 31.<br>70.13 M1 field exciter node ID = 21.</td><td>See example 2.</td></tr>
</table></td></tr>
<tr><td></td><td colspan="7">Example 1<br>Single drive with one or two field exciters and communication supervision:<br> </td></tr>
<tr><td></td><td colspan="7">Example 2<br>12-pulse configuration and communication supervision:<br> </td></tr>
<tr><td><b>70.01</b></td><td colspan="7"><b>DCSLink status 1</b></td></tr>
<tr><td></td><td colspan="7">DCSLink status 1 of field exciter nodes 1 … 16.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

This word displays the status of the DCSLink for field exciter nodes 1 … 16.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Node01 | 1 | DCSLink node01 active and OK. |
| | | 0 | DCSLink node01 not active or faulty. |
| 1 | Node02 | 1 | DCSLink node02 active and OK. |
| | | 0 | DCSLink node02 not active or faulty. |
| 2 | Node03 | 1 | DCSLink node03 active and OK. |
| | | 0 | DCSLink node03 not active or faulty. |
| 3 | Node04 | 1 | DCSLink node04 active and OK. |
| | | 0 | DCSLink node04 not active or faulty. |
| 4 | Node05 | 1 | DCSLink node05 active and OK. |
| | | 0 | DCSLink node05 not active or faulty. |
| 5 | Node06 | 1 | DCSLink node06 active and OK. |
| | | 0 | DCSLink node06 not active or faulty. |
| 6 | Node07 | 1 | DCSLink node07 active and OK. |
| | | 0 | DCSLink node07 not active or faulty. |
| 7 | Node08 | 0 | DCSLink node08 active and OK. |
| | | 1 | DCSLink node08 not active or faulty. |
| 8 | Node09 | 0 | DCSLink node09 active and OK. |
| | | 1 | DCSLink node09 not active or faulty. |
| 9 | Node10 | 0 | DCSLink node10 active and OK. |
| | | 1 | DCSLink node10 not active or faulty. |
| 10 | Node11 | 0 | DCSLink node11 active and OK. |
| | | 1 | DCSLink node11 not active or faulty. |
| 11 | Node12 | 0 | DCSLink node12 active and OK. |
| | | 1 | DCSLink node12 not active or faulty. |
| 12 | Node13 | 0 | DCSLink node13 active and OK. |
| | | 1 | DCSLink node13 not active or faulty. |
| 12 | Node14 | 0 | DCSLink node14 active and OK. |
| | | 1 | DCSLink node14 not active or faulty. |
| 14 | Node15 | 0 | DCSLink node15 active and OK. |
| | | 1 | DCSLink node15 not active or faulty. |
| 15 | Node16 | 0 | DCSLink node16 active and OK. |
| | | 1 | DCSLink node16 not active or faulty. |

| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0000h … FFFFh | - | - | 1 = 1 | y | n | Signal |

**70.02** **DCSLink status 2**

DCSLink status 2 of field exciter nodes 17 … 32.
This word displays the status of the DCSLink for field exciter nodes 17 … 32.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Node17 | 1 | DCSLink node17 active and OK. |
| | | 0 | DCSLink node17 not active or faulty. |
| 1 | Node18 | 1 | DCSLink node18 active and OK. |
| | | 0 | DCSLink node18 not active or faulty. |
| 2 | Node19 | 1 | DCSLink node19 active and OK. |
| | | 0 | DCSLink node19 not active or faulty. |
| 3 | Node20 | 1 | DCSLink node20 active and OK. |
| | | 0 | DCSLink node20 not active or faulty. |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">
<table>
<tr><td>4</td><td>Node21</td><td>1</td><td>DCSLink node21 active and OK.</td></tr>
<tr><td></td><td></td><td>0</td><td>DCSLink node21 not active or faulty.</td></tr>
<tr><td>5</td><td>Node22</td><td>1</td><td>DCSLink node22 active and OK.</td></tr>
<tr><td></td><td></td><td>0</td><td>DCSLink node22 not active or faulty.</td></tr>
<tr><td>6</td><td>Node23</td><td>1</td><td>DCSLink node23 active and OK.</td></tr>
<tr><td></td><td></td><td>0</td><td>DCSLink node23 not active or faulty.</td></tr>
<tr><td>7</td><td>Node24</td><td>0</td><td>DCSLink node24 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node24 not active or faulty.</td></tr>
<tr><td>8</td><td>Node25</td><td>0</td><td>DCSLink node25 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node25 not active or faulty.</td></tr>
<tr><td>9</td><td>Node26</td><td>0</td><td>DCSLink node26 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node26 not active or faulty.</td></tr>
<tr><td>10</td><td>Node27</td><td>0</td><td>DCSLink node27 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node27 not active or faulty.</td></tr>
<tr><td>11</td><td>Node28</td><td>0</td><td>DCSLink node28 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node28 not active or faulty.</td></tr>
<tr><td>12</td><td>Node29</td><td>0</td><td>DCSLink node29 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node29 not active or faulty.</td></tr>
<tr><td>12</td><td>Node30</td><td>0</td><td>DCSLink node30 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node30 not active or faulty.</td></tr>
<tr><td>14</td><td>Node31</td><td>0</td><td>DCSLink node31 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node31 not active or faulty.</td></tr>
<tr><td>15</td><td>Node32</td><td>0</td><td>DCSLink node32 active and OK.</td></tr>
<tr><td></td><td></td><td>1</td><td>DCSLink node32 not active or faulty.</td></tr>
</table>
</td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>70.05</b></td><td colspan="7"><b>DCSLink node ID</b></td></tr>
<tr><td colspan="7">DCSLink node ID.<br>Defines the DCSLink node ID of the drive. Two drives with the same node ID are not allowed. Maximum allowed drive count is 50. See also examples 1 … 2 above. The DCSLink node ID is inactive, if 70.05 DCSLink node ID is set to 0.<br>A chosen (70.05 DCSLink node ID > 0), but not connected or faulty SDCS-DSL-H0x board generates fault 7082 I/O extension communication or warning A7AB I/O extension configuration depending on the setting of 70.07 DCSLink comm loss function.</td></tr>
<tr><td>0 … 63</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>70.06</b></td><td colspan="7"><b>Baud rate</b></td></tr>
<tr><td colspan="7">Baud rate.<br>Defines the transfer rate of the DCSLink. The transfer rate decreases with the total length of the DCSLink cable:<br>0: <b>20 kbit/s</b>; 20 kbit/s, total cable length max. 500 m.<br>1: <b>50 kbit/s</b>; 50 kbit/s, total cable length max. 500 m.<br>2: <b>125 kbit/s</b>; 125 kbit/s, total cable length max. 500 m.<br>3: <b>250 kbit/s</b>; 250 kbit/s, total cable length max. 250 m.<br>4: <b>500 kbit/s</b>; 500 kbit/s, total cable length max. 100 m.<br>5: <b>800 kbit/s</b>; 800 kbit/s, total cable length max. 50 m.<br>7: <b>1 Mbit/s</b>; 1 Mbit/s, total cable length approximately 25 m.<br><b>Note:</b> Maximum total cable length should not exceed 100 m. Maximum amount of connected drives is 50 (e.g. 25 drives including one external field exciter each).</td></tr>
<tr><td>0 … 7</td><td>500 kbit/s</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>70.07</b></td><td colspan="7"><b>DCSLink comm loss function</b></td></tr>
<tr><td colspan="7">DCSLink communication and DCSLink board (SDCS-DSL-H1x) loss action.</td></tr>
</table>

| Index | Name | | | | | | |
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| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | Selects how the drive reacts to a DCSLink communication and DCSLink board (SDCS-DSL-H1x) loss.<br>0: **No action**; none, disable communication loss function and board loss function.<br>1: **Fault**; the event generates fault F544 P2P and M/F communication or 7082 I/O extension communication and the motor stops due to 31.13 Fault stop mode communication. This occurs only when the drive is controlled via the DCSLink.<br>2: **Warning**; the event generates warning A112 P2P and M/F communication or A7AB I/O extension configuration. This occurs even though no control is expected via the DCSLink.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break or a board loss.<br>3: **Last speed**; the evet generates warning A112 P2P and M/F communication or A7AB I/O extension configuration and freezes the speed to the level the drive was operating at. The last speed is determined based on the speed feedback using an 850 ms low-pass filter.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break or a board loss.<br>4: **Speed reference safe**; the event generates warning A112 P2P and M/F communication or A7AB I/O extension configuration and sets the speed to the value defined in 22.46 Speed reference safe.<br>**WARNING!**<br>Make sure that it is safe to continue operation in case of a communication break or a board loss.<br>5: **Fault always**; the event generates fault F544 P2P and M/F communication or 7082 I/O extension communication and the motor stops due to 31.13 Fault stop mode communication. This occurs even though no control is expected via the DCSLink. | | | | | | |
| | 0 … 5 | No action | - | 1 = 1 | n | y | Parameter |
| **70.08** | **12-pulse timeout** | | | | | | |
| | 12-pulse communication loss timeout.<br>Defines the time delay before a 12-pulse communication break is declared and fault F535 12-pulse communication is generated. Time count starts when the communication link fails to update the message.<br>70.08 12-pulse timeout is only active in the 12-pulse master drive. The communication fault is inactive, if 70.08 12-pulse timeout is set to 0 ms.<br>**Note:** 70.08 12-pulse timeout is void, when 99.06 Operation mode = Armature converter, Large field exciter or xxx Slave. | | | | | | |
| | 0 … 32500 | 100 | ms | 1 = 1 ms | n | y | Parameter |
| **70.09** | **12-pulse slave node ID** | | | | | | |
| | 12-pulse slave node ID.<br>Defines the DCSLink node ID of the 12-pulse slave drive in the 12-pulse master drive. See also example 2 above.<br>The 12-pulse node ID is inactive, if 70.09 12-pulse slave node ID is set to 0.<br>**Note:** 70.09 12-pulse slave node ID is void, when 99.06 Operation mode = Armature converter, Large field exciter or xxx Slave. | | | | | | |
| | 0 … 63 | 31 | - | 1 = 1 | n | n | Parameter |
| **70.12** | **Field exciter timeout** | | | | | | |
| | Field exciter communication loss timeout.<br>Defines the time delay before a field exciter communication break is declared and either fault F516 M1 field exciter communication or F519 M2 field exciter communication is generated, depending on the field exciter with the communication break. Time count starts when the communication link fails to update the message.<br>70.12 Field exciter timeout is only active in the armature drive. The communication fault is inactive, if 70.12 Field exciter timeout is set to 0 ms.<br>**Note:** 70.12 Field exciter timeout is void, when 99.07 M1 used field exciter type = NotUsed, OnBoard or External field exciter via Aix and 42.49 M2 used field exciter type = NotUsed, OnBoard or External field exciter via AIx. | | | | | | |
| | 0 … 32500 | 100 | ms | 1 = 1 ms | n | y | Parameter |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **70.13** | **M1 field exciter node ID** | | | | | | |
| | Motor 1 field exciter node ID.<br>Defines the DCSLink node ID of motor 1 field exciter in the armature drive. See also examples 1 and 2 above.<br>Motor 1 field exciter node ID is inactive, if 70.13 M1 field exciter node ID is set to 0.<br>**Note:** 70.13 M1 field exciter node ID is void, when 99.07 M1 used field exciter type = NotUsed, OnBoard or External field exciter via AIx. | | | | | | |
| | 0 … 32 | 21 | - | 1 = 1 | n | n | Parameter |
| **70.14** | **M2 field exciter node ID** | | | | | | |
| | Motor 2 field exciter node ID.<br>Defines the DCSLink node ID of motor 2 field exciter in the armature drive. See also example 1 above.<br>Motor 1 field exciter node ID is inactive, if 70.14 M2 field exciter node ID is set to 0.<br>**Note:** 70.14 M2 field exciter node ID is void, when 42.49 M2 used field exciter type = NotUsed, OnBoard or External field exciter via AIx. | | | | | | |
| | 0 … 32 | 30 | - | 1 = 1 | n | n | Parameter |

## 74 … 89 Application specific groups

Groups used for application programming.

## 90 Feedback selection

Motor and load feedback configuration.

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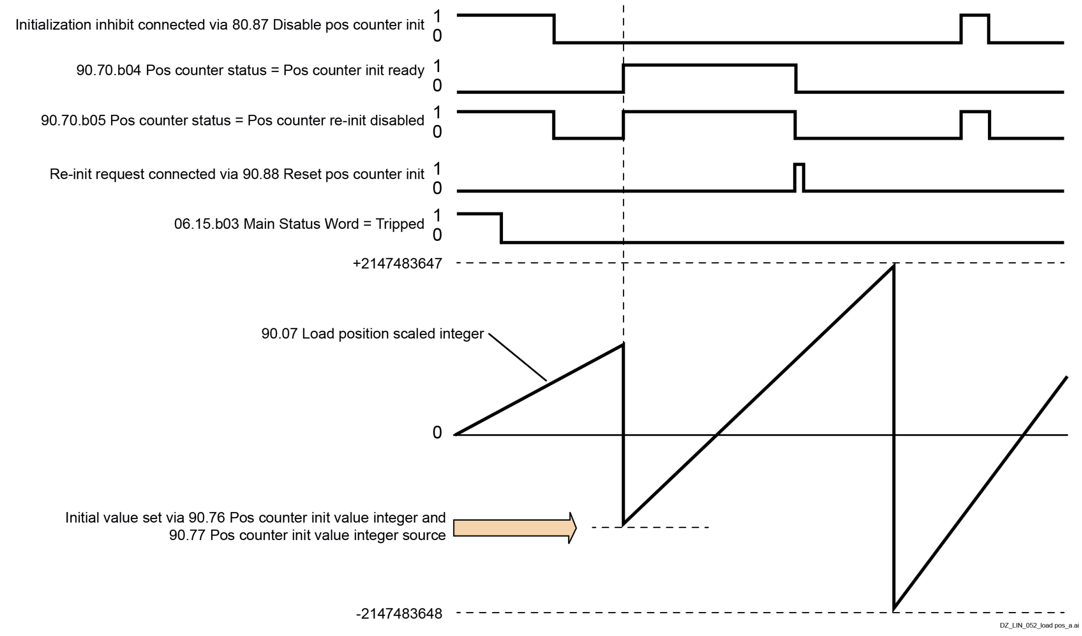
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **90.01** | **Motor speed for control** | | | | | | |
| | Measured (tacho/encoder), EMF or external motor speed used for control.<br>Displays measured, EMF or external motor speed depending on the used feedback. See 90.41 M1 feedback selection. For measured or EMF motor speed a filter time constant is defined by 46.11 Filter time motor speed.<br>In case a measured or external feedback is selected, it is also scaled by the motor gear function. See 90.43 Motor gear numerator and 90.44 Motor gear denominator. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **90.02** | **Motor position** | | | | | | |
| | Motor position.<br>Displays the motor position, within one revolution, received from the source selected by 90.41 Motor feedback selection. This parameter is only valid for encoder speed feedback.<br>An encoder feedback is scaled by the motor gear function. See 90.43 Motor gear numerator and 90.44 Motor gear denominator. | | | | | | |
| | 0.00000000 … 1.00000000 | - | rev | 32767 = 1 rev | y | n | Signal |
| **90.03** | **Load speed** | | | | | | |
| | Measured (tacho/encoder), EMF or external load speed.<br>Displays measured, EMF or external load speed depending on the used feedback. See 90.51 Load feedback selection. A filter time constant is defined by 90.52 Load speed filter time.<br>In case an encoder feedback from the load is selected, it is also scaled by the load gear function. See 90.53 Load gear numerator and 90.54 Load gear denominator.<br>In case a feedback from the motor is used, it is inversely scaled by 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61). | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **90.04** | **Load position** | | | | | | |
| | Load position. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | Displays the (rotational) load position received from the source selected by 90.51 Load feedback selection. This parameter is only valid for encoder speed feedback.<br>In case an encoder feedback from the load is selected, it is also scaled by the load gear function. See 90.53 Load gear numerator and 90.54 Load gear denominator.<br>In case a feedback from the motor is used, it is inversely scaled by 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61).<br>Offset and resolution are defined by 90.56 Load position offset and 90.57 Load position resolution. | | | | | | |
| | -2147483648 … 2147483647 | - | - | 1 = 1 | y | n | Signal |
| **90.05** | **Load position scaled** | | | | | | |
| | Scaled (translatory) load position in decimal format.<br>Displays the output of the position counter function in decimal format. The position is relative to the initial position set by 90.80 Pos counter init value and 90.81 Pos counter init value.<br>The number of decimal places is defined by 90.82 Pos counter decimals.<br>**Note:** This is a floating-point parameter and the accuracy is compromised near the ends of the range. Consider using 90.07 Load position scaled int instead. | | | | | | |
| | -2147483.648 … 2147483.647 | - | - | 1 = 1 | y | n | Signal |
| **90.06** | **Motor position scaled** | | | | | | |
| | Scaled motor position.<br>Displays the calculated (rotational) motor position.<br>The axis mode (linear or rollover) and resolution are defined by 90.48 Motor position axis mode and 90.49 Motor position resolution.<br>**Note:** The position value can be sent on a fast time level to the fieldbus controller by selecting Position in either 50.07 FBA A actual 1 type, 50.08 FBA A actual 2 type, 50.37 FBA B actual 1 type or 50.38 FBA B actual 2 type. | | | | | | |
| | -2147483.648 … 2147483.647 | - | - | 1 = 1 | y | n | Signal |
| **90.07** | **Load position scaled int** | | | | | | |
| | Scaled (translatory) load position in integer format.<br>Displays the output of the position counter function as an integer. The position is relative to the initial position set by 90.76 Pos counter init value int and 90.77 Pos counter init value int source. | | | | | | |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| |  | | | | | | |
| | -2147483648 … 2147483647 | - | - | 1 = 1 | y | n | Signal |
| 90.10 | **Encoder 1 speed** | | | | | | |
| | Encoder 1 speed.<br>Displays the speed feedback measured by encoder 1 in rpm. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| 90.11 | **Encoder 1 position** | | | | | | |
| | Encoder 1 position within one revolution.<br>Displays encoder 1 position, within one revolution. See 90.48 Motor position axis mode. | | | | | | |
| | 0.00000000 … 1.00000000 | - | rev | 32767 = 1 rev | y | n | Signal |
| 90.12 | **Encoder 1 multiturn revolutions** | | | | | | |
| | Encoder 1 revolutions.<br>Displays the revolutions of a multi-turn encoder 1 within its range. See 92.14 Revolution data width and 90.48 Motor position axis mode. | | | | | | |
| | 0 … 16777215 | - | - | 1 = 1 | n | n | Signal |
| 90.13 | **Encoder 1 revolution extension** | | | | | | |
| | Encoder 1 revolution count extension.<br>Displays the revolution count extension for encoder 1. See 90.48 Motor position axis mode.<br>With a single-turn encoder the counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.11 Encoder 1 position.<br>With a multi-turn encoder the counter is incremented, when the revolutions count exceeds the value range in positive direction and decremented in negative direction. See 90.12 Encoder 1 multiturn revolutions. | | | | | | |
| | -2147483648 … 2147483647 | - | - | 1 = 1 | n | n | Signal |
| 90.14 | **Encoder 1 position raw** | | | | | | |
| | Raw encoder 1 position within one revolution.<br>Displays the raw measurement data of encoder 1 position within one revolution. The encoder interface provides a 24-bit unsigned integer. | | | | | | |

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<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
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<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.15</b></td><td colspan="7"><b>Encoder 1 revolutions raw</b></td></tr>
<tr><td colspan="7">Raw encoder 1 revolution count.<br>Displays the revolutions of a multi-turn encoder 1 within its value range as a raw measurement. See 92.14 Revolution data width.</td></tr>
<tr><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.20</b></td><td colspan="7"><b>Encoder 2 speed</b></td></tr>
<tr><td colspan="7">Encoder 2 speed.<br>Displays the speed feedback measured by encoder 2 in rpm.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>-</td><td>rpm</td><td>See 46.02</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.21</b></td><td colspan="7"><b>Encoder 2 position</b></td></tr>
<tr><td colspan="7">Encoder 2 position within one revolution.<br>Displays encoder 1 position, within one revolution. See 90.48 Motor position axis mode.</td></tr>
<tr><td>0.00000000 … 1.00000000</td><td>-</td><td>rev</td><td>32767 = 1 rev</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.22</b></td><td colspan="7"><b>Encoder 2 multiturn revolutions</b></td></tr>
<tr><td colspan="7">Encoder 2 revolutions.<br>Displays the revolutions of a multi-turn encoder 2 within its range. See 93.14 Revolution data width and 90.48 Motor position axis mode.</td></tr>
<tr><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.23</b></td><td colspan="7"><b>Encoder 2 revolution extension</b></td></tr>
<tr><td colspan="7">Encoder 2 revolution count extension.<br>Displays the revolution count extension for encoder 2. See 90.48 Motor position axis mode.<br>With a single-turn encoder the counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.21 Encoder 2 position.<br>With a multi-turn encoder the counter is incremented, when the revolutions count exceeds the value range in positive direction and decremented in negative direction. See 90.22 Encoder 2 multiturn revolutions.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.24</b></td><td colspan="7"><b>Encoder 2 position raw</b></td></tr>
<tr><td colspan="7">Raw encoder 2 position within one revolution.<br>Displays the raw measurement data of encoder 2 position within one revolution. The encoder interface provides a 24-bit unsigned integer.</td></tr>
<tr><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.25</b></td><td colspan="7"><b>Encoder 2 revolutions raw</b></td></tr>
<tr><td colspan="7">Raw encoder 2 revolution count.<br>Displays the revolutions of a multi-turn encoder 2 within its value range as a raw measurement. See 93.14 Revolution data width.</td></tr>
<tr><td>0 … 16777215</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.26</b></td><td colspan="7"><b>Motor revolution extension</b></td></tr>
<tr><td colspan="7">Motor revolution count extension.<br>Displays the revolution count extension for the motor.<br>The counter is incremented, when the position selected by 90.41 Motor feedback selection wraps around in positive direction and decremented in negative direction.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>90.27</b></td><td colspan="7"><b>Load revolution extension</b></td></tr>
<tr><td colspan="7">Load revolution count extension.<br>Displays the revolution count extension for the load.</td></tr>
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<tr><th colspan="7">Text</th></tr>
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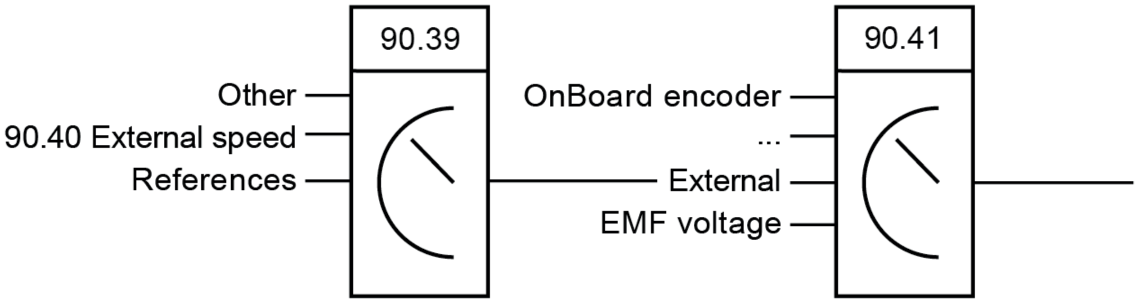
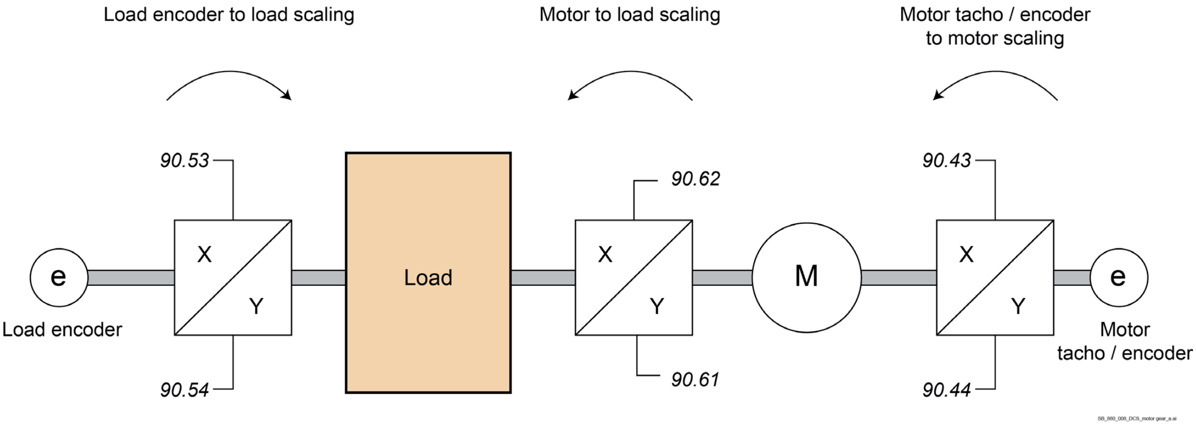
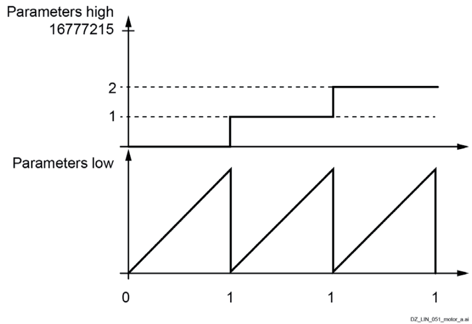
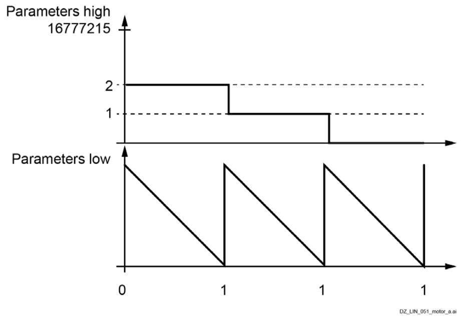
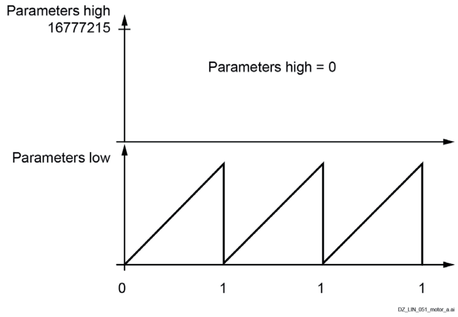
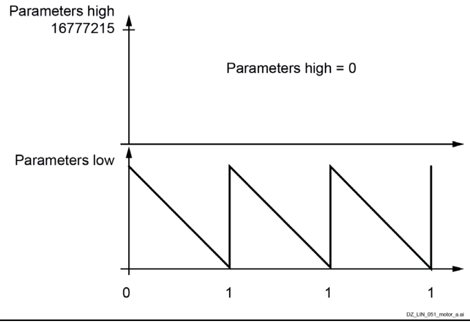
<tr><td rowspan="2"></td><td colspan="7">The counter is incremented, when the position selected by 90.51 Load feedback selection wraps around in positive direction and decremented in negative direction.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3">**90.39**</td><td colspan="7">**External speed feedback source**</td></tr>
<tr><td colspan="7">Selects the external speed feedback source.<br>90.39 External speed source is valid if 90.41 M1 feedback selection = External. The external speed feedback can be connected in several ways:<br>– Any source via option Other.<br>– Via 90.40 External speed. This parameter can be written to by e.g. Adaptive Program, application program or overriding control.<br>– Via an analog input.<br>– Via serial communication using the fast communication cycle of REF1/REF2 instead of the slower communication cycle of direct parameter access. See also 50.21 FBA A timelevel sel and corresponding parameters.<br> <br>SF_880_030_DCS_ext-speed-source_b.ai<br>**Other**; source selection.<br>0: **90.40 External speed**; 90.40 External speed.<br>4: **AI1 scaled**; 12.12 AI1 scaled value.<br>5: **AI2 scaled**; 12.22 AI2 scaled value.<br>6: **AI3 scaled**; 12.32 AI3 scaled value.<br>7: **FBA A reference 1**; 03.05 FBA A reference 1.<br>8: **FBA A reference 2**; 03.06 FBA A reference 2.<br>9: **FBA B reference 1**; 03.07 FBA B reference 1.<br>10: **FBA B reference 2**; 03.08 FBA B reference 2.<br>11: **EFB reference 1**; 03.09 EFB reference 1.<br>12: **EFB reference 2**; 03.10 EFB reference 2.<br>13: **DDCS controller ref 1**; 03.11 DDCS controller ref 1.<br>14: **DDCS controller ref 2**; 03.12 DDCS controller ref 2.<br>15: **M/F or D2D ref 1**; 03.13 M/F or D2D ref 1.<br>16: **M/F or D2D ref 2**; 03.14 M/F or D2D ref 2.</td></tr>
<tr><td>0 … 16</td><td>90.40 External speed</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**90.40**</td><td colspan="7">**External speed**</td></tr>
<tr><td colspan="7">External speed feedback.<br>This parameter can be written to by e.g. Adaptive Program, application program or overriding control and is valid if 90.39 External speed source = 90.41 M1 feedback selection = External.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>y</td><td>y</td><td>Parameter</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>90.41</b></td><td colspan="7"><b>M1 feedback selection</b></td></tr>
<tr><td colspan="7">Motor 1 speed feedback selection.<br>Selects the motor speed feedback for motor control.<br><b>Other</b>; source selection.<br>1: <b>OnBoard encoder</b>; the speed feedback is measured by means of a pulse encoder connected to the SDCS-CON-H01. See group 94.<br>2: <b>Encoder 1</b>; the speed feedback is measured by encoder 1. See group 92.<br>3: <b>Encoder 2</b>; the speed feedback is measured by encoder 2. See group 93.<br>4: <b>Tacho</b>; the speed feedback is measured by means of an analog tacho connected to the SDCS-CON-H01. See group 94.<br>5: <b>EMF</b>; the speed feedback is calculated from the EMF (base speed area) and field current (field weakening area). Thus, it is possible to go into the field weakening range, but with a low performance compared to encoder or analog tacho feedback.<br><b>Commissioning hint</b>: The flux linearization must be tuned manually.<br>6: <b>External</b>; the speed feedback is connected using 90.39 External speed source.<br>7: <b>EMF voltage</b>; the speed feedback is calculated from the EMF only. Thus, no field weakening is possible.</td></tr>
<tr><td>1 … 7</td><td>EMF</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.42</b></td><td colspan="7"><b>Motor speed filter time</b></td></tr>
<tr><td colspan="7">Motor speed feedback filter time constant.<br>Filter time constant for 90.01 Motor speed for control.<br><b>Note</b>: There are three different filters for speed feedback and speed error:<br>– 90.42 Motor speed filter time is filtering the speed feedback and should be used for filter time constants smaller than 30 ms.<br>– 24.18 Speed error filter time 1 and 24.19 Speed error filter time 2 are filtering the speed error and should be used for filter time constants greater than 30 ms. Set 24.18 Speed error filter time 1 = 24.19 Speed error filter time 2.</td></tr>
<tr><td>0 … 32500</td><td>5</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>90.43</b></td><td colspan="7"><b>Motor gear numerator</b></td></tr>
<tr><td colspan="7">Motor gear numerator.<br>90.43 Motor gear numerator and 90.44 Motor gear denominator define a gear function between motor speed feedback and motor control. The gear function is used to correct a difference between motor and measured (tacho/encoder) speed, for example if the tacho/encoder is not mounted directly on the motor shaft.<br>$$\frac{Motor\ speed}{Measured\ (tacho/encoder)\ speed} = \frac{90.43\ Motor\ gear\ numerator}{90.44\ Motor\ gear\ denominator}$$<br><br> </td></tr>
</table>

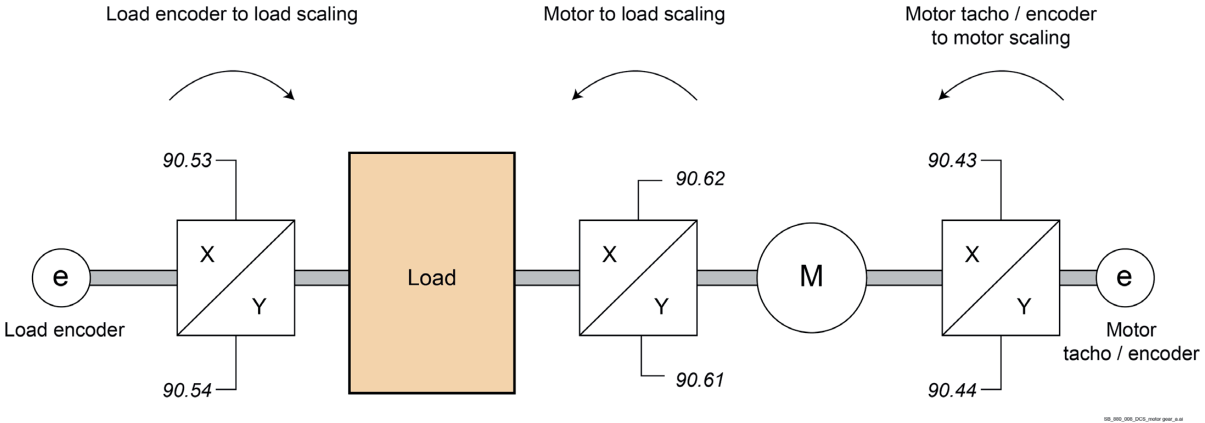
| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | -2147483648 … 2147483647 | 1 | - | 1 = 1 | n | y | Parameter |
| 90.44 | **Motor gear denominator** | | | | | | |
| | Motor gear denominator.<br>See 90.43 Motor gear numerator. | | | | | | |
| | -2147483648 … 2147483647 | 1 | - | 1 = 1 | n | y | Parameter |
| 90.48 | **Motor position axis mode** | | | | | | |
| | Axis type for the motor position.<br>Selects the axis type for the motor position measurement.<br>0: **Linear**; linear.<br>1: **Rollover**; the value is between 0 and 1 revolutions, and rolls over at 360 degrees. | | | | | | |

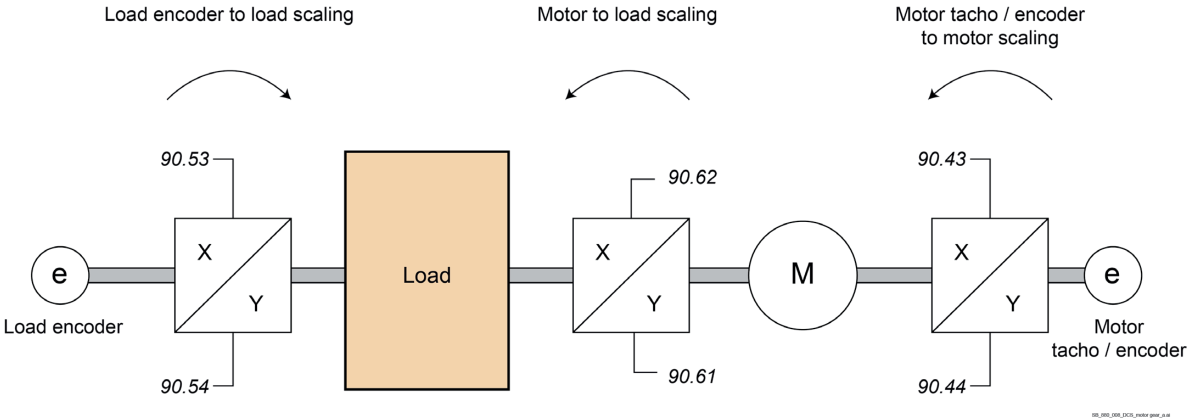
| Setting | Parameters low | Parameters high |
|---|---|---|
| | 90.11 Encoder 1 position<br>90.21 Encoder 2 position<br>94.16 OnBoard encoder position | 90.12 Encoder 1 multiturn revolutions<br>90.13 Encoder 1 revolution extension<br>90.22 Encoder 2 multiturn revolutions<br>90.23 Encoder 2 revolution extension<br>94.18 OnBoard encoder revolution extension |
| Linear | 0.00000000 == 0° and<br>1.00000000 == 360° | 1 == 1 revolution |
| | Forward direction:<br><br> | Reverse direction:<br><br> |
| Rollover | 0.00000000 == 0° and<br>1.00000000 == 360° | Always zero |
| | Forward direction:<br><br> | Reverse direction:<br><br> |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 1 | Rollover | - | 1 = 1 | n | y | Parameter |
| 90.49 | **Motor position resolution** | | | | | | |
| | Motor position resolution.<br>Defines how many bits are used for the motor position count within one revolution. For example, with the setting of 16, the position value is multiplied by $2^{16}$ = 65536 to be displayed in 90.06 Motor position scaled and thus, also or for the fieldbuses. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 31</td><td>16</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.51</b></td><td colspan="7"><b>Load feedback selection</b></td></tr>
<tr><td colspan="7">Load speed feedback selection.<br>Selects the load speed feedback and position feedbacks for the control. The values are scaled by 90.53 Load gear numerator and 90.54 Load gear denominator.<br>0: <b>None</b>; no load feedback selected.<br>1: <b>OnBoard encoder</b>; load feedbacks are updated based on the speed and position values read from a pulse encoder connected to the SDCS-CON-H01. See group 94.<br>2: <b>Encoder 1</b>; load feedbacks are updated based on the speed and position values read from encoder 1. See group 92.<br>3: <b>Encoder 2</b>; load feedbacks are updated based on the speed and position values read from encoder 2. See group 93.<br>8: <b>Motor feedback</b>; the source selected by 90.41 Motor feedback selection can also be used for load feedback. Any difference between the motor and load speed/position can be compensated using the inverted ratio between 90.61 Gear numerator and 90.62 Gear denominator (90.62 divided by 90.61).</td></tr>
<tr><td>0 … 8</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.52</b></td><td colspan="7"><b>Load speed filter time</b></td></tr>
<tr><td colspan="7">Load speed feedback filter time constant.<br>Filter time constant for 90.03 Load speed.</td></tr>
<tr><td>0 … 32500</td><td>5</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.53</b></td><td colspan="7"><b>Load gear numerator</b></td></tr>
<tr><td colspan="7">Load (e.g. driven equipment) gear numerator.<br>90.53 Load gear numerator and 90.54 Load gear denominator define a gear function between load speed and encoder feedback selected by 90.51 Load feedback selection. The gear function is used to correct a difference between load and encoder speed, for example if the encoder is not mounted directly on the rotated machinery.

$$\frac{\mathit{Load\ speed}}{\mathit{Encoder\ speed}} = \frac{90.53\ \mathit{Load\ gear\ numerator}}{90.54\ \mathit{Load\ gear\ denominator}}$$


</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.54</b></td><td colspan="7"><b>Load gear denominator</b></td></tr>
<tr><td colspan="7">Load (e.g. driven equipment) gear denominator.<br>See 90.53 Load gear numerator.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>90.56</b></td><td colspan="7"><b>Load position offset</b></td></tr>
<tr><td colspan="7">Load side position offset.</td></tr>
</table>

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | Defines a load side position offset. | | | | | | |
| | -2147483648 … 2147483647 | 0 | - | 1 = 1 | n | y | Parameter |
| **90.57** | **Load position resolution** | | | | | | |
| | Load position resolution.<br>Defines how many bits are used for the load position count within one revolution. For example, with the setting of 16, the position value is multiplied by $2^{16}$ = 65536 to be displayed in 90.04 Load position. | | | | | | |
| | 0 … 31 | 16 | - | 1 = 1 | n | y | Parameter |
| **90.61** | **Gear numerator** | | | | | | |
| | Gear numerator (motor side).<br>90.61 Gear numerator and 90.62 Gear denominator define a gear function between motor and load speed.<br>$\frac{Motor\ speed}{Load\ eed} = \frac{90.61\ Gear\ numerator}{90.62\ Gear\ denominator}$<br> | | | | | | |
| | -2147483648 … 2147483647 | 1 | - | 1 = 1 | n | y | Parameter |
| **90.62** | **Gear denominator** | | | | | | |
| | Gear denominator (load side).<br>See 90.61 Gear numerator. | | | | | | |
| | -2147483648 … 2147483647 | 1 | - | 1 = 1 | n | y | Parameter |
| **90.63** | **Feed constant numerator** | | | | | | |
| | Feed constant numerator.<br>90.63 Feed constant numerator and 90.64 Feed constant denominator define the feed constant for the position calculation.<br>$\frac{90.63\ Feed\ constant\ numerator}{90.62\ Feed\ constant\ denominator}$<br>The feed constant converts rotational motion into translatory motion. E.g., the feed constant is the distance the load moves during one turn of the motor shaft.<br>The translatory load position is shown in 90.07 Load position scaled int.<br>**Note:** The load position is only updated after new position input data is received. | | | | | | |
| | -2147483648 … 2147483647 | 1 | - | 1 = 1 | n | y | Parameter |
| **90.64** | **Feed constant denominator** | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Feed constant denominator.<br>See 90.63 Feed constant numerator.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.70</b></td><td colspan="7"><b>Pos counter status</b></td></tr>
<tr><td colspan="7">Position counter status word.<br>Displays the status of the position counter.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>OnBoard encoder feedback</td><td>1</td><td>OnBoard encoder is selected as load feedback source.</td></tr>
<tr><td>1</td><td>Encoder 1 feedback</td><td>1</td><td>Encoder 1 is selected as load feedback source.</td></tr>
<tr><td>2</td><td>Encoder 2 feedback</td><td>1</td><td>Encoder 2 is selected as load feedback source.</td></tr>
<tr><td>3</td><td>Motor feedback</td><td>1</td><td>Motor is feedback selected as load feedback source.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Pos counter init ready</td><td>1</td><td>Position counter is successfully initialized.</td></tr>
<tr><td>0</td><td>Position counter is not initialized or encoder feedback was lost. Fresh counter initialization is recommended.<br><b>Note:</b> Always zero if 90.85 Pos counter sync mode = Cyclic.</td></tr>
<tr><td>5</td><td>Pos counter re-init disabled</td><td>1</td><td>Position counter initialization is prevented. See 90.87 Disable pos counter init.</td></tr>
<tr><td>6</td><td>Position data inaccurate</td><td>1</td><td>Encoder feedback intermittent or lost. If the drive is stopped, the position counting will continue based on encoder data after the connection is restored.</td></tr>
<tr><td>7 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>90.73</b></td><td colspan="7"><b>Pos counter error and boot action</b></td></tr>
<tr><td colspan="7">Position counter, error handling.<br>Selects how the position counter reacts to loss of load feedback.<br>0: <b>Request re-initialization</b>; 90.70.b04 Pos counter status is cleared. Re-initialization of the position counter is recommended.<br>1: <b>Continue from previous value</b>; the position counting resumes from the previous value over a loss of load feedback or drive reboot. 90.70.b04 Pos counter status is not cleared, but 90.70.b06 Pos counter status is set to indicate that an error has occurred.<br><b>WARNING!</b><br>If load feedback is lost when the drive is stopped or not powered, the counter is not updated even if the load moves.</td></tr>
<tr><td>0 … 1</td><td>Request re-initialization</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.76</b></td><td colspan="7"><b>Pos counter init value int</b></td></tr>
<tr><td colspan="7">Position counter, initial position integer value.<br>Defines an initial position or distance for the position counter as an integer value. For this, set 90.77 Pos counter init value int source = Pos counter init value integer.<br>Result see 90.07 Load position scaled int.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>90.77</b></td><td colspan="7"><b>Pos counter init value int source</b></td></tr>
<tr><td colspan="7">Position counter, source of the initial position integer value.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Selects the source of the initial position integer value. When the device selected by 90.86 Pos counter init cmd source (trigger) activates, the selection in 90.77 Pos counter init value int source becomes the position of the load.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0.<br>1: <b>Pos counter init value integer</b>; see 90.76 Pos counter init value int.</td></tr>
<tr><td>0 … 1</td><td>Pos counter init value integer</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.80</b></td><td colspan="7"><b>Pos counter init value</b></td></tr>
<tr><td colspan="7">Position counter, initial position value.<br>Defines an initial position or distance for the position counter as a decimal number. For this, set 90.81 Pos counter init value source = Pos counter init value.<br>The number of decimal places is defined by 90.82 Pos counter decimals.<br>Result see 90.05 Load position scaled.</td></tr>
<tr><td>-2147483.648 … 2147483.647</td><td>0.000</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.81</b></td><td colspan="7"><b>Pos counter init value source</b></td></tr>
<tr><td colspan="7">Position counter, source of the initial position value.<br>Selects the source of the initial position value. When the device selected by 90.86 Pos counter init cmd source (trigger) activates, the selection in 90.81 Pos counter init value source becomes the position of the load.<br><b>Other</b>; source selection.<br>0: <b>Zero</b>; 0.<br>1: <b>Pos counter init value</b>; see selection in 90.80 Pos counter init value.</td></tr>
<tr><td>0 … 1</td><td>Pos counter init value</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.82</b></td><td colspan="7"><b>Pos counter decimals</b></td></tr>
<tr><td colspan="7">Position counter, number of decimal places.<br>Scales the values of 90.05 Load position scaled and 90.80 Pos counter init value when written to or read by an external source (e.g. fieldbus). The setting corresponds to the number of decimal places.<br><b>Examples with a setting of 3:</b><br>– An integer value written into 90.80 Pos counter init value by an external source is divided by 1000. The value written is 12345 and the value shown is 12.345.<br>– The value of 90.05 Load position scaled is multiplied by 1000 when read by an external source. The value shown is 12.345 and the value written is 12345.</td></tr>
<tr><td>0 … 9</td><td>3</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>90.85</b></td><td colspan="7"><b>Pos counter sync mode</b></td></tr>
<tr><td colspan="7">Position counter, synchronization mode.<br>Position counter synchronization mode for encoder feedback.<br>0: <b>Single</b>; the next synchronization of the encoder feedback must be prepared by resetting 90.70.b04 Pos counter status using 90.88 Reset pos counter init ready.<br>1: <b>Cyclic</b>; the synchronization of the encoder feedback happens at every occurrence of the synchronization event.</td></tr>
<tr><td>0 … 1</td><td>Single</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>90.86</b></td><td colspan="7"><b>Pos counter init cmd source (trigger)</b></td></tr>
<tr><td colspan="7">Position counter, source of the initialization command.<br>Selects a digital source e.g. a limit switch that initializes the position counter. When the digital source triggers, the selection in 90.77 Pos counter init value int source becomes the position of the load.<br>0 = No trigger.<br>0 → 1 = Trigger.<br><b>Note</b>: The position counter initialization can be prevented by 90.87 Disable pos counter init.<br><b>Other [bit]</b>; source selection.<br>0: <b>No trigger</b>; 0, normal operation.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change<br>running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">1: **Trigger**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.<br>50: **Z OnBoard**; taken from the zero channel of the OnBoard encoder.<br>51: **Z OnBoard forward**; taken from zero channel the OnBoard encoder and the motor is rotating forward. See 06.21.b01 Speed control status word.<br>52: **Z OnBoard reverse**; taken from zero channel the OnBoard encoder and the motor is rotating reverse. See 06.21.b02 Speed control status word.</td></tr>
<tr><td>0 … 52</td><td>No trigger</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**90.87**</td><td colspan="7">**Disable pos counter init**</td></tr>
<tr><td colspan="7">Position counter, source of the initialization inhibit command.<br>Selects a source that prevents the initialization of the position counter. Thus, it blocks the synchronization command.<br>0 = Release.<br>1 = Disable.<br>**Other [bit]**; source selection.<br>0: **Release**; 0, normal operation.<br>1: **Disable**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
<tr><td>0 … 19</td><td>Release</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**90.88**</td><td colspan="7">**Reset pos counter init ready**</td></tr>
<tr><td colspan="7">Position counter, source of the initialization command reset.<br>Selects a source that enables a new initialization of the position counter. It resets 90.70.b04 Pos counter status.<br>0 = No reset.<br>0 → 1 = Reset.<br>**Other [bit]**; source selection.<br>0: **No Reset**; 0.<br>1: **Reset**; 1.<br>3: **DI1**; 10.02.b00 DI delayed status.<br>4: **DI2**; 10.02.b01 DI delayed status.<br>5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td>0 … 19</td><td>No Reset</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 91 Encoder module settings

Configuration of the encoder interface modules.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>91.01</b></td><td colspan="7"><b>FEN DI status</b></td></tr>
<tr><td colspan="7">Module 1 and 2, status of digital inputs.<br>Displays the electrical status of DI1 and DI2.<br>Bits 0 and 1 reflect the status of DI1 and DI2 of module 1. Bits 4 and 5 reflect the status of DI1 and DI2 of module 2.<br><b>Example</b>: 0000000000010010b = DI1 of module 2 and DI2 of module 1 are on.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>DI1 / module 1</td><td>1</td><td>On. See parameters 91.11 and 91.12.</td></tr>
<tr><td>1</td><td>DI2 / module 1</td><td>1</td><td>On. See parameters 91.11 and 91.12.</td></tr>
<tr><td>2</td><td>reserved</td><td></td><td></td></tr>
<tr><td>3</td><td>reserved</td><td></td><td></td></tr>
<tr><td>4</td><td>DI1 / module 2</td><td>1</td><td>On. See parameters 91.13 and 91.14.</td></tr>
<tr><td>5</td><td>DI2 / module 2</td><td>1</td><td>On. See parameters 91.13 and 91.14.</td></tr>
<tr><td>6 … 15</td><td>reserved</td><td></td><td></td></tr>
</table></td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>91.02</b></td><td colspan="7"><b>Module 1 status</b></td></tr>
<tr><td colspan="7">Module 1, status.<br>Displays the type of the module found in the location specified by 91.12 Module 1 location.<br>0: <b>No option</b>; no module detected in the specified slot.<br>1: <b>No communication</b>; a module has been detected but cannot be communicated with.<br>2: <b>Unknown</b>; the module type is unknown.<br>16: <b>FEN-01</b>; a FEN-01 has been detected and is active.<br>17: <b>FEN-11</b>; a FEN-11 has been detected and is active. Not supported at the time of publication.<br>18: <b>FEN-21</b>; a FEN-21 has been detected and is active.<br>21: <b>FEN-31</b>; a FEN-31 has been detected and is active.<br>25: <b>FSE-31</b>; a FSE-31 has been detected and is active. Not supported at the time of publication.</td></tr>
<tr><td>0 … 25</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>91.03</b></td><td colspan="7"><b>Module 2 status</b></td></tr>
<tr><td colspan="7">Module 2, status.<br>Displays the type of the module found in the location specified by 91.14 Module 2 location. See 91.02 Module 1 status.</td></tr>
<tr><td>0 … 25</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>91.04</b></td><td colspan="7"><b>Module 1 temperature</b></td></tr>
<tr><td colspan="7">Module 1, measured temperature.<br>Displays the temperature measured through the sensor input of module 1.<br>The unit is selected by 96.02 Unit selection.<br><b>Note</b>: With a PTC sensor, the unit is Ω.</td></tr>
<tr><td>0 … 1000</td><td>-</td><td>°C, °F or Ohm</td><td>1 = 1°C, °F or Ohm</td><td>y</td><td>n</td><td>Signal</td></tr>
</table>

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **91.06** | **Module 2 temperature** | | | | | | |
| | Module 2, measured temperature.<br>Displays the temperature measured through the sensor input of module 2.<br>The unit is selected by 96.02 Unit selection.<br>**Note**: With a PTC sensor, the unit is Ω. | | | | | | |
| | 0 … 1000 | - | °C, °F or Ohm | 1 = 1°C, °F or Ohm | y | n | Signal |
| **91.10** | **Encoder parameter refresh** | | | | | | |
| | Module 1 and 2, parameter refresh.<br>Validates any changed module parameters. This is needed for any parameter changes in groups 90 … 93 to take effect. The value reverts to Done automatically, when the refresh is done.<br>0: **Done**; 0, refreshing done.<br>1: **Refresh**; 1, refreshing. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | y | y | Parameter |
| **91.11** | **Module 1 type** | | | | | | |
| | Module 1, type.<br>Activates (and specifies the type of) module 1.<br>0: **None**; inactive.<br>1: **FEN-01**; FEN-01, 2 inputs (TTL encoder), 1 output.<br>2: **FEN-11**; FEN-11, 2 inputs (absolute encoder, TTL encoder), 1 output. Not supported at the time of publication.<br>3: **FEN-21**; FEN-21, 2 inputs (resolver, TTL encoder), 1 output.<br>4: **FEN-31**; FEN-31, 1 input (HTL encoder), 1 output (beta).<br>5: **FSE-31**; FSE-31. Not supported at the time of publication. | | | | | | |
| | 0 … 5 | None | - | 1 = 1 | n | n | Parameter |
| **91.12** | **Module 1 location** | | | | | | |
| | Module 1, location.<br>Activates and specifies the slot (1 … 3) on the drive's control board into which module 1 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module.<br>1: **Slot 1**; module 1 is located in slot 1.<br>2: **Slot 2**; module 1 is located in slot 2.<br>3: **Slot 3**; module 1 is located in slot 3.<br>**04 … 254**: Node ID of the slot on the FEA-03 extension module.<br>**Note:** The node ID of the slot on the FEA-03 extension module can be typed in. This is only possible with Drive composer. | | | | | | |
| | 1 … 254 | Slot 2 | - | 1 = 1 | n | n | Parameter |
| **91.13** | **Module 2 type** | | | | | | |
| | Module 2, type.<br>Activates (and specifies the type of) module 2.<br>See 91.11 Module 1 type. | | | | | | |
| | 0 … 5 | None | - | 1 = 1 | n | n | Parameter |
| **91.14** | **Module 2 location** | | | | | | |
| | Module 2, location.<br>Activates and specifies the slot (1 … 3) on the drive's control board into which module 2 is installed. Alternatively, specifies the node ID of the slot on a FEA-03 extension module.<br>See 91.12 Module 1 location. | | | | | | |
| | 1 … 254 | Slot 3 | - | 1 = 1 | n | n | Parameter |
| **91.21** | **Module 1 temp sensor type** | | | | | | |
| | Module 1, temperature sensor type.<br>Specifies the type of temperature sensor connected to module 1.<br>**Note:** Module 1 must also be activated by parameters 91.11 … 91.12. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">0: **None**; disable module 1 temperature monitoring function.<br>1: **PTC**; PTC sensor connected to module 1. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.<br>2: **KTY84**; KTY84 sensor connected to module 1. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.</td></tr>
<tr><td>0 … 2</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.22**</td><td colspan="7">**Module 1 temp filter time**</td></tr>
<tr><td colspan="7">Module 1, filter time constant for temperature measurement.<br>Defines the filter time constant for the temperature measurement through module 1.</td></tr>
<tr><td>0 … 10000</td><td>1500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.24**</td><td colspan="7">**Module 2 temp sensor type**</td></tr>
<tr><td colspan="7">Module 2, temperature sensor type.<br>Specifies the type of temperature sensor connected to module 2.<br>**Note:** Module 2 must also be activated by parameters 91.13 … 91.14.<br>0: **None**; disable module 2 temperature monitoring function.<br>1: **PTC**; PTC sensor connected to module 2. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.<br>2: **KTY84**; KTY84 sensor connected to module 2. See 35.11 Temperature 1 source and 35.21 Temperature 2 source.</td></tr>
<tr><td>0 … 2</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.25**</td><td colspan="7">**Module 2 temp filter time**</td></tr>
<tr><td colspan="7">Module 2, filter time constant for temperature measurement.<br>Defines the filter time constant for the temperature measurement through module 2.</td></tr>
<tr><td>0 … 10000</td><td>1500</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.31**</td><td colspan="7">**Module 1 TTL output source**</td></tr>
<tr><td colspan="7">Module 1, source for TTL output.<br>Selects the encoder input on module 1 whose signal is echoed by or emulated to the TTL output.<br>**Note:** This can be used as a splitter.<br>0: **Not selected**; module 1 TTL output not in use.<br>1: **Module input 1**; module 1 input 1 is echoed by or emulated to the TTL output.<br>2: **Module input 2**; module 1 input 2 is echoed by or emulated to the TTL output.</td></tr>
<tr><td>0 … 2</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.32**</td><td colspan="7">**Module 1 emulation pulses/rev**</td></tr>
<tr><td colspan="7">Module 1, pulses per revolution for the TTL output.<br>Defines the number of TTL pulses per revolution for the encoder emulation output of module 1.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**91.33**</td><td colspan="7">**Module 1 emulated Z-pulse offset**</td></tr>
<tr><td colspan="7">Module 1, position of the emulated zero pulses.<br>Defines when zero pulses are emulated in relation to the zero position received from the encoder.<br>**Examples:**<br>– With a value of 0.50000, a zero pulse is emulated whenever the encoder position passes 0.5 revolutions.<br>– With a value of 0.00000, a zero pulse is emulated whenever the encoder position passes zero position.</td></tr>
<tr><td>0.00000 … 1.00000</td><td>0.00000</td><td>rev</td><td>32767 = 1 rev</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**91.41**</td><td colspan="7">**Module 2 TTL output source**</td></tr>
<tr><td colspan="7">Module 2, source for TTL output.<br>Selects the encoder input on module 2 whose signal is echoed by or emulated to the TTL output.<br>**Note:** This can be used as a splitter.<br>0: **Not selected**; module 2 TTL output not in use.<br>1: **Module input 1**; module 2 input 1 is echoed by or emulated to the TTL output.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">2: <b>Module input 2</b>; module 2 input 2 is echoed by or emulated to the TTL output.</td></tr>
<tr><td>0 … 2</td><td>Not selected</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>91.42</b></td><td colspan="7"><b>Module 2 emulation pulses/rev</b></td></tr>
<tr><td colspan="7">Module 2, pulses per revolution for the TTL output.<br>Defines the number of TTL pulses per revolution for the encoder emulation output of module 2.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>91.43</b></td><td colspan="7"><b>Module 2 emulated Z-pulse offset</b></td></tr>
<tr><td colspan="7">Module 2, position of the emulated zero pulses.<br>Defines when zero pulses are emulated in relation to the zero position received from the encoder.<br><b>Examples:</b><br>– With a value of 0.50000, a zero pulse is emulated whenever the encoder position passes 0.5 revolutions.<br>– With a value of 0.00000, a zero pulse is emulated whenever the encoder position passes zero position.</td></tr>
<tr><td>0.00000 … 1.00000</td><td>0.00000</td><td>rev</td><td>32767 = 1 rev</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 92 Encoder 1 configuration

Settings for encoder 1.

**Notes:**

- The contents of the parameter group varies according to the selected encoder type.
- It is recommended that encoder connection 1 (this group) is used whenever possible since the data received through this interface is fresher than the data received through connection 2 (group 93).

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>92.01</b></td><td colspan="7"><b>Encoder 1 type</b></td></tr>
<tr><td colspan="7">Encoder 1, type.<br>Activates (and specifies the type of) encoder/resolver 1.<br>0: <b>None configured</b>; inactive.<br>1: <b>TTL</b>; TTL, module type (input): FEN-01 (X31), FEN-11 (X41) or FEN-21 (X51).<br>2: <b>TTL+</b>; TTL+, module type (input): FEN-01 (X32).<br>3: <b>Absolute encoder</b>; absolute encoder, module type (input): FEN-11 (X42).<br>4: <b>Resolver</b>; resolver, module type (input): FEN-21 (X52).<br>5: <b>HTL</b>; HTL, module type (input): FEN-31 (X82).<br>6: <b>HTL 1</b>; HTL, module type (input): FSE-31 (X31). Not supported at the time of publication.<br>7: <b>HTL 2</b>; HTL, module type (input): FSE-31 (X32). Not supported at the time of publication.<br><b>Attention:</b> FEN-11 and FSE-31 are not supported at the time of publication.</td></tr>
<tr><td>0 … 7</td><td>None configured</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.02</b></td><td colspan="7"><b>Encoder 1 source</b></td></tr>
<tr><td colspan="7">Encoder 1, source.<br>Selects the module (either module 1 or module 2) that the encoder is connected to. The physical locations and types of encoder interface modules are defined in group 91 Encoder module settings.<br>0: <b>Module 1</b>; module 1 is activated by parameters 91.11 … 91.12.<br>1: <b>Module 2</b>; module 2 is activated by parameters 91.13 … 91.14.</td></tr>
<tr><td>0 … 1</td><td>Module 1</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>92.10</b></td><td colspan="7"><b>Pulses/revolution</b></td></tr>
<tr><td colspan="7">Encoder 1, pulses per revolution (ppr).<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Defines encoder 1 pulses per revolution, see encoder nameplate.</td></tr>
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<tr><td></td><td>0 … 65535</td><td>2048</td><td>ppr</td><td>1 = 1 ppr</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.10</b></td><td colspan="7"><b>Sine/cosine number</b></td></tr>
<tr><td colspan="7">Encoder 1, Number of sine/cosine wave cycles within one revolution.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Defines encoder 1 number of sine/cosine wave cycles within one revolution.<br><b>Note:</b> 92.10 Sine/cosine number must not be set when an EnDat or SSI encoder is used in continuous mode. Valid when 92.30 Serial link mode = Continuous or Continuous speed and position.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.10</b></td><td colspan="7"><b>Excitation signal frequency</b></td></tr>
<tr><td colspan="7">Encoder 1, excitation signal frequency.<br>(Visible when 92.01 Encoder 1 type = Resolver)<br>Defines the frequency of the excitation signal.<br><b>Note:</b> With an EnDat or HIPERFACE encoder and a FEN-21 with FPGA version VIE12200 or later, 92.10 Excitation signal frequency is automatically set using 91.10 Encoder parameter refresh = Refresh.</td></tr>
<tr><td>1 … 20</td><td>1</td><td>kHz</td><td>1 = 1 kHz</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.11</b></td><td colspan="7"><b>Pulse encoder type</b></td></tr>
<tr><td colspan="7">Encoder 1, type.<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Selects the type of encoder 1.<br>0: <b>Quadrature</b>; quadrature encoder with two channels, A and B.<br>1: <b>Single track</b>; single-track encoder with one channel, A.<br><b>Note</b>: With this setting, the measured speed value is always positive regardless of direction of rotation.</td></tr>
<tr><td>0 … 1</td><td>Quadrature</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.11</b></td><td colspan="7"><b>Absolute position source</b></td></tr>
<tr><td colspan="7">Encoder 1, source for absolute position.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Selects the source of the absolute position information.<br>0: <b>None</b>; not selected.<br>1: <b>Commut signals</b>; commutation signals.<br>2: <b>EnDat</b>; serial interface: EnDat encoder.<br>3: <b>Hiperface</b>; serial interface: HIPERFACE encoder.<br>4: <b>SSI</b>; resolver, serial interface: SSI encoder.<br>5: <b>Tamagawa</b>; serial interface: Tamagawa 17/33-bit encoder.</td></tr>
<tr><td>0 … 5</td><td>None</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.11</b></td><td colspan="7"><b>Excitation signal amplitude</b></td></tr>
<tr><td colspan="7">Encoder 1, excitation signal amplitude.<br>(Visible when 92.01 Encoder 1 type = Resolver)<br>Defines the rms amplitude of the excitation signal.</td></tr>
<tr><td>4.0 … 12.0</td><td>4.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>92.12</b></td><td colspan="7"><b>Speed calculation mode</b></td></tr>
<tr><td colspan="7">Encoder 1, encoder speed calculation mode.<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Selects the speed calculation mode.<br><b>*</b>With a single-track encoder, 92.11 Pulse encoder type = Single track, the speed is always positive.<br>0: <b>A&B all</b>; channels A and B rising and falling edges are used for the speed calculation.<br>*Channel B defines the direction of rotation, see comment above<br><b>Note:</b> With a single-track encoder, 92.11 Pulse encoder type = Single track, this setting acts like setting A all.<br>1: <b>A all</b>; channel A rising and falling edges are used for speed calculation.</td></tr>
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<tr><td rowspan="2"></td><td colspan="7">*Channel B defines the direction of rotation, see comment above.<br>2: <b>A rising</b>; channel A rising edges are used for speed calculation.<br>*Channel B defines the direction of rotation, see comment above.<br>3: <b>A falling</b>; channel A falling edges are used for speed calculation.<br>*Channel B defines the direction of rotation, see comment above.<br>4: <b>Auto rising</b>; one of the above modes is selected automatically depending on the pulse frequency:
<table>
<tr><th>Pulse frequency of the channel(s)</th><th>Used mode</th></tr>
<tr><td>< 2442 Hz</td><td>A&B all</td></tr>
<tr><td>2442 … 4884 Hz</td><td>A all</td></tr>
<tr><td>> 4884 Hz</td><td>A rising</td></tr>
</table>
5: <b>Auto falling</b>; one of the above modes is selected automatically depending on the pulse frequency:
<table>
<tr><th>Pulse frequency of the channel(s)</th><th>Used mode</th></tr>
<tr><td>< 2442 Hz</td><td>A&B all</td></tr>
<tr><td>2442 … 4884 Hz</td><td>A all</td></tr>
<tr><td>> 4884 Hz</td><td>A falling</td></tr>
</table></td></tr>
<tr><td>0 … 5</td><td>Auto rising</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.12</b></td><td colspan="7"><b>Zero pulse enable</b></td></tr>
<tr><td colspan="7">Encoder 1, enable zero pulse.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Enables/Disables the encoder zero pulse for the absolute encoder input (X42) of the FEN-11.<br><b>Note:</b> No zero pulse exists with serial interfaces, when 92.11 Absolute position source = EnDat, HIPERFACE, SSI or Tamagawa.<br>0: <b>Disable</b>; disable the encoder zero pulse.<br>1: <b>Enable</b>; enable the encoder zero pulse.</td></tr>
<tr><td>0 … 1</td><td>Disable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.12</b></td><td colspan="7"><b>Resolver polepairs</b></td></tr>
<tr><td colspan="7">Encoder 1, number of resolver pole pairs.<br>(Visible when 92.01 Encoder 1 type = Resolver)<br>Defines the number of pole pairs of the resolver.</td></tr>
<tr><td>1 … 32</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.13</b></td><td colspan="7"><b>Position estimation enable</b></td></tr>
<tr><td colspan="7">Encoder 1, enable position estimation.<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Enables/Disables the position estimation to increase the position data resolution.<br>0: <b>Disable</b>; disable the position estimation. Measured position is used. The resolution is 4 times the amount of pulses per revolution for quadrature encoders and 2 times the amount of pulses per revolution for single-track encoders.<br>1: <b>Enable</b>; enable the position estimation. Estimated position is used. Uses the position interpolation which is extrapolated at the time of the data request.</td></tr>
<tr><td>0 … 1</td><td>Enable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.13</b></td><td colspan="7"><b>Position data width</b></td></tr>
<tr><td colspan="7">Encoder 1, number of bits used in the position indication within one revolution.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Defines the number of bits used to indicate the position within one revolution.<br><b>Example:</b> A setting of 15 bits corresponds to 32768 positions per revolution.<br>The value is used when 92.11 Absolute position source = EnDat, Hiperface or SSI. When 92.11 Absolute position source = Tamagawa, 92.13 Position data width is internally set to 17.<br><b>Note:</b> With an EnDat or HIPERFACE encoder and a FEN-11 with FPGA version VIE12200 or later, 92.13 Position data width is automatically set using 91.10 Encoder parameter refresh = Refresh.</td></tr>
<tr><td>0 … 32</td><td>0</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td><b>92.14</b></td><td colspan="7"><b>Speed estimation enable</b></td></tr>
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| | Encoder 1, enable speed estimation.<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Selects whether calculated or estimated speed is used. Estimation increases the speed ripple in steady state operation, but improves the dynamics.<br>**Note:** 92.14 Speed estimation enable is not effective using FEN-xx with FPGA version VIEx 2000 or later.<br>0: **Disable**; last calculated speed is used. The calculation interval is 62.5 µs … 4 ms.<br>1: **Enable**; estimated speed is used, estimated at the time of data request. | | | | | | |
| | 0 … 1 | Disable | - | 1 = 1 | n | y | Parameter |
| **92.14** | **Revolution data width** | | | | | | |
| | Encoder 1, Number of bits used in the revolution count.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Defines the number of bits used in the revolution counting with a multiturn encoder.<br>**Example:** A setting of 12 bits would support counting up to 4096 revolutions.<br>The value is used when 92.11 Absolute position source = EnDat, Hiperface or SSI. When 92.11 Absolute position source = Tamagawa, setting 92.14 Revolution data width to a non-zero value activates the multiturn data requesting.<br>**Note:** With an EnDat or HIPERFACE encoder and a FEN-11 FPGA version VIE12200 or later, 92.14 Revolution data width is automatically set using 91.10 Encoder parameter refresh = Refresh. | | | | | | |
| | 0 … 32 | 0 | - | 1 = 1 | n | y | Parameter |
| **92.15** | **Transient filter** | | | | | | |
| | Encoder 1, transient filter.<br>(Visible when 92.01 Encoder 1 type = TTL, TTL+ or HTL)<br>Activates the transient filtering for encoder 1. Thus, unintentional changes in direction of rotation are ignored. Should be activated when the connected mechanics are vibrating heavily.<br>0: **4880 Hz**; change in direction of rotation allowed below 4880 Hz.<br>1: **2440 Hz**; change in direction of rotation allowed below 2440 Hz.<br>2: **1220 Hz**; change in direction of rotation allowed below 1220 Hz.<br>3: **Disabled**; change in direction of rotation allowed at any pulse frequency. | | | | | | |
| | 0 … 3 | 4880 Hz | - | 1 = 1 | n | y | Parameter |
| **92.16** | **Encoder 1 supply voltage** | | | | | | |
| | Encoder 1, supply voltage.<br>(Visible when 92.01 Encoder 1 type = HTL 1 or HTL 2)<br>Selects the power supply voltage for encoder 1.<br>0: **0V**; disable.<br>1: **5V**; 5 V.<br>2: **24V**; 24 V. | | | | | | |
| | 0 … 2 | 0V | - | 1 = 1 | n | y | Parameter |
| **92.17** | **Accepted pulse freq of encoder 1** | | | | | | |
| | Encoder 1, maximum pulse frequency.<br>(Visible when 92.01 Encoder 1 type = HTL 1 or HTL 2)<br>Defines the maximum pulse frequency of encoder 1. | | | | | | |
| | 0 … 300 | 0 | kHz | 1 = 1 kHz | n | y | Parameter |
| **92.21** | **Encoder cable fault mode** | | | | | | |
| | Encoder 1, mode for a cable fault.<br>Selects which encoder track channels are monitored for wiring faults. In case of problems, the event generates warning A7E1 Speed feedback device or fault 7381 Speed feedback device, depending on the setting of 31.35 Motor feedback fault.<br>0: **A, B**; tracks A and B.<br>1: **A, B, Z**; tracks A, B and Z.<br>2: **A+, A-, B+, B-**; tracks A+, A-, B+ and B-.<br>3: **A+, A-, B+, B-, Z+, Z-**; tracks A+, A-, B+, B-, Z+ and Z-. | | | | | | |
| | 0 … 3 | A, B | - | 1 = 1 | n | y | Parameter |

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<tr><td rowspan="3">**92.23**</td><td colspan="7">**Maximum pulse waiting time**</td></tr>
<tr><td colspan="7">Encoder 1, maximum pulse waiting time.<br>(Visible when 92.01 Encoder 1 type = TTL or HTL)<br>When an encoder is used as speed feedback device the actual speed is measured by counting pulses per measurement interval. The base (minimum) measurement interval is 4 ms.<br>92.23 Maximum pulse waiting time determines the pulse waiting time for the speed feedback calculation of encoder 1.If no pulse edges are detected within the measurement interval, the measured speed feedback is set to zero. Increasing the time can improve measuring performance especially at low, near zero speeds.<br>Only the speed measurement is affected. The position is updated whenever a new pulse edge is detected. When the measured speed from the interface is zero, the drive updates its speed data based on position changes.<br>**Note:** 92.23 Maximum pulse waiting time is only supported using FEN-xx with FPGA version VIEx 2000 or later. On older FEN-xx, the pulse waiting time is fixed at 4 ms.</td></tr>
<tr><td>1 … 200</td><td>4</td><td>ms</td><td>1 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**92.24**</td><td colspan="7">**Pulse edge filtering**</td></tr>
<tr><td colspan="7">Encoder 1, pulse edge filtering.<br>(Visible when parameter 92.01 Encoder 1 type = HTL)<br>Enables pulse edge filtering. Pulse edge filtering can improve the reliability of measurements especially from encoders with a single-ended connection.<br>**Notes:**<br>– 92.24 Pulse edge filtering is only supported using FEN-31 with FPGA version VIE3 2200 or later.<br>– Pulse edge filtering decreases the maximum pulse frequency. With 2 µs filtering time, the maximum pulse frequency is 200 kHz.<br>0: **No filtering**; disable filtering.<br>1: **1 µs**; filtering time is 1 µs.<br>2: **2 µs**; filtering time is 2 µs.</td></tr>
<tr><td>0 … 2</td><td>No filtering</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**92.25**</td><td colspan="7">**Pulse overfrequency function**</td></tr>
<tr><td colspan="7">Encoder 1, overfrequency function.<br>(Visible when parameter 92.01 Encoder 1 type = HTL)<br>Selects how the drive reacts when the FEN-31 detects a pulse overfrequency condition.<br>**Note:** 92.25 Pulse overfrequency function is only supported using FEN-31 with FPGA version VIEx 2200 or later.<br>0: **Warning**; the event generates warning 7381 Speed feedback device. The FEN-31 module will continue to update speed and position data.<br>1: **Fault**; the event generates fault 7381 Speed feedback device.</td></tr>
<tr><td>0 … 1</td><td>Fault</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**92.30**</td><td colspan="7">**Serial link mode**</td></tr>
<tr><td colspan="7">Encoder 1, serial link mode.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Selects the serial link mode with an EnDat or SSI encoder.<br>0: **Initial position**; single position transfer mode (initial position).<br>1: **Continuous**; continuous position data transfer mode.<br>2: **Continuous speed and position**; Continuous speed and position data transfer mode. Intended for EnDat 2.2 encoders without sin/cos signals.<br>**Note:** This setting requires a FEN-11 revision H or later.</td></tr>
<tr><td>0 … 2</td><td>Initial position</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2">**92.31**</td><td colspan="7">**EnDat max calculation time**</td></tr>
<tr><td colspan="7">Encoder 1, maximum calculation time.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Selects the maximum encoder calculation time for an EnDat encoder.</td></tr>
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<tr><td></td><td colspan="7"><b>Note:</b> 92.31 EnDat max calculation time needs to be set only when an EnDat encoder is used in continuous mode, e.g. without incremental sin/cos signals (supported only as encoder 1). See also 92.30 Serial link mode.<br>0: <b>10 µs</b>; 10 µs.<br>1: <b>100 µs</b>; 100 µs.<br>2: <b>1 ms</b>; 1 ms.<br>3: <b>50 ms</b>; 50 ms.</td></tr>
<tr><td></td><td>0 … 3</td><td>50 ms</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.32</b></td><td colspan="7"><b>SSI cycle time</b></td></tr>
<tr><td colspan="7">Encoder 1. SSI cycle time.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Selects the transmission cycle for an SSI encoder.<br><b>Note:</b> 92.32 SSI cycle time needs to be set only when a SSI encoder is used in continuous mode, e.g. without incremental sin/cos signals (supported only as encoder 1). See also 92.30 Serial link mode.<br>0: <b>50 µs</b>; 50 µs.<br>1: <b>100 µs</b>; 100 µs.<br>2: <b>200 µs</b>; 200 µs.<br>3: <b>500 µs</b>; 500 µs.<br>4: <b>1 ms</b>; 1 ms.<br>5: <b>2 ms</b>; 2 ms.</td></tr>
<tr><td>0 … 5</td><td>100 µs</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.33</b></td><td colspan="7"><b>SSI clock cycles</b></td></tr>
<tr><td colspan="7">Encoder 1, SSI message length.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Defines the length of an SSI message. The length is the number of clock cycles. The number of cycles can be calculated by adding 1 to the number of bits in an SSI message frame.</td></tr>
<tr><td>2 … 127</td><td>2</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.34</b></td><td colspan="7"><b>SSI position msb</b></td></tr>
<tr><td colspan="7">Encoder 1, position data MSB (<b>M</b>ost <b>S</b>ignificant <b>B</b>it) location (bit number).<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With an SSI encoder, defines the location of the MSB of the position data within an SSI message.</td></tr>
<tr><td>1 … 126</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.35</b></td><td colspan="7"><b>SSI revolution msb</b></td></tr>
<tr><td colspan="7">Encoder 1, revolution count MSB (<b>M</b>ost <b>S</b>ignificant <b>B</b>it) location (bit number).<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With an SSI encoder, defines the location of the MSB of the revolution count within an SSI message.</td></tr>
<tr><td>1 … 126</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>92.36</b></td><td colspan="7"><b>SSI data format</b></td></tr>
<tr><td colspan="7">Encoder 1, SSI data format.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With an SSI encoder, selects the data format.<br>0: <b>Binary</b>; binary code.<br>1: <b>Gray</b>; gray code.</td></tr>
<tr><td>0 … 1</td><td>Binary</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>92.37</b></td><td colspan="7"><b>SSI baud rate</b></td></tr>
<tr><td colspan="7">Encoder 1, SSI baud rate.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With an SSI encoder, selects the baud rate.<br>0: <b>10 kBit/s</b>; 10 kBit/s.<br>1: <b>50 kBit/s</b>; 50 kBit/s.<br>2: <b>100 kBit/s</b>; 100 kBit/s.</td></tr>
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| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | 3: **200 kBit/s**; 200 kBit/s.<br>4: **500 kBit/s**; 500 kBit/s.<br>5: **1000 kBit/s**; 1000 kBit/s. | | | | | | |
| | 0 … 5 | 100 kBit/s | - | 1 = 1 | n | y | Parameter |
| **92.40** | **SSI zero phase** | | | | | | |
| | Encoder 1, SSI zero phase.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>Selects the phase angle within one sine/cosine signal period that corresponds to the value of zero on the SSI serial link data. 92.40 SSI zero phase is used to adjust the synchronization of the SSI position data and the position based on sine/cosine incremental signals. Incorrect synchronization may cause an error of ±1 incremental period.<br>**Note:** 92.40 SSI zero phase needs to be set only when an SSI encoder is used in initial position mode (see 92.30 Serial link mode).<br>0: **315-45 deg**; 315° … 45°.<br>1: **45-135 deg**; 45° … 135°.<br>2: **135-225 deg**; 135° … 225°.<br>3: **225-315 deg**; 225° … 315°. | | | | | | |
| | 0 … 3 | 315-45 deg | - | 1 = 1 | n | y | Parameter |
| **92.45** | **Hiperface parity** | | | | | | |
| | Encoder 1, HIPERFACE parity.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With a HIPERFACE encoder, selects the use of parity and stop bits.<br>**Note:** Typically 92.45 Hiperface parity does not need to be set.<br>0: **Odd**; odd parity indication bit, one stop bit.<br>1: **Even**; even parity indication bit, one stop bit. | | | | | | |
| | 0 … 1 | Odd | - | 1 = 1 | n | y | Parameter |
| **92.46** | **Hiperface baud rate** | | | | | | |
| | Encoder 1, HIPERFACE baud rate.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With a HIPERFACE encoder, selects the transfer rate of the link.<br>**Note:** Typically 92.46 Hiperface baud rate does not need to be set.<br>0: **4800 bits/s**; 4800 bits/s.<br>1: **9600 bits/s**; 9600 bits/s.<br>2: **19200 bits/s**; 19200 bits/s.<br>3: **38400 bits/s**; 38400 bits/s. | | | | | | |
| | 0 … 3 | 4800 bits/s | - | 1 = 1 | n | y | Parameter |
| **92.47** | **Hiperface node address** | | | | | | |
| | Encoder 1, HIPERFACE encoder node address.<br>(Visible when 92.01 Encoder 1 type = Absolute encoder)<br>With a HIPERFACE encoder, selects the node address.<br>Typically this parameter need not be set.<br>**Note:** Typically 92.46 Hiperface baud rate does not need to be set. | | | | | | |
| | 0 … 255 | 64 | - | 1 = 1 | n | y | Parameter |

## 93 Encoder 2 configuration

Settings for encoder 2.
Description see group 92 Encoder 1 configuration.

**Notes:**

- The contents of the parameter group varies according to the selected encoder type.
- It is recommended that encoder connection 1 (group 92) is used whenever possible since the data received through that interface is fresher than the data received through connection 2 (this group).

## 94 OnBoard speed feedback configuration

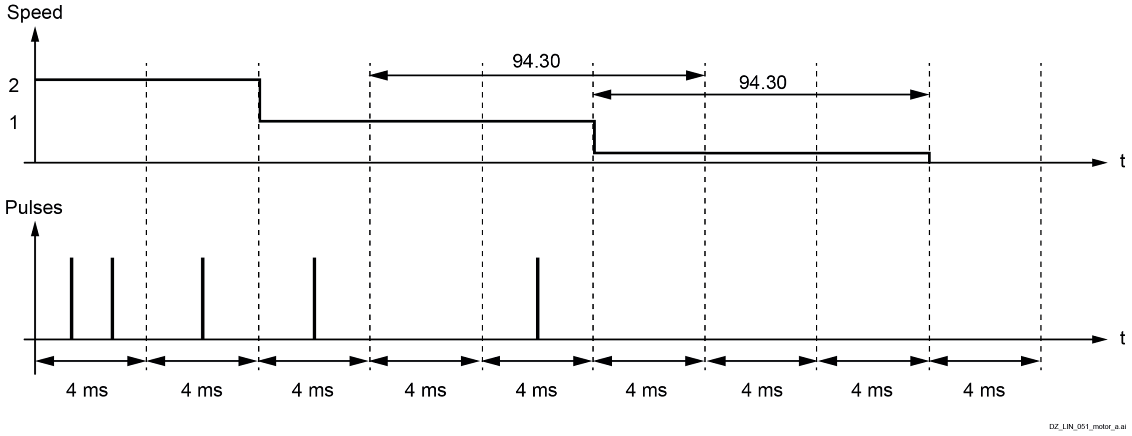
Settings for analog tacho and OnBoard encoder.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **94.01** | **EMF speed** | | | | | | |
| | EMF speed.<br>Displays the speed feedback calculated from the EMF in rpm. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **94.02** | **Tacho voltage** | | | | | | |
| | Value of XTAC (tacho terminals).<br>Displays the value of the tacho connected to XTAC in V. | | | | | | |
| | -3250.0 … 3250.0 | - | V | 10 = 1 V | y | n | Signal |
| **94.03** | **Tacho speed** | | | | | | |
| | Tacho speed.<br>Displays the speed feedback measured by the tacho in rpm. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **94.04** | **OnBoard encoder speed** | | | | | | |
| | OnBoard encoder speed.<br>Displays the speed feedback measured by the OnBoard encoder in rpm. | | | | | | |
| | -30000.00 … 30000.00 | - | rpm | See 46.02 | y | n | Signal |
| **94.07** | **M1 tacho type** | | | | | | |
| | Type of connected tacho.<br>Depending on the type of the connected tacho, a hardware filter of 40 ms is activated.<br>0: **DC tacho**; filter disabled.<br>1: **AC tacho**; filter enabled. | | | | | | |
| | 0 … 1 | DC tacho | - | 1 = 1 | n | y | Parameter |
| **94.08** | **M1 tacho voltage at 1000 rpm** | | | | | | |
| | Motor 1 tacho voltage at 1000 rpm.<br>A tacho generates this voltage at a speed of 1000 rpm, see tacho nameplate. It is used to calculate 94.10 M1 tacho tuning gain. Measure and set the value using 99.20 Tuning requested = Speed feedback assistant.<br>– 94.08 M1 tacho voltage at 1000 rpm ≥ 1.0 V, the value is set by hand.<br>– 94.08 M1 tacho voltage at 1000 rpm = 0.0 V, the value is to be measured by means of the speed feedback assistant.<br>– 94.08 M1 tacho voltage at 1000 rpm ≤ -1.0 V, the value was successfully measured and set by means of the speed feedback assistant. | | | | | | |
| | -270.0 … 270.0 | 0.0 | V | 10 = 1 V | n | y | Parameter |
| **94.09** | **M1 tacho max displayable speed** | | | | | | |
| | Motor 1 maximum displayable speed.<br>Internally used maximum tacho speed for motor 1. This value is depending on the tacho output voltage, see 94.08 M1 tacho voltage at 1000 rpm, and the maximum speed of the drive system. For maximum speed, see 46.02 M1 speed scaling actual, 30.11 M1 minimum speed, 30.12 M1 maximum speed, 31.30 M1 overspeed trip margin and 99.14 M1 nominal (base) speed.<br>The value is only valid if written to by:<br>– Via 99.20 Tuning requested = Speed feedback assistant.<br>– Via 94.08 M1 tacho voltage at 1000 rpm.<br>– Via parameter download. | | | | | | |
| | 0.00 … 30000.00 | 0.00 | rpm | See 46.02 | n | y | Parameter |
| **94.10** | **M1 tacho tuning gain** | | | | | | |
| | Motor 1 tacho tuning gain.<br>Internally used tacho gain tuning for motor 1.<br>The value is only valid if written to by:<br>– Via 99.20 Tuning requested = Speed feedback assistant. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– Via 94.08 M1 tacho voltage at 1000 rpm.<br>– Via parameter download.</td></tr>
<tr><td>0 … 5</td><td>5</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>94.11</b></td><td colspan="7"><b>M1 tacho fine-tuning adjust</b></td></tr>
<tr><td colspan="7">Motor 1 tacho fine-tuning adjust.<br>Internally used fine-tuning adjust of the tacho. The value equals the speed feedback measured by means of a hand held tacho. Set the value of 94.11 M1 tacho fine-tuning adjust to the measured speed feedback of a hand held tacho.<br>The value is only valid if written to by:<br>– Via 99.20 Tuning requested = Tacho fine-tuning. During the tacho fine-tuning 90.41 M1 feedback selection is automatically forced to EMF.<br>– Via parameter download.<br><b>Attention:</b> The value of 94.11 M1 tacho fine-tuning adjust has to be the measured speed feedback of a hand held tacho and not to the delta between speed reference and measured speed.</td></tr>
<tr><td>-30000.00 … 30000.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>94.12</b></td><td colspan="7"><b>M1 tacho fine-tuning factor</b></td></tr>
<tr><td colspan="7">Motor 1 tacho fine-tuning factor.<br>Internally used tacho fine-tuning factor for motor 1.</td></tr>
<tr><td>0.30 … 3.00</td><td>1.00</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>94.13</b></td><td colspan="7"><b>M1 tacho offset</b></td></tr>
<tr><td colspan="7">Motor 1 tacho offset.<br>Adds an offset to 94.03 Tacho speed.</td></tr>
<tr><td>-10.00 … 10.00</td><td>0.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>94.16</b></td><td colspan="7"><b>OnBoard encoder position</b></td></tr>
<tr><td colspan="7">OnBoard encoder position within one revolution.<br>Displays the OnBoard encoder position, within one revolution. See 90.48 Motor position axis mode.</td></tr>
<tr><td>0.00000000 … 1.00000000</td><td>-</td><td>rev</td><td>32767 = 1 rev</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>94.18</b></td><td colspan="7"><b>OnBoard encoder revolution extension</b></td></tr>
<tr><td colspan="7">OnBoard encoder revolution count extension.<br>Displays the revolution count extension for the OnBoard encode. See 90.48 Motor position axis mode.<br>The counter is incremented, when the encoder position wraps around in positive direction and decremented in negative direction. See 90.11 Encoder 1 position.</td></tr>
<tr><td>-2147483648 … 2147483647</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>94.23</b></td><td colspan="7"><b>OnBoard encoder pulses/revolution</b></td></tr>
<tr><td colspan="7">OnBoard encoder pulses per revolution (ppr).<br>Defines the OnBoard encoder pulses per revolution, see encoder nameplate.<br><b>Note</b>: Formula to calculate the frequency at the encoder with maximum speed:<br>$$f\ kHz = \frac{n_{max}\ [rpm]\ \times ppr}{60\ s\ *1000}$$<br>with: ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.<br>If the calculated frequency exceeds 150 kHz, set 94.26 OnBoard encoder transient filter = 0.0 µs.</td></tr>
<tr><td>0 … 65535</td><td>2048</td><td>ppr</td><td>1 = 1 ppr</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>94.24</b></td><td colspan="7"><b>OnBoard encoder type</b></td></tr>
<tr><td colspan="7">OnBoard encoder type.<br>Selects the type of the OnBoard encoder.<br>0: <b>Quadrature</b>; quadrature encoder with two channels, A and B.<br>1: <b>Single track</b>; single-track encoder with one channel, A.</td></tr>
</table>

| **Index** | **Name** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | **Note**: With this setting, the measured speed value is always positive regardless of direction of rotation. | | | | | | |
| | 0 … 1 | Quadrature | - | 1 = 1 | n | y | Parameter |
| **94.25** | **OnBoard encoder speed calculation mode** | | | | | | |
| | OnBoard encoder speed calculation mode.<br>Selects the speed calculation mode.<br>0: **A&B all**; channels A and B rising and falling edges are used for the speed calculation and direction. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 4.<br>1: **A all, B direction**; channel A rising and falling edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 2.<br>2: **A rising, B direction**; channel A rising edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 1.<br>3: **A falling, B direction**; channel A falling edges are used for speed calculation. Channel B defines the direction of rotation. Set 94.24 OnBoard encoder type = Quadrature. The speed evaluation factor = 1.<br>4: **A all**; channel A rising and falling edges are used for speed calculation. EMF speed feedback defines the direction of rotation. Can be used, if channel B is defective. Set 94.24 OnBoard encoder type = Single-track. The speed evaluation factor = 2.<br>5: **B all**; channel B rising and falling edges are used for speed calculation. EMF speed feedback defines the direction of rotation. Can be used, if channel A is defective. Set 94.24 OnBoard encoder type = Single-track. The speed evaluation factor = 2. | | | | | | |
| | 0 … 5 | A&B all | - | 1 = 1 | n | y | Parameter |
| **94.26** | **OnBoard encoder transient filter** | | | | | | |
| | OnBoard encoder transient filter.<br>Activates the transient filtering for the OnBoard encoder. Thus, unintentional changes in direction of rotation are ignored. Should be activated when the connected mechanics are vibrating heavily.<br>0: **0.0 µs**; filter not active.<br>1: **3.2 µs**; fast filter time.<br>2: **6.4 µs**; medium filter time.<br>3: **12.8 µs**; slow filter time.<br>**Note**: Formula to calculate the frequency at the encoder with maximum speed:<br>$f\ kHz = \frac{n_{max}\ [rpm]\ \times ppr}{60\ s\ * 1000}$<br>with: ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.<br>If the calculated frequency exceeds 150 kHz, set 94.26 OnBoard encoder transient filter = 0.0 µs. | | | | | | |
| | 0 … 3 | 3.2 µs | - | 1 = 1 | n | y | Parameter |
| **94.30** | **OnBoard encoder maximum pulse waiting time** | | | | | | |
| | OnBoard encoder, maximum pulse waiting time.<br>When an encoder is used as speed feedback device the actual speed is measured by counting pulses per measurement interval. The base (minimum) measurement interval is 4 ms.<br>94.30 OnBoard encoder maximum pulse waiting time determines the pulse waiting time for the speed feedback calculation of the OnBoard encoder. If no pulse edges are detected within the measurement interval, the measured speed feedback is set to zero. Increasing the time can improve measuring performance especially at low, near zero speeds. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|



**Notes**:

- Formula to calculate the maximum speed using an encoder:

$$n_{max}\ [rpm] = \frac{300\ kHz * 60\ s}{ppr} * 1000$$

with: ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.
300 kHz are the maximum allowed input frequency.

- Formula to calculate the minimum speed resolution using an encoder:

$$n_{min}\ [rpm] = \frac{60\ s}{k\ \times\ ppr\ \times t_{cycle}} * 1000$$

with: k = speed evaluation factor, see 94.25 OnBoard encoder speed calculation mode.
ppr = pulses per revolution, see 94.23 OnBoard encoder pulses/revolution.
$t_{cycle}$ = cycle time of the speed feedback measurement, 4 ms.

–

- Only the speed measurement is affected. The position is updated whenever a new pulse edge is detected. When the measured speed from the interface is zero, the drive updates its speed data based on position changes.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 … 200 | 4 | ms | 1 = 1 ms | n | y | Parameter |

## 95 HW configuration

Various hardware-related settings.

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| **95.14** | **Set: Power unit** | | | | | | |

Set the type of power unit.
95.14 Set: Power unit is only shown and available when there is a mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged in memory unit. See also 07.02 Power unit set.
Either adapt the SDCS-CON-H01 using 95.14 Set: Power unit and 95.25 Set: Type code or use a memory unit with an appropriate firmware.
0: **DCS converter**; the unit is a DCS880.
20: **DCT controller**; the unit is a DCT880.
40: **TSU supply unit**; the unit is a TSU880.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| | 100: **Unsupported power unit type**; mismatch between 95.14 Set: Power unit read from SDCS-CON-H01 and 95.14 Set: Power unit read from the plugged in memory unit. This event generates fault 50FE Type code and shows 95.14 Set: Power unit. | | | | | | |
| | 0 … 100 | Unsupported power unit type | - | 1 = 1 | n | n | Parameter |
| **95.15** | **Set: Special HW settings** | | | | | | |
| | Hardware configuration.<br>Contains hardware-related settings. 95.15 Set: Special HW settings is write protected. To enable use 95.24 Service mode = Set: Type code.<br>Service mode = Set: Type code has to be set back to Normal mode by the user.<br>0: **3ph B6C**; the connected power part is a B6 configuration connected to three phase mains.<br>4: **1ph B2C**; the connected power part is a B2 configuration or a B6 configuration connected to single phase mains. This setting is e.g. needed for the demo unit. | | | | | | |
| | 0 … 4 | 3ph B6C | - | 1 = 1 | n | n | Parameter |
| **95.24** | **Service mode** | | | | | | |
| | Drive service mode.<br>The service mode contains Type code settings, thyristor test and firing pulse test procedures.<br>Service mode is automatically reset to Normal mode after the deleting the application or thyristor test is finished/failed. In case errors occur during the selected procedure, AF90 Autotuning is generated. The reason of the error can be seen in the AUX code.<br>Service mode = Set: Type code or Firing pulses Vxx has to be set back to Normal mode by the user.<br>**Notes**:<br>– The reference chain is blocked while 95.24 Service mode ≠ Normal mode.<br>– After checking individual firing pulses the power needs to be cycled, otherwise the drive will not start.<br>0: **Normal mode**; normal operating mode depending on 99.06 Operation mode.<br>1: **Set: Type code**; enables setting of following parameters:<br>– 95.15 Set: Special HW settings.<br>– 95.25 Set: Type code.<br>– 95.27 Set: Drive DC current scaling.<br>– 95.28 Set: Drive AC voltage scaling.<br>5: **Thyristor test**; starts a complete Thyristor test. All thyristors are tested. The result is shown in 05.22 Diagnostic.<br>11: **Firing pulses V11**; only firing pulses for thyristor V11 are released.<br>12: **Firing pulses V12**; only firing pulses for thyristor V12 are released.<br>13: **Firing pulses V13**; only firing pulses for thyristor V13 are released.<br>14: **Firing pulses V14**; only firing pulses for thyristor V14 are released.<br>15: **Firing pulses V15**; only firing pulses for thyristor V15 are released.<br>16: **Firing pulses V16**; only firing pulses for thyristor V16 are released.<br>21: **Firing pulses V21**; only firing pulses for thyristor V21 are released.<br>22: **Firing pulses V22**; only firing pulses for thyristor V22 are released.<br>23: **Firing pulses V23**; only firing pulses for thyristor V23 are released.<br>24: **Firing pulses V24**; only firing pulses for thyristor V24 are released.<br>25: **Firing pulses V25**; only firing pulses for thyristor V25 are released.<br>26: **Firing pulses V26**; only firing pulses for thyristor V26 are released. | | | | | | |
| | 0 … 26 | Normal mode | - | 1 = 1 | y | n | Parameter |
| **95.25** | **Set: Type code** | | | | | | |
| | Set the type code of the drive.<br>Contains the drives current-, voltage-, temperature measurement and its quadrant type. 95.25 Set: Type code is preset in the factory and is write protected. To enable use 95.24 Service mode = Set: Type code. The change of the type code is immediately taken over.<br>95.24 Service mode has to be set back to Normal mode by the user. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

0: **None**; the type code is set by the user, see 95.26 Set: Drive block bridge 2, 95.27 Set: Drive DC current scaling, 95.28 Set: Drive AC voltage scaling and 95.29 Set: Drive max bridge temperature e.g. for rebuild kits.
1: **S01-0020-04**; type code, see table.
…
152: **S02-5200-05**; type code, see table.

| The drive's basic type code: **DCS880-aab-cccc-ddef** | | | |
|---|---|---|---|
| Product family: | DCS880 | | |
| Product type: | aa | = S0 | Standard converter module |
| | | = R0 | Rebuild kit |
| | | = E0 | Panel solution |
| | | = A0 | Enclosed converter |
| Bridge type: | b | = 1 | Single bridge (2-Q) |
| | | = 2 | 2 anti-parallel bridges (4-Q) |
| Module type: | cccc | = | Rated DC current (IP00) |
| Rated AC voltage: | dd | = 04 | 100 $V_{AC}$ … 415 $V_{AC}$ |
| | | = 05 | 100 $V_{AC}$ … 525 $V_{AC}$ |
| | | = 06 | 270 $V_{AC}$ … 600 $V_{AC}$ |
| | | = 07 | 315 $V_{AC}$ … 690 $V_{AC}$ |
| | | = 08 | 360 $V_{AC}$ … 800 $V_{AC}$ |
| | | = 10 | 450 $V_{AC}$ … 990 $V_{AC}$ |
| | | = 12 | 540 $V_{AC}$ … 1190 $V_{AC}$ |
| Power connection: | e | = X | Standard H1 … H7 |
| | | = L | Left side H8 |
| | | = R | Right side H8 |
| Revision code: | f | = 0 | 1st generation |

**Attention**: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 $A_{DC}$ and max 600 $V_{AC}$.

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 0 … 520 | None | - | 1 = 1 | n | n | Parameter |

**95.26** **Set: Drive block bridge 2**

Set the quadrant type of the drive (1 or 2 bridges).
Bridge 2 can be blocked.
0: **Auto**; operation mode is taken from 95.25 Set: Type code. If 95.25 Set: Type code = None set 95.26 Set: Drive block bridge 2 = Block bridge 2 or Release bridge 2.
1: **Block bridge 2**; block bridge 2 (≡ 2-Q operation), e.g. for 2-Q rebuild kits.
2: **Release bridge 2**; release bridge 2 (≡ 4-Q operation), e.g. 4-Q for rebuild kits.
This value overrides the type code and is immediately visible in 07.61 Drive block bridge 2 set.

| | Range | Default | Unit | Scale/Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| 95.26 | 0 … 2 | Auto | - | 1 = 1 | n | n | Parameter |

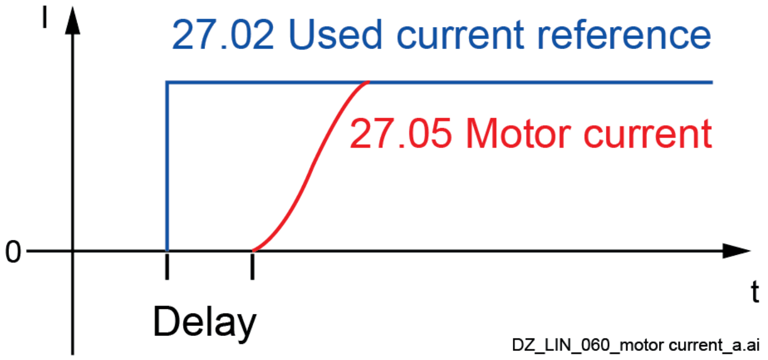
**95.27** **Set: Drive DC current scaling**

Set the nominal DC current of the drive.
Adjustment of DC current measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). 95.27 Set: Drive DC current scaling is write protected. To enable use 95.24 Service mode = Set: Type code.

| | |
|---|---|
| 0 A | Take value from 95.25 Set: Type code. |
| 1 … 32500 A | Take value from 95.27 Set: Drive DC current scaling. |

This value overrides the type code and is immediately visible in 07.62 Drive DC current scaling set.
95.24 Service mode has to be set back to Normal mode by the user.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7"><b>Attention</b>: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 $A_{DC}$ and max 600 $V_{AC}$.</td></tr>
<tr><td>0 … 32500</td><td>0</td><td>A</td><td>1 = 1 A</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.28</b></td><td colspan="7"><b>Set: Drive AC voltage scaling</b></td></tr>
<tr><td colspan="7">Set the nominal AC voltage of the drive.<br>Adjustment of AC voltage measuring channels (SDCS-PIN-H01 or SDCS-PIN-H51). 95.28 Set: Drive AC voltage scaling is write protected. To enable use 95.24 Service mode = Set: Type code.
<table>
<tr><td>0.0 V</td><td>Take value from 95.25 Set: Type code.</td></tr>
<tr><td>0.1 … 3250.0 V</td><td>Take value from 95.28 Set: Drive AC voltage scaling.</td></tr>
</table>
This value overrides the type code and is immediately visible in 07.64 Drive AC voltage scaling set.<br>95.24 Service mode has to be set back to Normal mode by the user.<br><b>Attention</b>: When using H1 … H5 modules the current and voltage range of the type code setting is limited to max 1190 $A_{DC}$ and max 600 $V_{AC}$.</td></tr>
<tr><td>0.0 … 3250.0</td><td>0.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.29</b></td><td colspan="7"><b>Set: Drive max bridge temperature</b></td></tr>
<tr><td colspan="7">Set the maximum bridge temperature of the drive.<br>Adjustment of the drive bridge temperature tripping level.
<table>
<tr><td>0°C/32°F</td><td>Take value from 95.25 Set: Type code.</td></tr>
<tr><td>1°C … 149°C/33°F … 300°F</td><td>Take value from 95.29 Set: Drive max bridge temperature.</td></tr>
<tr><td>150°C/301°F</td><td>The temperature supervision is inactive, e.g. for rebuild kits.</td></tr>
</table>
This value overrides the type code and is immediately visible in 07.65 Drive max bridge temperature set.<br>Maximum setting for converters size H7 and H8 is 55°C/131°F, because the cooling air input temperature is measured. For more details, see DCS880 Hardware manual (3ADW000462).<br>The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td>-80.0 … 1000.0</td><td>0.0</td><td>°C or °F</td><td>1 = 1°C or °F</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.32</b></td><td colspan="7"><b>DC current measurement adjust</b></td></tr>
<tr><td colspan="7">Set the DC current measurement adjust of the drive.<br>95.32 DC current measurement adjust in percent of 07.62 Drive DC current scaling set is used to cover drives with different current measuring circuits for bridge 1 and bridge 2. It rescales the measured armature current if bridge 2 is active.</td></tr>
<tr><td>12.5 … 800.0</td><td>100.0</td><td>%</td><td>10 = 1 %</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>95.33</b></td><td colspan="7"><b>DC current measurement offset</b></td></tr>
<tr><td colspan="7">Set the DC current measurement offset of the drive.<br>The offset value in percent of 99.11 M1 nominal current is added to the armature current measurement. 95.33 DC current measurement offset adjusts 01.10 Motor current in to the real armature current.<br><b>Commissioning hints</b>:<br>– In case the response of the current controller is delayed when starting at zero current, increase 95.33 DC current measurement offset slowly to 1.0 %:</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| |  <br>DZ_LIN_060_motor current_a.ai<br>– In case a 2-Q converter module is used and the motor turns with a zero speed reference increase 95.33 DC current measurement offset until the motor is not turning anymore. | | | | | | |
| | -10.0 … 10.0 | 0.5 | % | 10 = 1 % | n | y | Parameter |
| **95.34** | **DC voltage measurement adjust** | | | | | | |
| | Set the DC voltage measurement adjust of the drive.<br>95.34 DC voltage measurement adjust in percent of 07.64 Drive AC voltage scaling set is used to cover drives with different voltage measuring circuits for armature and mains voltage. It rescales the armature voltage measurement. | | | | | | |
| | 12.5 … 800.0 | 100.0 | % | 10 = 1 % | n | y | Parameter |
| **95.35** | **DC voltage measurement offset** | | | | | | |
| | Set the DC voltage measurement offset of the drive.<br>The offset value in percent of 99.12 M1 nominal voltage added to the armature voltage measurement. 95.35 DC voltage measurement offset adjusts 01.21 Armature voltage in V to the real armature voltage. See 95.37 DC voltage measurement mode. | | | | | | |
| | -10.0 … 10.1 | 0 | % | 10 = 1 % | n | y | Parameter |
| **95.36** | **DC voltage measurement hardware filter** | | | | | | |
| | DC voltage measurement hardware filter.<br>Hardware filter for the DC voltage measuring circuit.<br>0: **Filter off**; the filter time is set to 200 µs.<br>1: **Filter on**; the filter time is set to 10 ms. | | | | | | |
| | 0 … 1 | Filter off | - | 1 = 1 | n | y | Parameter |
| **95.37** | **DC voltage measurement mode** | | | | | | |
| | DC voltage measurement mode of the drive.<br>Selects the DC voltage measurement mode.<br>0: **Auto**; automatic voltage measurement offset. The automatic offset is executed until an On command is given. See 06.09.b00 Used main control word.<br>**Attention:** The armature voltage measurement circuit between drive and motor must be closed before the On command is given. If this is not the case set 95.37 DC voltage measurement mode = DC contactor.<br>1: **Manual**; manual voltage measurement offset. The value of 95.35 DC voltage measurement offset is taken.<br>2: **DC contactor**; manual voltage measurement offset. The value of 95.35 DC voltage measurement offset is taken. Until an On command is given the voltage measurement is forced to zero. | | | | | | |
| | 0 … 3 | Manual | - | 1 = 1 | n | y | Parameter |
| **95.39** | **PLL input deviation** | | | | | | |
| | PLL input deviation.<br>Actual measured mains voltage cycle (period) time. Is used as input of the PLL controller. | | | | | | |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">For 50 Hz mains the value should be: $\frac{1}{50\,Hz} = 20\,ms \; \equiv 0^{\circ}$.<br>For 60 Hz mains the value should be: $\frac{1}{60\,Hz} = 16.67\,ms \; \equiv 0^{\circ}$.</td></tr>
<tr><td>-180.00 … 180.00</td><td>-</td><td>°</td><td>100 = 1°</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>95.40</b></td><td colspan="7"><b>PLL output, internal mains frequency</b></td></tr>
<tr><td colspan="7">PLL output.<br>Calculated and internally controlled mains frequency. Output of PLL controller.</td></tr>
<tr><td>0.00 … 100.00</td><td>-</td><td>Hz</td><td>100 = 1 Hz</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>95.43</b></td><td colspan="7"><b>PLL offset synchronization transformer</b></td></tr>
<tr><td colspan="7">PLL offset due to a synchronization transformer.<br>Compensation of a synchronization transformer’s phase shift compared to the mains transformer. The maximum phase shift compensation is ±60.00°.</td></tr>
<tr><td>-60.00 … 60.00</td><td>0.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.44</b></td><td colspan="7"><b>PLL deviation level</b></td></tr>
<tr><td colspan="7">PLL deviation to block current controller.<br>Maximum allowed deviation of the PLL controller. The current controller is blocked in case the limit is reached.<br>For 50 Hz mains is valid: $\frac{1}{50\,Hz} = 20\,ms \; \equiv 0^{\circ}$.<br>For 60 Hz mains is valid: $\frac{1}{60\,Hz} = 16.67\,ms \; \equiv 0^{\circ}$.</td></tr>
<tr><td>5.00 … 20.00</td><td>10.00</td><td>°</td><td>100 = 1°</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.45</b></td><td colspan="7"><b>PLL proportional gain</b></td></tr>
<tr><td colspan="7">PLL p-part.<br>Gain of firing unit’s phase lock loop.</td></tr>
<tr><td>0.01 … 2.00</td><td>0.50</td><td>-</td><td>100 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.46</b></td><td colspan="7"><b>PLL filter time</b></td></tr>
<tr><td colspan="7">PLL filter time constant.<br>Filter of firing unit’s phase lock loop.</td></tr>
<tr><td>0.0 … 500.0</td><td>0.0</td><td>ms</td><td>10 = 1 ms</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>95.47</b></td><td colspan="7"><b>PLL Uk compensation</b></td></tr>
<tr><td colspan="7">PLL mains transformer $u_k$ compensation.<br>The measured firing angle of the firing unit's PLL can be corrected in order to compensate the error caused by the commutation notches of the thyristors. The compensation depends on the $u_k$ (short circuit voltage) of the mains.<br>95.47 PLL Uk compensation defines the mains short circuit voltage, in percent of 99.01 Mains voltage, which is caused by the unit’s nominal current for the PLL correction:<br>$PLL\ u_k\ compenzation = u_k \times \frac{S_c}{S_t} \times 100\ \%$<br>With: $u_k$ = related mains short circuit voltage.<br>$S_c$ = apparent power of the drive.<br>$S_t$ = apparent power of transformer.<br><b>Commissioning hint</b>: 95.47 PLL Uk compensation is used to compensate for the phase shift of the mains due to the thyristors switching, in case the mains are measured on the secondary side of the dedicated transformer.</td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">This situation leads to unstable output currents during high loads. Increase 95.47 PLL Uk compensation slowly (1 by 1) until the output current becomes stable.</td></tr>
<tr><td>0.0 … 15.0</td><td>0.0</td><td>%</td><td>10 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>95.50</b></td><td colspan="7"><b>PLL sync mode</b></td></tr>
<tr><td colspan="7">PLL synchronization mode.<br>reserved</td></tr>
<tr><td>0 … 1</td><td>1</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

## 96 System

Language selection; access levels; macro selection; parameter save and restore; control board reboot; user parameter sets; unit selection; data logger triggering; parameter checksum calculation; user lock.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>96.01</b></td><td colspan="7"><b>Language</b></td></tr>
<tr><td colspan="7">Select language.<br>Selects the language of the parameter interface and other displayed information when viewed on the control panel.<br><b>Notes:</b><br>– Not all languages listed below are necessarily supported.<br>– 96.01 Language does not affect the languages visible in the PC tool.<br>0: <b>Not selected</b>; none.<br>1029: <b>Czech</b>; Czech.<br>1030: <b>Dansk</b>; Danish.<br>1031: <b>Deutsch</b>; German.<br>1033: <b>English</b>; English.<br>1035: <b>Suomi</b>; Finnish.<br>1036: <b>Français</b>; French.<br>1040: <b>Italiano</b>; Italian.<br>1043: <b>Nederlands</b>; Dutch.<br>1045: <b>Polski</b>; Polish.<br>1049: <b>Russki</b>; Russian.<br>1053: <b>Svenska</b>; Swedish.<br>1055: <b>Türkçe</b>; Turkish.<br>2052: <b>Chinese (Simplified, PRC)</b>; Simplified Chinese.<br>2070: <b>Portugues</b>; Portuguese.<br>3082: <b>Español</b>; Spanish.</td></tr>
<tr><td>0 … 3082</td><td>English</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>96.02</b></td><td colspan="7"><b>Unit selection</b></td></tr>
<tr><td colspan="7">Unit selection word.<br>Selects the unit of parameters indicating power, temperature and torque.<br>Bit assignment:<br>
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Power unit</td><td>1</td><td>hp</td></tr>
<tr><td>0</td><td>kW</td></tr>
<tr><td>1</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Temperature unit</td><td>1</td><td>°F</td></tr>
<tr><td>0</td><td>°C</td></tr>
<tr><td>3</td><td>reserved</td><td></td><td></td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Torque unit</td><td>1</td><td>Lb ft</td></tr>
<tr><td>0</td><td>Nm</td></tr>
</table>
</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| 5 … 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | 0000h | - | 1 = 1 | n | y | Parameter |

**96.03** **Unit for speed control**

Unit for the speed control.
Sets the speed control unit.
0: **rpm**; in rpm.
1: **%;** in percent of 99.14 M1 nominal (base) speed. Set 99.14 M1 nominal (base) speed = 100 %.
2: **V**; in volt. Set 99.14 M1 nominal (base) speed = 99.12 M1 nominal voltage from 99.07.
Following signals / parameters are affected:

- Liste von R&D

**Note**: After changing, the speed control unit restart the PC tool to make the change visible.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 2 | rpm | - | 1 = 1 | n | y | Parameter |

**96.04** **Access levels active**

Active access levels.
Shows, which access levels, have been activated by 96.07 Pass code and 96.102 User lock functionality.
Bit assignment:

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | End user | 1 | End user active. |
| 1 | Service | 1 | Service active. |
| 2 | Advanced programmer | 1 | Advanced programmer active. |
| 3 | reserved | | |
| 4 | reserved | | |
| 5 | reserved | | |
| 6 | reserved | | |
| 7 | reserved | | |
| 8 | reserved | | |
| 9 | reserved | | |
| 10 | reserved | | |
| 11 | reserved | | |
| 12 | reserved | | |
| 13 | reserved | | |
| 14 | Parameter lock | 1 | Parameter lock active. |
| 15 | reserved | | |

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0000h … FFFFh | - | - | 1 = 1 | n | n | Signal |

**96.07** **Pass code**

Pass code.
Enter a pass code to activate the parameter lock or to configure the user lock. See 96.102 User lock functionality.
Parameter lock:
Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through control panel or PC tool.
User lock (opening generates warning A6B0 User lock open):
Entering the user pass code, by default “10000000”, unhides parameters 96.100 … 96.102. Now it is possible to define a new user pass code and to select the actions to be prevented.
Entering an invalid pass code will close an open user lock, by hiding parameters 96.100 … 96.102. After entering the code, check that the parameters are in fact hidden.
**Note**: We recommend changing the default user pass code.
**Example**: For better cyber security, set a user pass code preventing change of parameter values or loading of firmware and other files.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">To activate the user lock for the first time, enter the default user pass code “10000000” into 96.07 Pass code. This unhide parameters 96.100 … 96.102. Then enter a new user pass code into 96.100 Change user pass code and confirm the code in 96.101 Confirm user pass code. In 96.102 User lock functionality define the actions to be prevented.<br>To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power. With the lock closed, parameters 96.100 … 96.102 are hidden.<br>To reopen the lock, enter Your user pass code into 96.07 Pass code. This will again unhide parameters 96.100 … 96.102.<br>**WARNING!**<br>Do not forget Your user pass code. The factory has no means to reset the control board! A **new** control board has to be purchased.</td></tr>
<tr><td>0 … 99999999</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**96.08**</td><td colspan="7">**Local control**</td></tr>
<tr><td colspan="7">Local control access.<br>Enables/Disables local control. Start and stop buttons on the control panel and the local controls of the PC tool.<br>**WARNING!**<br>Before disabling local control, ensure that the control panel or PC tool is not needed to stop the drive.<br>0: **Disable**; disable local control.<br>1: **Enable**; enable local control.</td></tr>
<tr><td>0 … 1</td><td>Enable</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3">**96.11**</td><td colspan="7">**Macro active**</td></tr>
<tr><td colspan="7">Shows the active macro.<br>Shows which macro is currently selected. To change the macro, use 96.14 Macro select.<br>0: **None**; no macro selected.<br>1: **Default**; default parameter set. See 96.15 Parameter restore = Default.<br>10: **Factory**; factory parameter set. See 96.14 Macro select.<br>11: **ABB standard**; macro ABB standard. See 96.14 Macro select.<br>12: **ABB standard US**; macro ABB standard with US style DC-contactor. See 96.14 Macro select.<br>13: **3-wire standard**; macro 3 wire standard. See 96.14 Macro select.<br>14: **3-wire standard US**; macro 3 wire with US style DC-contactor. See 96.14 Macro select.<br>15: **Fieldbus/Local I/O**; macro control via fieldbus/control via local I/O. See 96.14 Macro select.<br>16: **Motor potentiometer**; macro motor potentiometer. See 96.14 Macro select.<br>17: **Speed/Torque**; macro speed control/torque control. See 96.14 Macro select.<br>20: **Demo unit**; macro for the demo unit. See 96.14 Macro select.</td></tr>
<tr><td>0 … 20</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2">**96.14**</td><td colspan="7">**Macro select**</td></tr>
<tr><td colspan="7">Selects a macro (pre-defined parameter set).<br>Selects a macro. The value reverts automatically to Done, when the macro selection is done. The selected macro is shown in 96.11 Macro active.<br>**Notes:**<br>– Only macro depending parameters will be set. The rest of the parameters will not be changed.<br>– It is possible to change all preset parameters of a loaded macro.<br>– Selecting the actual macro again restores all macro depending parameters to the macro’s default values.<br>0: **Done**; normal operation or application macro selection done.<br>10: **Factory**; factory parameter set. Same as 96.15 Parameter restore = Default.<br>11: **ABB standard**; macro ABB standard.<br>12: **ABB standard US**; macro ABB standard with US style DC-contactor.<br>13: **3-wire standard**; macro 3 wire standard.<br>14: **3-wire standard US**; macro 3 wire with US style DC-contactor.<br>15: **Fieldbus/Local I/O**; macro control via fieldbus/control via local I/O.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|
| | 16: **Motor potentiometer**; macro motor potentiometer.<br>17: **Speed/Torque**; macro speed control/torque control.<br>20: **Demo unit**; macro for the demo unit. | | | | | | |
| | 0 … 20 | Done | - | 1 = 1 | n | n | Parameter |
| **96.15** | **Parameter restore** | | | | | | |
| | Reset parameter values.<br>Restores the default settings of the firmware. Depending on the choice only certain parameters or all parameter are restored. The value reverts automatically to Done, when the restore is done.<br>**Note**: Restoring may cause a communication break, so reconnecting the drive may be required.<br>0: **Done**; normal operation or restore done.<br>8: **Restore**; all parameter are restored to default, except:<br>– Motor 1 and Motor 2 parameters.<br>– Control panel/PC communication settings.<br>– I/O extension module settings.<br>– Fieldbus adapter settings.<br>– Encoder configuration data.<br>– Macro depending parameters.<br>– 99.10 Nominal mains voltage.<br>– Defaults implemented by 95.20 HW options word 1 and 95.21 HW options word 2.<br>– User lock parameters 96.100 … 96.102.<br>62: **Clear**; all parameter are restored to default, except:<br>– Control panel/PC communication settings.<br>– Fieldbus adapter settings.<br>– Encoder configuration data.<br>– Macro depending parameters.<br>– 99.10 Nominal mains voltage.<br>– Defaults implemented by 95.20 HW options word 1 and 95.21 HW options word 2.<br>– User lock parameters 96.100 … 96.102.<br>70: **Default**; all parameters are restored to default. | | | | | | |
| | 0 … 70 | Done | - | 1 = 1 | y | n | Parameter |
| **96.16** | **Parameter save manually** | | | | | | |
| | Save/Load parameters and enable/disable an application program.<br>Saves valid parameter values to permanent memory. 96.16 Parameter save manually should be used to save e.g. values sent from a fieldbus.<br>96.16 Parameter save manually is also used to save/load a parameter set on/from the memory unit and to enable/disable application programs.<br>The value reverts automatically to Done, when the parameter save is done.<br>**Notes:**<br>– Use the parameter save function only when needed.<br>– A new parameter value is saved automatically when changed from the control panel or PC tool but not when altered through a fieldbus adapter connection.<br>0: **Done**; normal operation or parameter save/all other actions are done.<br>1: **Save**; command to save parameters or saving parameters in progress. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | y | n | Parameter |
| **96.19** | **User set status** | | | | | | |
| | User parameter set status display.<br>Shows the status of the user parameter sets.<br>0: **None**; No user parameter sets have been saved.<br>1: **Loading**; currently loading a user parameter set.<br>2: **Saving**; currently saving a user parameter set.<br>3: **Faulted**; invalid or empty user set.<br>4: **User set 1**; user set 1 is loaded. | | | | | | |

| Index | Name<br>Text<br>Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

5: **User set 2**; user set 2 is loaded.
6: **User set 3**; user set 3 is loaded.
7: **User set 4**; user set 4 is loaded.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 7 | - | - | 1 = 1 | n | n | Signal |

**96.22** **User set save/load**

User parameter set handling.
Enables the saving and restoring of up to four user parameter sets. The value reverts automatically to Done, when the loading or saving is done.
**Notes:**

- Hardware configuration settings such as I/O extension module, fieldbus and encoder configuration parameters (groups 14 … 16, 47, 51 … 56, 58 and 92 … 93) are not included in the user parameter sets.
- Forced input/output values such as 10.03 DI force selection and 10.04 DI force data are not included in the user parameter sets.
- The user parameter set that was in use before powering down the drive is in use after the next power-up. Except User set I/O mode is used.
- Parameter changes made after loading a user parameter set are not automatically stored in it. They must be saved again using 96.22 User set save/load.
- The loaded user parameter set is shown in 96.19 User set status and 06.18.b06 … b09 Drive status word 3.
- The PC tool backup function only saves the active parameter set. Thus, user set 1 … user set 4 must be backed-up separately.

0: **Done**; normal operation, loading or saving is done.
1: **User set I/O mode**; load user parameter set using 96.23 User set I/O mode in1 and 96.24 User set I/O mode in2.
2: **Load set 1**; load user set 1.
3: **Load set 2**; load user set 2.
4: **Load set 3**; load user set 3.
5: **Load set 4**; load user set 4.
18: **Save to set 1**; save parameters to user set 1.
19: **Save to set 2**; save parameters to user set 2.
20: **Save to set 3**; save parameters to user set 3.
21: **Save to set 4**; save parameters to user set 4.

| Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|
| 0 … 21 | Done | - | 1 = 1 | y | n | Parameter |

**96.23** **User set I/O mode in1**

Load user sets using digital I/O.
With 96.22 User set save/load = User set I/O mode it is possible to select user parameter sets via 96.23 User set I/O mode in1 and 96.24 User set I/O mode in2 according to the following table.

| Source defined by 96.23 User set I/O mode in1 | Source defined 96.24 User set I/O mode in2 | Selected user parameter set |
|---|---|---|
| 0 | 0 | User set 1 |
| 1 | 0 | User set 2 |
| 0 | 1 | User set 3 |
| 1 | 1 | User set 4 |

0 = Always off.
1 = Always on.
**Other [bit]**; source selection.
0: **Not selected**; 0, normal operation.
1: **Selected**; 1.
3: **DI1**; 10.02.b00 DI delayed status.
4: **DI2**; 10.02.b01 DI delayed status.

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | Text | | | | | | |
| | Range | Default | Unit | Scale/ Fbeq16 | Volatile | Change running | Type |
| | 5: **DI3**; 10.02.b02 DI delayed status.<br>6: **DI4**; 10.02.b03 DI delayed status.<br>7: **DI5**; 10.02.b04 DI delayed status.<br>8: **DI6**; 10.02.b05 DI delayed status.<br>11: **DIO1**; 11.02.b00 DIO delayed status.<br>12: **DIO2**; 11.02.b01 DIO delayed status.<br>19: **DIL**; 10.02.b15 DI delayed status | | | | | | |
| | 0 … 19 | Not selected | - | 1 = 1 | n | n | Parameter |
| **96.24** | **User set I/O mode in2** | | | | | | |
| | Load user sets using digital I/O.<br>See 96.23 User set I/O mode in1. | | | | | | |
| | 0 … 19 | Not selected | - | 1 = 1 | n | n | Parameter |
| **96.27** | **Control board boot** | | | | | | |
| | Reboot the control board.<br>Reboots the control unit. No cycling the power of the complete drive required.<br>The value reverts automatically to Done, when the reboot is done.<br>**Other [bit]**; source selection.<br>0: **Done**; 0, normal operation or reboot done.<br>1: **Reboot**; 1, reboot the control board. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | y | n | Parameter |
| **96.28** | **FSO reboot** | | | | | | |
| | Reboot the FSO-xx safety functions module.<br>Reboots the optional FSO-xx safety functions module.<br>**Note**: The value does not revert to done automatically.<br>**Other [bit]**; source selection.<br>0: **Done**; 0, normal operation or reboot done.<br>1: **Reboot**; 1, reboot the FSO-xx safety functions module. | | | | | | |
| | 0 … 1 | Done | - | 1 = 1 | n | n | Parameter |
| **96.31** | **Time sync source status** | | | | | | |
| | Time source status word.<br>Displays the time source status word. See 96.35 Time sync primary source.<br>Bit assignment: | | | | | | |

| Bit | Name | Value | Remarks |
|---|---|---|---|
| 0 | Time tick received | 1 | 1st priority tick received:<br>Tick has been received from 1st priority source. |
| 1 | Aux Time tick received | 1 | 2nd priority tick received:<br>Tick has been received from 2nd priority. |
| 2 | Tick interval is too long | 1 | Yes:<br>Tick interval too long, accuracy compromised. |
| 3 | DDCS controller | 1 | Tick received:<br>Tick has been received from an external DDCS-PLC. |
| 4 | M/F | 1 | Tick received:<br>Tick has been received through the master-follower link. |
| 5 | reserved | | |
| 6 | D2D | 1 | Tick received:<br>Tick has been received through the drive-to-drive link. |
| 7 | FBA A | 1 | Tick received:<br>Tick has been received through fieldbus adapter A. |
| 8 | FBA B | 1 | Tick received:<br>Tick has been received through fieldbus adapter A. |
| 9 | EFB | 1 | Tick received:<br>Tick has been received through the embedded fieldbus. |

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7"><table>
<tr><td>10</td><td>reserved</td><td></td><td></td></tr>
<tr><td>11</td><td>Panel link</td><td>1</td><td>Tick received:<br>Tick has been received from the control panel, or the PC tool connected to the control panel.</td></tr>
<tr><td>12</td><td>Ethernet tool link</td><td>1</td><td>Tick received:<br>Tick has been received from the PC tool through a FENA module.</td></tr>
<tr><td>13</td><td>Parameter setting</td><td>1</td><td>Tick received:<br>Tick has been set by parameters 96.37 … 96.39.</td></tr>
<tr><td>14</td><td>RTC</td><td>1</td><td>RTC time in use:<br>Time and date have been read from the real-time clock.</td></tr>
<tr><td>15</td><td>Drive On-Time</td><td>1</td><td>Drive on-time in use:<br>Time and date are displaying drive on-time.</td></tr>
</table></td></tr>
<tr><td></td><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>96.32</b></td><td colspan="7"><b>Drive time</b></td></tr>
<tr><td colspan="7">Actual drive time.<br>Shows the 24 h drive time in format hh:mm:ss. The drive time is set by parameters 96.35 … 96.39.</td></tr>
<tr><td>00:00:00 … 23:59:59</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>96.35</b></td><td colspan="7"><b>Time sync primary source</b></td></tr>
<tr><td colspan="7">1<sup>st</sup> priority time synchronization source.<br>Defines the 1<sup>st</sup> priority external source for the drive time and date synchronization.<br>0: <b>Internal</b>; no external source selected.<br>1: <b>DDCS controller</b>; external DDCS-PLC.<br>2: <b>FBA A or FBA B</b>; fieldbus adapter A or fieldbus adapter B.<br>3: <b>FBA A</b>; fieldbus adapter A.<br>4: <b>FBA B</b>; fieldbus adapter B.<br>5: <b>D2D or M/F</b>; master drive of a master-follower link or drive-to-drive link.<br>6: <b>EFB</b>; embedded fieldbus.<br>8: <b>Panel link</b>; control panel, or the PC tool connected to the control panel.<br>9: <b>Ethernet tool link</b>; PC tool through a FENA module.</td></tr>
<tr><td>0 … 9</td><td>DDCS controller</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.36</b></td><td colspan="7"><b>M/F and D2D clock synchronization</b></td></tr>
<tr><td colspan="7">Activate the clock synchronization (master and followers).<br>Activates the clock synchronization for master-follower and drive-to-drive communication.<br>0: <b>Inactive</b>; clock synchronization not active.<br>1: <b>Active</b>; clock synchronization active.</td></tr>
<tr><td>0 … 1</td><td>Inactive</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.37</b></td><td colspan="7"><b>Full days since 1st Jan 1980</b></td></tr>
<tr><td colspan="7">Days since beginning of 1980.<br>Number of full days passed since beginning of the year 1980. Together with 96.28 Time in minutes within 24 h and 96.39 Time in ms within one minute makes it possible to set the date and time in the drive via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.</td></tr>
<tr><td>1 … 59999</td><td>12055</td><td>days</td><td>1 = 1 day</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.38</b></td><td colspan="7"><b>Time in minutes within 24 h</b></td></tr>
<tr><td colspan="7">Minutes since midnight.<br>Number of full minutes passed since midnight. For example, the value 860 corresponds to 14:20.<br>See 96.37 Full days since 1st Jan 1980.</td></tr>
<tr><td>0 … 1439</td><td>0</td><td>min</td><td>1 = 1 min</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>96.39</b></td><td colspan="7"><b>Time in ms within one minute</b></td></tr>
<tr><td colspan="7">Number of milliseconds since last minute.</td></tr>
</table>

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<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">Number of milliseconds passed since last minute.<br>See 96.37 Full days since 1st Jan 1980.</td></tr>
<tr><td>0 … 59999</td><td>0</td><td>ms</td><td>1 = 1 ms</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.51</b></td><td colspan="7"><b>Clear fault and event logger</b></td></tr>
<tr><td colspan="7">Clears the fault and event logger in the Drive composer by setting to a value greater than 0.<br>96.51 Clear fault and event logger is automatically reset to 0 after the cleaning has been finished.</td></tr>
<tr><td>0 … 65535</td><td>0</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.61</b></td><td colspan="7"><b>User data logger status word</b></td></tr>
<tr><td colspan="7">User data logger status word.<br>Provides status information about the user data logger.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">Running</td><td>1</td><td>Running.</td></tr>
<tr><td>0</td><td>The post-trigger time is passed.</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Triggered</td><td>1</td><td>Triggered.</td></tr>
<tr><td>0</td><td>Restarted.</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Data available</td><td>1</td><td>Contains data that can be read.</td></tr>
<tr><td>0</td><td>Contains no data.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Configured</td><td>1</td><td>Configured.</td></tr>
<tr><td></td><td>Not configured.</td></tr>
<tr><td>4 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>96.63</b></td><td colspan="7"><b>User data logger trigger</b></td></tr>
<tr><td colspan="7">Trigger source for the user data logger.<br>Triggers or selects a source that triggers the user data logger.<br>0 = No trigger command.<br>1 = Trigger.<br><b>Other [bit]</b>; source selection.<br>0: <b>No trigger command</b>; 0, normal operation.<br>1: <b>Trigger</b>; 1.</td></tr>
<tr><td>0 … 1</td><td>No trigger command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.64</b></td><td colspan="7"><b>User data logger start</b></td></tr>
<tr><td colspan="7">Start source for the user data logger.<br>Starts or selects a source that starts the user data logger.<br>0 = No start command.<br>1 = Start.<br><b>Other [bit]</b>; source selection.<br>0: <b>No start command</b>; 0, normal operation.<br>1: <b>Start</b>; 1.</td></tr>
<tr><td>0 … 1</td><td>No start command</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>96.65</b></td><td colspan="7"><b>Factory data logger time level</b></td></tr>
<tr><td colspan="7">Factory data logger sample time.<br>– Selects the sampling interval for the factory data logger. The values that are recorded in the factory data logger are:<br>– 06.09 Used main control word.<br>– 06.15 Main Status Word.<br>– 06.25 Current controller status word 2.<br>– 99.01 Mains voltage.</td></tr>
</table>

<table>
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<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">– 24.01 Used speed reference.<br>– 90.01 Motor speed for control.<br>– 27.02 Used current reference.<br>– 27.05 Motor current.<br>– 27.18 Firing angle.<br>– 28.15 M1 field current.<br>This selection of parameters cannot be changed by the user.<br>500: <b>500µs</b>; 500 microseconds.<br>2000: <b>2ms</b>; 2 milliseconds.<br>10000: <b>10ms</b>; 10 milliseconds.</td></tr>
<tr><td>500 … 10000</td><td>500µs</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.70</b></td><td colspan="7"><b>Disable adaptive program</b></td></tr>
<tr><td colspan="7">Enable/Disable an adaptive program.<br>Enables/Disables an adaptive program, if present.<br>0 = Enable adaptive program.<br>1 = Disable adaptive program.<br><b>Other [bit]</b>; source selection.<br>0: <b>Enable adaptive program</b>; 0, normal operation.<br>1: <b>Disable adaptive program</b>; 1.</td></tr>
<tr><td>0 … 1</td><td>Enable adaptive program</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.100</b></td><td colspan="7"><b>Change user pass code</b></td></tr>
<tr><td colspan="7">New user pass code. Only visible when the user lock is open.<br>To change the current user pass code, enter a new one here and confirm using 96.101 Confirm user pass code. Warning A6B1 User pass code not confirmed is active until the new pass code is confirmed.<br>To cancel changing the pass code, close the user lock without confirming. To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power.<br>See 96.07 Pass code.</td></tr>
<tr><td>10000000 … 99999999</td><td>10000000</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="3"><b>96.101</b></td><td colspan="7"><b>Confirm user pass code</b></td></tr>
<tr><td colspan="7">Confirms the new user pass code. Only visible when the user lock is open.<br>Confirms the new user pass code entered in 96.100 Change user pass code.<br>See 96.07 Pass code.</td></tr>
<tr><td>10000000 … 99999999</td><td>10000000</td><td>-</td><td>1 = 1</td><td>y</td><td>y</td><td>Parameter</td></tr>
<tr><td rowspan="2"><b>96.102</b></td><td colspan="7"><b>User lock functionality</b></td></tr>
<tr><td colspan="7">Selects the actions to be prevented by the user lock. Only visible when the user lock is open.<br>Selects the actions or functionalities to be prevented by the user lock.<br><b>Note:</b> Changes made, take effect after the user lock is closed. See parameter 96.07 Pass code.<br>Bit assignment:
<table>
<tr><th>Bit</th><th>Name</th><th>Value</th><th>Remarks</th></tr>
<tr><td>0</td><td>Disable ABB access levels</td><td>1</td><td>Disable ABB access levels like service, advanced programmer, etc. See 96.04 Access levels active.</td></tr>
<tr><td>1</td><td>Freeze parameter lock state</td><td>1</td><td>Prevent changing the parameter lock state. See 96.07 Pass code = 358.</td></tr>
<tr><td>2</td><td>Disable file download</td><td>1</td><td>Prevent loading of files to drive. This applies to:<br>– Firmware upgrades.<br>– Safety functions module FSO-xx configuration.</td></tr>
</table></td></tr>
</table>

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="2"></td><td colspan="7">
<table>
<tr><td></td><td></td><td></td><td>– Parameter restore. See 96.15 Parameter restore.<br>– Loading of adaptive or application programs.<br>– Changing the home view of the control panel.<br>– Editing drive texts.<br>– Editing the favorite parameters list on the control panel.<br>– Configuration settings made via the control panel such as time/date formats and enabling/disabling the clock display.</td></tr>
<tr><td>3 … 15</td><td>reserved</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>0000h … FFFFh</td><td>-</td><td>-</td><td>1 = 1</td><td>n</td><td>y</td><td>Parameter</td></tr>
</table>

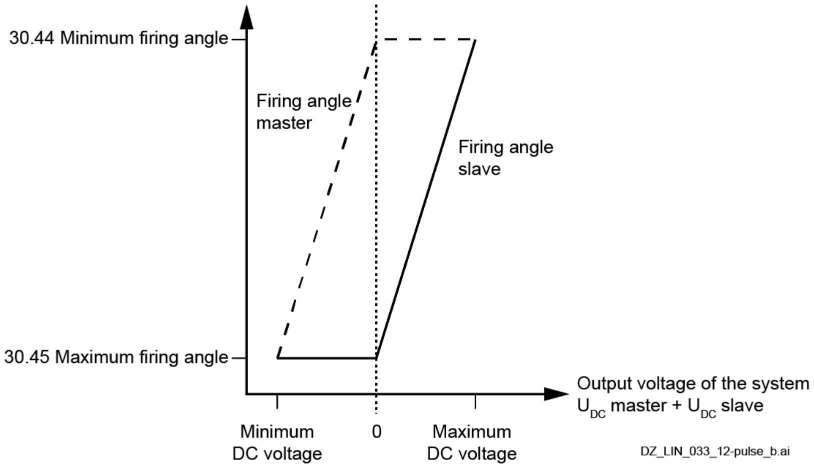
## 99 Motor data

Motor configuration settings.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/<br>Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td rowspan="3"><b>99.01</b></td><td colspan="7"><b>Mains voltage</b></td></tr>
<tr><td colspan="7">Mains voltage.<br>Measured mains voltage in percent of 99.10 Nominal mains voltage.</td></tr>
<tr><td>0.00 … 325.00</td><td>-</td><td>%</td><td>100 = 1 %</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>99.02</b></td><td colspan="7"><b>M1 nominal torque</b></td></tr>
<tr><td colspan="7">Motor 1, calculated nominal torque.<br>Motor 1 nominal torque is calculated the following way:<br>$$99.02\ M1\ nominal\ torque = \frac{60}{2\pi} \times \frac{[99.12\ M1\ nominal\ voltage - 99.11\ M1\ nominal\ current \times 27.32\ M1\ armature\ resistance] \times 99.11\ M1\ nominal\ current}{99.14\ M1\ nominal\ (base)\ speed}$$<br>The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td>0 … 200000000</td><td>-</td><td>Nm or Lb ft</td><td>1 = 1 Nm or Lb ft</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="3"><b>99.03</b></td><td colspan="7"><b>M1 nominal power</b></td></tr>
<tr><td colspan="7">Motor 1, calculated nominal power.<br>Motor 1 nominal power is calculated the following way:<br>$$99.03\ M1\ nominal\ power = \frac{99.12\ M1\ nominal\ voltage \times 99.11\ M1\ nominal\ current}{1000}$$<br>The unit is selected by 96.02 Unit selection.</td></tr>
<tr><td>0.00 … 32500.00</td><td>-</td><td>kW or hp</td><td>1 = 1 kW or hp</td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td rowspan="2"><b>99.06</b></td><td colspan="7"><b>Operation mode</b></td></tr>
<tr><td colspan="7">Operation mode of the drive.<br>Specifies the operating mode of the drive.<br>0: <b>Armature converter</b>; the drive is used as a 6-pulse single armature converter.<br>1: <b>Large field exciter</b>; the drive is used as a large field exciter.<br><b>Attention:</b> The digital input for the external overvoltage protection is assigned by means of 20.47 Overvoltage protection trigger source.<br>2: <b>12-pulse parallel master</b>; the drive is used as 12-pulse parallel master. Connected to a 3-winding transformer having 30° phase shift between secondary windings.</td></tr>
</table>

| Index | Name<br>Text<br>Range | Default | Unit | Scale/<br>Fbeq16 | Volatile | Change running | Type |
|---|---|---|---|---|---|---|---|

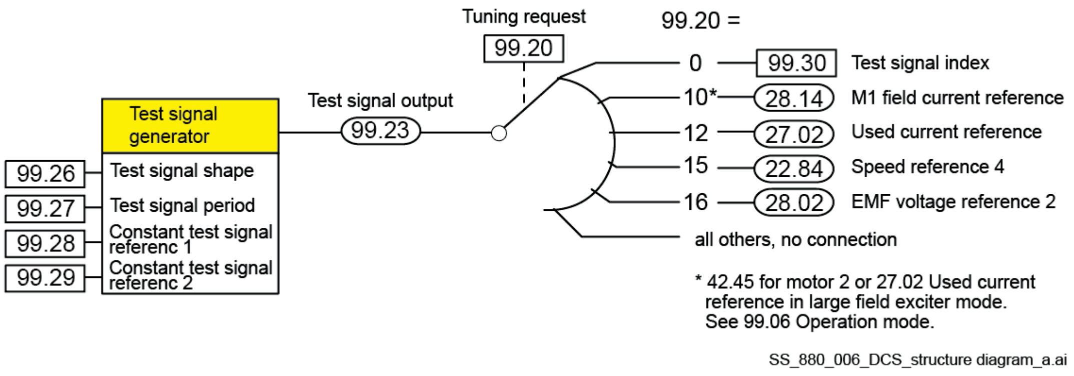
3: **12-pulse parallel slave**; the drive is used as 12-pulse parallel slave. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
4: **12-pulse serial master**; the drive is used as 12-pulse serial master. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
5: **12-pulse serial slave**; the drive is used as 12-pulse serial slave. Connected to a 3-winding transformer having 30° phase shift between secondary windings.
6: **6-pulse serial master**; the drive is used as 6-pulse serial master. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
7: **6-pulse serial slave**; the drive is used as 6-pulse serial slave. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
8: **Serial sequential master 30°**; the drive is used as a serial sequential master. Connected to a 3-winding transformer having a 30° phase shift between secondary windings.
9: **Serial sequential slave 30°**; the drive is used as a serial sequential slave. Connected to a 3-winding transformer having a 30° phase shift between secondary windings.
10: **Serial sequential master 0°**; the drive is used as a serial sequential master. Connected to a 3-winding transformer having no (0°) phase shift between secondary windings.
11: **Serial sequential slave 0°**; the drive is used as a serial sequential slave. Connected to a 3-winding transformer having no (0°) phase shift secondary windings.
**Note:** Sequential control of the firing angles. Only one of the two drives changes the firing angle. The other drive keeps the firing angle fixed at minimum- or maximum firing angle limit.



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 … 9 | Armature converter | - | 1 = 1 | n | n | Parameter |
| **99.07** | **M1 used field exciter type** | | | | | | |

Motor 1 field exciter type.
99.07 M1 used field exciter type ≠ None, activates motor 1 field exciter. Now it reacts to an On command and generates field current.
**Note**: To start both field exciters (motor 1 and motor 2) set also 42.49 M2 used field exciter type ≠ None.
0: **None**; no or third party field exciter connected.
1: **OnBoard**; integrated 1-Q field exciter (for sizes H1 … H4 only).
2: **DCF803-0016**; external 1-Q 16 A field exciter used for field currents from 0.3 A to 16 A.
3: **FEX-425-Int**; internal 1-Q 25 A field exciter (for size H5 and H6 only) used for field currents from 0.3 A to 25 A.
4: **DCF803-0035**; external 1-Q 35 A field exciter used for field currents from 0.3 A to 35 A.
5: **DCF803 terminal 5 A**; external 1-Q 16 A field exciter (DCF803-0016), internal 1-Q 25 A field exciter (FEX-425-Int) or external 1-Q 35 A field exciter (DCF803-0035) used for field currents from 0.3 A to 5 A.
**Note:** Use 5 A terminals.
6: **DCF803-0050**; external 1-Q 50 A field exciter.

<table>
<tr><th rowspan="3">Index</th><th colspan="7">Name</th></tr>
<tr><th colspan="7">Text</th></tr>
<tr><th>Range</th><th>Default</th><th>Unit</th><th>Scale/ Fbeq16</th><th>Volatile</th><th>Change running</th><th>Type</th></tr>
<tr><td></td><td colspan="7">7: **DCF804-0050**; external 4-Q 50 A field exciter.<br>8: **DCF803-0060**; external 1-Q 60 A field exciter.<br>9: **DCF804-0060**; external 4-Q 60 A field exciter.<br>10: **DCS880-S01**; external 2-Q standard DCS880 module.<br>11: **DCS880-S02**; external 4-Q standard DCS880 module.<br>16: **External field exciter via AI1**; third party field exciter, acknowledge via AI1.<br>17: **External field exciter via AI2**; third party field exciter, acknowledge via AI2.<br>18: **External field exciter via AI3**; third party field exciter, acknowledge via AI3.<br>19: **Multiple field exciters**; see DCS880 Multiple field exciters motor control (3ADW000xxx).</td></tr>
<tr><td></td><td>0 … 19</td><td>OnBoard</td><td>-</td><td>1 = 1</td><td>n</td><td>n</td><td>Parameter</td></tr>
<tr><td>**99.10**</td><td colspan="7">**Nominal mains voltage**</td></tr>
<tr><td></td><td colspan="7">Nominal mains voltage.<br>Nominal mains voltage (AC) of the supply. The default and maximum values are preset automatically according to 95.25 Set: Type coder and 95.28 Set: Drive AC voltage scaling. The absolute maximum is 1200.0 $V_{AC}$.</td></tr>
<tr><td></td><td>0.0 … 95.25/95.28</td><td>0.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.11**</td><td colspan="7">**M1 nominal current**</td></tr>
<tr><td></td><td colspan="7">Motor 1 nominal current.<br>Motor 1 nominal armature current (DC) from the motor rating plate.<br>**Notes:**<br>– For 12-pulse parallel mode, see DCS880 12-pulse manual (3ADW000xxx).<br>– In case the converter is used as a large field exciter set the value to the nominal field current from the motor rating plate. See 99.06 Operation mode.<br>– The allowable range for the motor nominal current is 10 % … 230 % of the nominal drive current. See 7.35 Drive DC current scaling set.</td></tr>
<tr><td></td><td>0 … 32500</td><td>0</td><td>A</td><td>1 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.12**</td><td colspan="7">**M1 nominal voltage**</td></tr>
<tr><td></td><td colspan="7">Motor 1 nominal voltage.<br>Motor 1 nominal armature voltage (DC) from the motor rating plate.<br>**Notes:**<br>– For 12-serial parallel mode or serial sequential mode, see DCS880 12-pulse manual (3ADW000xxx).<br>– In case the converter is used as a large field exciter set the value to the nominal field voltage from the motor rating plate. See 99.06 Operation mode.</td></tr>
<tr><td></td><td>0.0 … 3250.0</td><td>350.0</td><td>V</td><td>10 = 1 V</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.13**</td><td colspan="7">**M1 nominal field current**</td></tr>
<tr><td></td><td colspan="7">Motor 1 nominal field current.<br>Motor 1 nominal field current from the motor rating plate.<br>**Note**: In case the converter is used as a large field exciter use 99.11 M1 nominal current to set the nominal field current.</td></tr>
<tr><td></td><td>0.3 … 3250.0</td><td>0.3</td><td>A</td><td>10 = 1 A</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.14**</td><td colspan="7">**M1 nominal (base) speed**</td></tr>
<tr><td></td><td colspan="7">Motor 1 nominal (base) speed.<br>Motor 1 nominal (base) speed from the motor rating plate, usually the field weak point.</td></tr>
<tr><td></td><td>0.00 … 30000.00</td><td>1500.00</td><td>rpm</td><td>See 46.02</td><td>n</td><td>y</td><td>Parameter</td></tr>
<tr><td>**99.17**</td><td colspan="7">**Last tuning performed**</td></tr>
<tr><td></td><td colspan="7">Last performed tuning.<br>Shows the type of tuning that was performed last. See 99.20 Tuning request.</td></tr>
<tr><td></td><td>0 … 16</td><td>-</td><td></td><td></td><td>y</td><td>n</td><td>Signal</td></tr>
<tr><td>**99.20**</td><td colspan="7">**Tuning request**</td></tr>
<tr><td></td><td colspan="7">Drive tuning request.<br>The tuning request contains all auto- and manual tuning procedures.</td></tr>
</table>

| **Index** | **Name**<br>**Text**<br>**Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
|---|---|---|---|---|---|---|---|
| | Tuning request is automatically reset to Normal mode after an autotuning procedure is finished or failed. In case errors occur during the selected AF90 Autotuning. The reason of the error can be seen in the AUX codes.<br>When choosing manual tuning 99.20 Tuning request has to be set back to Normal mode by the user.<br>**Notes:**<br>– The reference chain is blocked while 99.20 Tuning request ≠ Normal mode.<br>– Depending on 06.18B04/B05 Drive status word 3 the field current of motor 1 or motor 2 is tuned.<br>– A standard DCS800 converter used as a large field exciter cannot be tuned by means of the armature converter it is connected to. Tune the field current controller by setting 99.20 Tuning request = Field current autotuning in the large field exciter itself.<br>0: **Normal mode**; normal operating mode depending on 99.06 Operation mode.<br>1: **Field current autotuning**; autotuning the field current controller.<br>**Attention**: The field autotuning is realized through increasing the field voltage (≡ decreasing the firing angel) and not via field current reference. Please note that the limits in group 30 will not be taken in consideration during the autotuning. The maximum field current during tuning can be reduced by adapting 99.13 M1 nominal field current if required.<br>2: **Armature current autotuning**; autotuning the armature current controller.<br>3: **Speed feedback assistant**; test the speed feedback. See 90.41 M1 feedback selection, 94.08 M1 tacho voltage at 1000 rpm, 94.23 OnBoard encoder pulses/revolution, 94.24 OnBoard pulse encoder type and 94.25 OnBoard encoder speed calculation mode.<br>4: **Speed controller autotuning**; autotuning the speed controller.<br>5: **EMF controller autotuning**; autotuning the EMF controller.<br>6: **Flux linearization autotuning**; autotuning the flux linearization.<br>10: **Field current manual tuning**; manual tuning of the field current controller.<br>11: **Field reversal assistant**; assistant to test the field reversal.<br>12: **Armature current manual tuning**; manual tuning of the Armature current controller.<br>13: **Find discontinuous current limit**; find the discontinuous current limit.<br>14: **Tacho fine-tuning**; tacho fine-tuning. See 94.11 M1 tacho fine-tuning adjust and 94.12 M1 tacho fine-tuning factor.<br>15: **Speed controller manual tuning**; manual tuning the speed controller.<br>16: **EMF controller manual tuning**; manual tuning the EMF controller. | | | | | | |
| | 0 … 16 | Normal mode | | | y | n | Parameter |
| **99.23** | **Test signal output** | | | | | | |
| | Test signal generator, output.<br>Output signal of the test signal generator.<br>**Note**: The range, the unit and the scaling for the fieldbus communication depends on the chosen sink. See 99.20 Tuning request and 99.30 Test signal index.<br>Test signal generator<br> | | | | | | |
| | 99.20/99.30 | 0.000 | 99.20/ 99.30 | 99.20/ 99.30 | y | y | Signal |

| Index | Name | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Text** | | | | | | |
| | **Range** | **Default** | **Unit** | **Scale/ Fbeq16** | **Volatile** | **Change running** | **Type** |
| **99.26** | **Test signal shape** | | | | | | |
| | Test signal generator, shape.<br>Signal forms for the test signal generator and the manual tuning functions. See 99.20 Tuning request.<br>**Note**: After a power-up, the value is set back to Zero and thus disables the test signal generator.<br>0: **Zero**; not in use.<br>1: **Square wave**; a square wave is used.<br>2: **Triangle**; a triangle wave is used.<br>3: **Sine save**; a sine wave is used.<br>4: **Constant test signal 1**; a constant value set with 99.28 Constant test signal reference 1 is used.<br>5: **Constant test signal 2**; a constant value set with 99.29 Constant test signal reference 2 is used. | | | | | | |
| | 0 … 5 | Zero | - | 1 = 1 | y | y | Parameter |
| **99.27** | **Test signal period** | | | | | | |
| | Test signal generator, time period.<br>The time period for the test signal generator and the manual tuning functions. See 99.20 Tuning request.<br>**Note**: After a power-up, the value is set back to 0.00. | | | | | | |
| | 0.00 … 655.36 | 0.00 | s | 10 = 1 s | y | y | Parameter |
| **99.28** | **Constant test signal reference 1** | | | | | | |
| | Test signal generator, test signal reference 1.<br>Constant test reference 1 for the test signal generator and the manual tuning functions. See 99.20 Tuning request.<br>**Notes:**<br>– The range, the unit and the scaling for the fieldbus communication depends on the chosen sink. See 99.20 Tuning request and 99.30 Test signal index.<br>– After a power-up, the value is set back to 0.<br>**Examples:**<br>– 100.00 % voltage ≡ 10,000.<br>– 100.00 % current ≡ 10,000.<br>– 100.00 % power ≡ 10,000.<br>– 100.00 % torque ≡ see 46.04 M1 torque scaling actual ≡ 10,000.<br>– 100.00 % speed ≡ 46.02 M1 speed scaling actual ≡ 20,000. | | | | | | |
| | 99.20/99.30 | 0 | 99.20/99.30 | 99.20/ 99.30 | y | y | Parameter |
| **99.29** | **Constant test signal reference 2** | | | | | | |
| | Test signal generator, test signal reference 2.<br>Constant test reference 2 for the test signal generator and the manual tuning functions.<br>See 99.28 Constant test signal reference 1. | | | | | | |
| | 99.20/99.30 | 0 | 99.20/99.30 | 99.20/ 99.30 | y | y | Parameter |
| **99.30** | **Test signal index** | | | | | | |
| | Test signal generator, test signal index.<br>Index pointer to the sink (signal/parameter) for the test signal generator. E.g. a setting of 2207 equals 22.07 Speed reference.<br>**Notes:**<br>– 99.30 Test signal index must not be used for the manual tuning functions of 99.20 Tuning request.<br>– After a power-up, the value is set back to 0. | | | | | | |
| | 0 … 9999 | 9999 | - | 1 = 1 | y | y | Parameter |

# Fault tracing

## What this chapter contains

This chapter lists all warning/fault messages including possible causes and corrective actions. By means of this chapter, the causes of all warnings/faults can be identified and corrected. If not, an ABB service representative should be contacted.

Warnings/faults are listed below in separate tables. Each table is sorted by warning and fault code.

## Safety

⚠ **WARNING!** Only qualified electricians are allowed to service the drive. Read the Safety instructions on the first pages of the DCS880 Hardware manual (3ADW000462) before working on the drive.

## Indications

### Warnings and faults

Warnings/faults indicate an abnormal drive status. The codes and names of active warnings/faults are displayed on the control panel of the drive as well as in the PC tool. Via fieldbus only the codes of the warnings/faults are available.

Warnings do not need to be reset. They stop showing when the cause of the warning ceases. Warnings do not latch and the drive will continue to operate the motor.

Faults do latch inside the drive. They cause the drive to trip and the motor stops. After the cause of a fault has been removed, the fault can be reset from a selectable source. See 20.13 Fault reset selection. This can be the control panel, the PC tool, a digital input of the drive or the fieldbus. After the fault is reset, the drive can be restarted.

**Note:** Some faults require a reboot of the control board, either by cycling the power or via 96.27 Control board boot. This is mentioned in the fault listing wherever appropriate.

The warning/fault indications can be directed to a relay output or a digital input/output by selecting Warning, Tripped or Tripped (-1) in the source selection parameter. See groups:

- 10 Standard DI, RO.
- 11 Standard DIO, FI, FO.
- 14 … 16 I/O extension module 1 … 3.

### Events

In addition to warnings and faults, there are notices that are only recorded in the event logs of the drive. The codes of these notices are included in the Warning messages table.

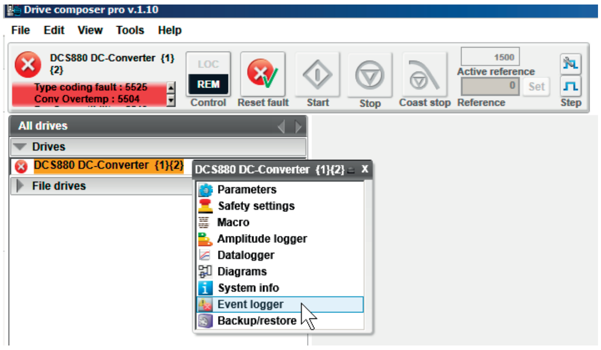
### Editable messages

For some warnings/faults, the message text can be edited and instructions and contact information added. To edit these messages, choose **Menu - Settings - Edit texts** on the control panel.

## Warning/fault history and analysis

### Event logs

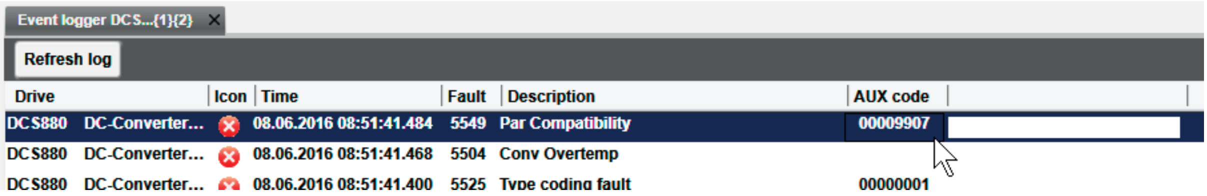
The drive has several event logs, to access, choose **Menu - Event log** on the control panel. The event logs can also be accessed and reset using the PC tool.


Type coding fault : 5525
Conv Overtemp : 5504

The event logs contain faults, warnings and notices, as well as cleared entries. Each event log contains 32 most recent events. All indications in the event logs are stored including a time stamp and other information.

**AUX codes**

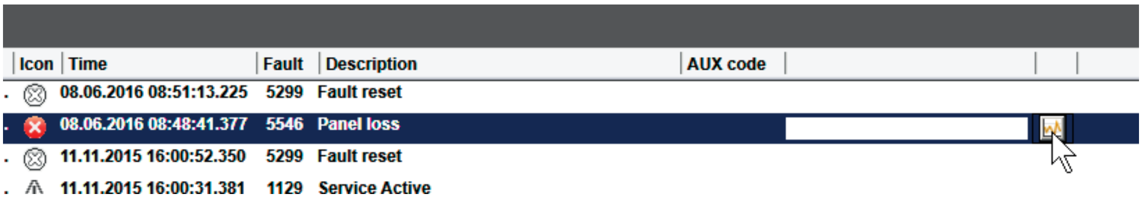
Some events generate AUX codes helping to pinpoint the problem.
The AUX codes are displayed on the control panel together with a corresponding message. It is also stored in the event logs details. In the PC tool, AUX codes can be found in the event listing.



| Drive | Icon | Time | Fault | Description | AUX code |
|---|---|---|---|---|---|
| DCS880 DC-Converter... | ✖ | 08.06.2016 08:51:41.484 | 5549 | Par Compatibility | 00009907 |
| DCS880 DC-Converter... | ✖ | 08.06.2016 08:51:41.468 | 5504 | Conv Overtemp | |
| DCS880 DC-Converter... | ⚠ | 08.06.2016 08:51:41.400 | 5525 | Type coding fault | 00000001 |

### Factory data logger

The drive has a factory data logger that samples preselected drive values. The default sampling time is 500 µs. See 96.65 Factory data logger time level for additional sampling times.
Approximately 7000 samples are recorded immediately before and after a fault. They are saved to the memory unit of the drive. The fault data of the last five faults are only accessible in the event log of the Drive composer pro PC tool.



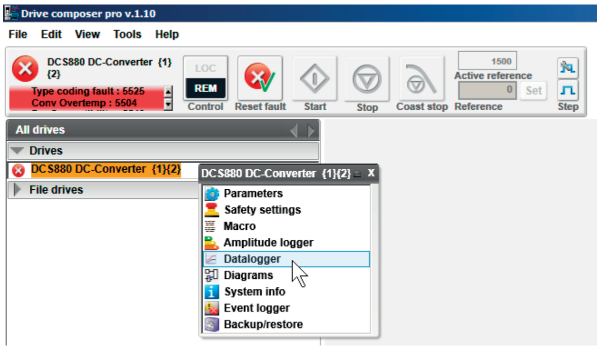
| Icon | Time | Fault | Description | AUX code |
|---|---|---|---|---|
| ⊗ | 08.06.2016 08:51:13.225 | 5299 | Fault reset | |
| ✖ | 08.06.2016 08:48:41.377 | 5546 | Panel loss | |
| ⊗ | 11.11.2015 16:00:52.350 | 5299 | Fault reset | |
| | 11.11.2015 16:00:31.381 | 1129 | Service Active | |

The values that are recorded in the factory data logger are:
- 06.09 Used main control word.
- 06.15 Main Status Word.
- 06.25 Current controller status word 2.
- 99.01 Mains voltage.
- 24.01 Used speed reference.
- 90.01 Motor speed for control.
- 27.02 Used current reference.
- 27.05 Motor current.
- 27.18 Firing angle.
- 28.15 M1 field current.

This selection of parameters cannot be changed by the user.

## User data logger

A custom data logger can be configured using the Drive composer pro PC tool.



Type coding fault : 5525
Conv Overtemp : 5504

This functionality enables the free selection of up to eight drive parameters to be sampled at selectable intervals. The triggering conditions and the length of the monitoring period can also be defined by the user within the limit of approximately 8000 samples.
In addition to the PC tool, the status of the logger is shown in 96.61 User data logger status word. The triggering sources can be selected by 96.63 User data logger trigger and 96.64 User data logger start. The configuration, status and collected data is saved on the memory unit for later analysis.

### Parameters that contain warning/fault information

The drive stores a list of active faults and the one causing the trip in signals 04.01 … 04.05. Active warnings are shown in signals 04.06 … 04.10. The group 04 also displays a list of faults and warnings that have previously occurred.

**Event word (parameters 04.40 … 04.72)**

04.40 Event word 1 can be configured by the user to indicate the status of 16 selectable events, e.g. faults, warnings or notices. It is possible to specify an AUX code for each event to filter out other AUX codes.

## QR Code generation for mobile service application

A QR Code or a series of QR Codes can be generated by the drive for display on the control panel. The QR Code contains drive identification data, information on the latest events, status information and counter parameters. The code can be read with a mobile device containing the ABB service application, which then sends the data to ABB for analysis. For more information on the application, contact your local ABB service representative.
The QR Code can be generated by choosing **Menu - Assistants - QRCode** on the control panel.

## Warnings

### Warning levels

The warning handling provides 5 warning levels.

**Warning level 1**

- The drive keeps on running and the warning is indicated.
- After the drive is stopped, the main contactor cannot be switched on again (no re-start possible).

**Warning level 2**

- The drive keeps on running and the warning is indicated.
- The fan contactor stays on as long as the warning is pending.
- After the warning disappears 20.40 Drive/Motor fan delay time starts.

**Warning level 3**

- Auto-reclosing logic is active (auto re-start). See 06.18.b10 Drive status word 3.
- Ready run is disabled, but the drive is automatically restarted when the warning condition vanishes. See 06.15.b01 Main Status Word.
- The firing angle is forced to the value of 30.45 Maximum firing angle.
- Single firing pulses to suppress the DC current are given.

**Warning level 4**

- The drive keeps on running and the warning is indicated.

**Warning level 5**

- Used for STO related warnings. See safety supplement for functional safety converter DCS880 (3ADW000452).

### Warning messages

The list contains the warning/notice code in hex, its name, the cause and hints what to do.
**Note:** The list also contains notices that only appear in the Event log.

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| A103 | DC-breaker acknowledge. | Selected motor, DC-breaker acknowledge at the DI is missing. The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given, thus the drive cannot be started or re-started while the DC-breaker acknowledge is missing.<br>Check: | 3 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The setting of 20.35 DC breaker acknowledge source, if necessary invert the signal. | |
| A105 | Dynamic braking acknowledge. | Selected motor, dynamic braking is still pending.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given, thus the drive cannot be started or re-started while dynamic braking is active, except if 21.01 Start mode = Flying start dynamic braking.<br>Check:<br>– The setting of 20.43 Dynamic braking acknowledge source.<br>– The setting of 21.01 Start mode. | 3 |
| A111 | Mains low voltage. | Mains/AC side low (under-) voltage. See also 3280.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.<br>Check:<br>– The setting of 31.51.Mains loss mode, 31.52 Mains loss down time, 31.53 Mains loss low level 1 and 31.54 Mains loss low level 2.<br>– That the mains voltage scaling is correct. See 99.10 Nominal mains voltage.<br>– The cutting of the voltage coding resistors on the SDCS-PIN-H51.<br>– The condition of the mains (voltage, cabling, fuses, switchgear).<br>– That all 3 phases are present directly at the drive.<br>    – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.<br>    – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.<br>– That the mains voltage is within the set tolerance.<br>– For mains supply imbalance.<br>– For loose mains cable connections.<br>– That the mains contactor closes and opens.<br>– For H1 … H4, that the field circuit has no short circuit or ground fault.<br>– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is set. If the problem persist for longer than 10 s 3280 Mains low voltage is generated. | 3 |
| A112 | P2P and M/F communication.<br>Programmable, see 70.07 DCSLink comm loss function. | Peer to peer and master-follower communication loss. See also F544.<br>Check:<br>– DCSLink node ID settings. See 70.05 DCSLink node ID.<br>– The setting of 31.13 Fault stop mode communication and 70.07 DCSLink comm loss function.<br>– The setting of 70.17 Mailbox 1 node ID, 70.23 Mailbox 2 node ID, 70.29 Mailbox 3 node ID and 70.35 Mailbox 4 node ID.<br>– The setting of 70.18 Mailbox 1 cycle time/timeout, 70.24 Mailbox 2 cycle time/timeout, 70.30 Mailbox 3 cycle time/timeout and 70.36 Mailbox 4 cycle time/timeout.<br>– The DCSLink cable connections.<br>– The DCSLink terminations. | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| A114 | Armature current deviation. | 27.02 Used current reference differs from 27.05 Motor current for longer than 5 sec by more than 20 % of nominal motor current.<br>If the current controller cannot match the given current reference, the warning signal is created. Normally the reason is a too small incoming voltage compared to the motor EMF.<br>For non-motoric applications, it is possible to block the warning using 06.11.b07 Auxiliary control word 2.<br>Check:<br>– For blown DC fuses.<br>– The ratio between mains voltage and armature voltage (either the mains voltage is too low or the motor's armature voltage is too high).<br>– If the setting of 30.44 Minimum firing angle is too high. | 4 |
| A116 | Brake long falling | Selected motor, the acknowledge signal for the mechanical brake closed (applied) stage at the DI is missing.<br>Check:<br>– The mechanical brake settings in group 44 Mechanical brake control.<br>– The mechanical brake itself.<br>– The mechanical brake cable connections.<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| A117 | Armature current ripple. | One or several thyristors may carry no current. See also F517.<br>Check:<br>– The values of 01.50 Current ripple and 01.51 Current ripple filtered1.<br>– The setting of 31.46 Current ripple function and 31.47 Current ripple level.<br>– For too high gain of current controller. See 27.29 M1 current proportional gain.<br>– The positive/negative current feedback with an oscilloscope (6 pulses within one cycle visible?).<br>– The thyristor gate-cathode resistance.<br>– The thyristor gate connection.<br>– The current transformers (T51, T52).<br>– The condition of the mains (voltage, cabling, fuses, switchgear). | 4 |
| A118 | Application. | Application file new or different.<br>Check the AUX code.<br>Actions see below. | 1 |
| | 0001 | Found a new application on the memory unit.<br>Activate the application on the memory unit by means of 96.16 Parameter save manually = Enable application. | |
| | 0002 | Application in drive memory and on memory unit are different.<br>Activate the application on the memory unit by means of 96.16 Parameter save manually = Enable application. | |
| A120 | Overvoltage protection active. | Overvoltage protection DCF506 is active and the field exciter is blocked.<br>**Note:** The DO of the DCF506 must be connected to a DI of the large field exciter. See 20.47 Overvoltage protection trigger source.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the field current are given.<br>Check: | 3 |

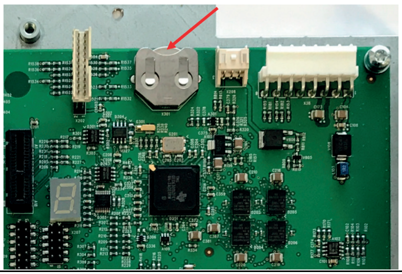
| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The setting of 20.47 Overvoltage protection trigger source if necessary invert the signal.<br>– The field converter cables and connections. | |
| A124 | Speed scaling | The settings of:<br>– 30.11 M1 minimum speed.<br>– 30.12 M1 maximum speed.<br>– 31.30 M1 overspeed trip margin.<br>– 46.01 M1 speed scaling.<br>– 99.14 M1 nominal (base) speed. Must be less than or equal to 1.6 • 46.02 M1 speed scaling actual (1.6 = 32000/20000).<br>– The parameters causing the warning can be identified in the AUX code (format YYZZ).<br>YY specifies the parameter group.<br>ZZ specifies the parameter number.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.<br>Check:<br>The settings of:<br>  – 30.11 M1 minimum speed.<br>  – 30.12 M1 maximum speed.<br>  – 31.30 M1 overspeed trip margin.<br>  – 46.01 M1 speed scaling.<br>  – 99.14 M1 nominal (base) speed. | 3 |
| A130 | Mains phase loss. Programmable, see 31.21 Mains phase loss. | One or several mains voltage phase(s) are missing or the mains voltage phases are imbalanced. See also 3130.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.<br>Check:<br>– The condition of the mains (voltage, cabling, fuses, switchgear).<br>– That all 3 phases are present directly at the drive.<br>  – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.<br>  – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.<br>– For mains supply imbalance.<br>– For loose mains cable connections.<br>– That the mains contactor closes and opens.<br>– The AUX code:<br>  – 0: All phase voltages U (L1), V (L2) and W (L3) are missing.<br>  – 1: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{UV}$ is the smallest voltage.<br>  – 2: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{VW}$ is the smallest voltage.<br>  – 3: Phase V (L2) is missing.<br>  – 4: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{WU}$ is the smallest voltage.<br>  – 5: Phase U (L1) is missing.<br>  – 6: Phase W (L3) is missing. | 3 |
| A132 | Parameter setting conflict. | Parameter settings conflicting with other parameters. | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | The parameters causing the warning can be identified in the AUX code (format YYZZ YYZZ).<br>YY specifies the parameter group. In case of 00, see the actions below.<br>ZZ specifies the parameter number or the actions below.<br>Additionally check:<br>– 95.25 Set: Type code for proper value. | |
| | 0070 | No field reversal possible due to 28.54 Field current force direction = External reverse. | |
| | 0071 | Flux linearization parameters not consistent. See 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux. | |
| | 0077 | Encoder 1 parameters not consistent. Check:<br>– 46.02 M1 speed scaling actual or 42.14 M2 speed scaling actual.<br>– 92.10 Pulses/revolution.<br>– 92.11 Pulse encoder type.<br>At scaling speed the pulse frequency must be greater than 600 Hz according to following formula:<br>$f \geq 600Hz = \frac{ppr \times evaluation \times speed\ scaling}{60s}$<br>$f \geq 600Hz = \frac{(92.10) \times (92.11) \times (46.02\ or\ 42.14)}{60s}$<br>E.g. the speed scaling must be greater than 9 rpm for a quadrature pulse encoder (with two channels, A and B) and 1024 pulses. | |
| | 0078 | Encoder 2 parameters not consistent. Check:<br>46.02 M1 speed scaling actual or 42.14 M2 speed scaling actual.<br>93.10 Pulses/revolution.<br>93.11 Pulse encoder type.<br>At scaling speed the pulse frequency must be greater than 600 Hz according to following formula:<br>$f \geq 600Hz = \frac{ppr \times evaluation \times speed\ scaling}{60s}$<br>$f \geq 600Hz = \frac{(93.10) \times (93.11) \times (46.02\ or\ 42.14\ )}{60s}$<br>E.g. the speed scaling must be greater than 9 rpm for a quadrature pulse encoder (with two channels, A and B) and 1024. | |
| A137 | Start condition conflict. | Re-start of the drive is not possible.<br>Check:<br>– The AUX code (format XXXX 00YY).<br>XXXX specifies the parameter group and number e.g.<br>– 0619: 06.19 Drive inhibit status word 2.<br>– 0620: 06.20 Run inhibit status word.<br>– 9524: 95.24 Service mode ≠ Normal mode.<br>YY specifies the bit showing the reason. | 1 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| A2B3 | Residual current detected.<br>Programmable, see 31.18 Residual current detection type. | The drive has detected an unbalance typically due to a residual current in the motor or the motor cables. Sum of $I_{L1}$, $I_{L2}$, $I_{L3} \neq$ zero. See also 2330.<br>Check:<br>– The settings of 31.17 Residual current detection source, 31.18 Residual current detection type, 31.19 Residual current detection level and 31.20 Residual current detection delay.<br>– The sum current transformer, if necessary change transformer or connected drive hardware.<br>– The insulation resistances of motor and motor cables. Disconnect the mains, verify safe isolation from supply in armature and field circuits and make insulation tests for the complete installation. | 1 |
| A490 | Incorrect temperature sensor setup. | Sensor type mismatch.<br>Check the settings of temperature source parameters 35.11 and 35.21 against 91.21 and 91.24. | 1 |
| | | Faulty wiring between an encoder interface module and the temperature sensor.<br>Check:<br>– The wiring of the sensor.<br>– The AUX code identifies the encoder interface module.<br>    – 0: Encoder interface Module 1.<br>    – 1: Encoder interface Module 2. | |
| A491 | Motor temperature 1 measured/estimated.<br>(Editable message text) | Measured/Estimated motor temperature 1 has exceeded the warning level. See also 4981.<br>Wait until the motor/motor model is cooled down. The fan contactor stays on as long as the warning is pending.<br>Check:<br>– The value of 35.02 Measured temperature 1.<br>– The real motor temperature. Let motor cool down and restart.<br>– The value of 35.13 Temperature 1 warning level.<br>– The cooling of the motor or other temperature measured equipment.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The motor fan supply voltage.<br>– The motor fan direction of rotation.<br>– The motor fan components.<br>– The motor cooling air inlet (e.g. filters).<br>– The motor cooling air outlet.<br>– The motor load and drive ratings.<br>– Inadmissible load cycle.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it.<br>Hint:<br>– The measured/estimated motor temperature is blocked, if 35.11 Temperature 1 source = Disable. | 2 |
| A492 | Motor temperature 2 measured/estimated.<br>(Editable message text) | Measured/Estimated motor temperature 2 has exceeded the warning level. See also 4982.<br>Wait until the motor/motor model is cooled down. The fan contactor stays on as long as the warning is pending.<br>Check:<br>– The value of 35.03 Measured temperature 2. | 2 |

| Code | Warning/Notice | Cause and what to do | | Warning level |
|---|---|---|---|---|
| | | – The real motor temperature. Let motor cool down and restart.<br>– The value of 35.23 Temperature 2 warning level.<br>– The cooling of the motor or other temperature measured equipment.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The motor fan supply voltage.<br>– The motor fan direction of rotation.<br>– The motor fan components.<br>– The motor cooling air inlet (e.g. filters).<br>– The motor cooling air outlet.<br>– The motor load and drive ratings.<br>– Inadmissible load cycle.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it.<br>Hint:<br>– The measured/estimated motor temperature is blocked, if 35.21 Temperature 2 source = Disable. | | |
| A497 | Motor temperature slot 1 measured.<br>(Editable message text) | The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 1 indicates overtemperature. | Depending on the used module, a PTC and/or KTY temperature sensor can be attached. See also 4991 … 4993.<br>Check:<br>– The cooling of the motor or other temperature measured equipment.<br>– The motor load and drive ratings.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it. | 2 |
| A498 | Motor temperature slot 2 measured.<br>(Editable message text) | The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 2 indicates overtemperature. | | 2 |
| A499 | Motor temperature slot 3 measured.<br>(Editable message text) | The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 3 indicates overtemperature. | | 2 |
| A4A0 | Control board temperature measured. | Excessive control board temperature.<br>Check the AUX code (format XXXXZZZZ).<br>ZZZZ indicates the problem. Actions see below. | | 2 |
| | None | Temperature above warning limit of xx °C or xx °F.<br>Check:<br>– The value of 05.10 Control board temperature.<br>– The ambient conditions.<br>– The airflow and fan operation.<br>– The heatsink fins for dust pick-up. | | |
| | 0001 | Thermistor broken.<br>Contact an ABB service representative for control board replacement. | | |
| A4B0 | Bridge temperature measured. | Excessive bridge temperature. See also 4310.<br>Wait until the bridge is cooled down. The fan contactor stays on as long as the warning is pending.<br>Shutdown temperature, see 07.65 Drive max bridge temperature set. The bridge overtemperature warning will already appear at approximately 5°C below the shutdown temperature.<br>Check: | | 2 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The values of 05.11 Ch1 bridge temperature … 05.14 Ch4 bridge temperature.<br>– The setting of 20.38 Drive fan acknowledge source.<br>– The setting of 20.40 Drive/Motor fan delay time.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The drive fan supply voltage.<br>– The drive fan direction of rotation.<br>– The drive fan components.<br>– The heatsink fins for dust pick-up.<br>– The drive cooling air inlet (e.g. filters).<br>– The drive cooling air outlet.<br>– For open drive doors.<br>– The motor power against the drive power.<br>– Inadmissible load cycle.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel. In case of a hardparallel configuration. | |
| A560 | Power unit, unbalanced current.<br>Programmable, see 29.63 Power unit unbalanced current function. | The unbalanced current between hardparallel connected power units is excessive. See also F560.<br>Check:<br>– That the mains and motor cable routing is according to the specification for hardparallel configurations.<br>– The branch fuses.<br>– The thyristors.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel.<br>ZZ identifies the affected thyristor.<br>**Example:** 00000314 means thyristor14 in the power unit connected to channel 3. | 4 |
| A561 | Power unit, thyristor loss function.<br>Programmable, see 29.68 Power unit thyristor loss function. | Displays the thyristors/branch fuses of a power unit which are lost, in other words not conducting any current. See also F561.<br>Check:<br>– The branch fuses.<br>– The thyristors.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel.<br>ZZ identifies the affected thyristor.<br>**Example:** 00000314 means thyristor14 in the power unit connected to channel 3. | 4 |
| A581 | Drive fan acknowledge.<br>Programmable, see 31.41 Drive fan fault function. | Drive cooling fan feedback at the DI is missing. See also 5080.<br>Check:<br>– The settings of 20.38 Drive fan acknowledge source and 20.40 Drive/Motor fan delay time.<br>– The drive fan operation and connection.<br>– The drive fan contactor.<br>– The drive fan circuit.<br>– The drive fan klixon.<br>– The drive fan components.<br>– The drive fan supply voltage.<br>– The drive fan direction of rotation.<br>– The drive door open.<br>– The drive cooling air inlet (e.g. filter).<br>– The drive cooling air outlet.<br>– H7 an H8 pressure switch (setting should be 2 mbar). | 2 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The used digital inputs and outputs (groups 10 and 11). | |
| A5A0 | Safe torque off. Programmable, see 31.22 STO indication run/stop. | STO active, no drive problem. See safety supplement for functional safety converter DCS880 (3ADW000452). See also B5A0 and 5091. | 5 |
| A5A3 | Safe off main contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. | STO monitor DC current not zero (zero current time out). See safety supplement for functional safety converter DCS880 (3ADW000452). See also B5A3 and 5093. | 5 |
| A5F4 | Control unit battery. | The battery on the SDCS-CON-H01 is low. Exchange the battery:<br> | 4 |
| A682 | Flash erase speed exceeded. | The flash memory in the memory unit has been erased too frequently. This compromises the lifetime of the memory. Avoid forcing unnecessary parameter saves by 96.16 Parameter save manually or cyclic parameter writes. E.g. user logger triggering via parameters.<br>Check the AUX code (format XYYYYZZZ).<br>X specifies the source of warning.<br>– 1: generic flash erase supervision.<br>ZZZ specifies the flash subsector number that generated the warning. | 1 |
| A6B0 | User lock open. | The user lock is open and parameters 96.100 … 96.102 are visible.<br>Close the user lock by entering an invalid pass code in 96.07 Pass code. | 4 |
| A6B1 | User pass code not confirmed. | A new user pass code has been entered, but not confirmed yet. A new user pass code has been entered in 96.100 Change user pass code. Confirm the new pass code by entering the same code in 96.101 Confirm user pass code. To cancel, close the user lock without confirming the new code. To close the user lock, enter an invalid user pass code into 96.07 Pass code then activate 96.27 Control board boot or cycle the power. | 4 |
| A6D1 | FBA A parameter conflict. | Fieldbus adapter A (FBA A): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. See also 65A1.<br>The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected.<br>Check:<br>– The PLC programming.<br>– The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings.<br>– The configuration of the fieldbus adapter. | 4 |
| A6D2 | FBA B parameter conflict. | Fieldbus adapter B (FBA B): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. See also 65A2. | 4 |

<table>
<tr><th>Code</th><th>Warning/Notice</th><th colspan="2">Cause and what to do</th><th>Warning level</th></tr>
<tr><td></td><td></td><td colspan="2">The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected.<br>Check:<br>– The PLC programming.<br>– The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings.<br>– The configuration of the fieldbus adapter.</td><td></td></tr>
<tr><td>A6DA</td><td>Reference source parametrization.</td><td colspan="2">A reference source is simultaneously connected to multiple parameters with different units. See also 65B1.<br>Check:<br>– The reference source selection parameters.<br>– The AUX code (format YYZZ).<br>YY specifies the parameter group.<br>ZZ specifies the parameter number.</td><td>4</td></tr>
<tr><td>A6E5</td><td>AI parametrization</td><td colspan="2">The current/voltage hardware setting of an analog input does not correspond to the parameter settings.<br>Check the AUX code. The code identifies the analog input whose settings are in conflict. Adjust either the jumper (J1, J2) setting on the control board or parameters 12.15, 12.25.</td><td>4</td></tr>
<tr><td rowspan="4">A6E6</td><td>ULC configuration</td><td colspan="2">User load curve configuration error.<br>Check the AUX code (format XXXXZZZZ).<br>ZZZZ indicates the problem. Actions see below.</td><td rowspan="4">4</td></tr>
<tr><td>0000</td><td colspan="2">Speed points inconsistent.<br>Check that each speed point, see parameters 37.11 … 37.15, has a higher value than the previous point.</td></tr>
<tr><td>0002</td><td>Underload point above overload point.</td><td rowspan="2">Check that each overload point, see parameters 37.31 … 37.35, has a higher value than the corresponding underload point, see parameters 37.21 … 37.25.</td></tr>
<tr><td>0003</td><td>Overload point below underload point.</td></tr>
<tr><td>A780</td><td>Motor stall.<br>Programmable, see 31.24 Stall function.</td><td colspan="2">Selected motor, the motor is operating in the stall region because of excessive load or insufficient motor power. See also 7121.<br>The motor torque exceeded 31.25 Stall torque level for a time longer than 31.28 Stall time while the speed feedback was below 31.26 Stall speed level.<br>Check:<br>– The motor load/mechanics (e.g. brake).<br>– The drive ratings.<br>– For correct field current.<br>– The settings of 31.24 Stall function, 31.25 Stall torque level, 31.26 Stall speed level and 31.28 Stall time.<br>– The settings for current and torque limits in group 30 Control limits.</td><td>1</td></tr>
<tr><td>A781</td><td>Motor fan acknowledge.<br>Programmable, see 20.39 Motor fan acknowledge source.</td><td colspan="2">Motor/External cooling fan feedback at the DI is missing. See also 71B1.<br>Check:<br>– The setting of 20.39 Motor fan acknowledge source.<br>– The fan operation and connection. Replace the motor/external fan if faulty.<br>– The fan contactor.<br>– The fan supply voltage.</td><td>2</td></tr>
<tr><td>A782</td><td>Measurement circuit FEN temperature</td><td colspan="2">Problem with the temperature measurement when a FEN-xx is used.</td><td>1</td></tr>
</table>

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | Check that 35.11 Temperature 1 source and 35.21 Temperature 2 source setting corresponds to the actual installation connected to the encoder interface. | |
| | | Problem with the temperature measurement when a FEN-01 is used.<br>A non-supported KTY sensor is connected to the encoder interface FEN-01. Use either a PTC sensor or another encoder interface module. | |
| A797 | Speed feedback configuration. | The speed feedback configuration via encoder interface modules has changed. See also 73A0.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the encoder interface module.<br>– 01: For module 1 see parameters 91.11 and 91.12.<br>– 02: For module 2 see parameters 91.13 and 91.14.<br>YY specifies the encoder.<br>– 01: Group 92 Encoder 1 configuration.<br>– 02: Group 93 Encoder 2 configuration.<br>ZZZZ indicates the problem. Actions see below. | 4 |
| | 0001 | Adapter not found in specified slot.<br>Check module location. See parameters 91.12 and 91.14. | |
| | 0002 | Detected type of interface module does not match parameter setting.<br>Check the module type parameters 91.11 and 91.13 against status parameters 91.02 and 91.03. | |
| | 0003 | Logic version too old.<br>Contact your local ABB representative. | |
| | 0004 | Firmware version too old.<br>Contact your local ABB representative. | |
| | 0006 | Encoder type incompatible with interface module type.<br>Check module type parameters 91.11 and 91.13 against encoder type parameters 92.01 and 93.01. | |
| | 0007 | Adapter not configured.<br>Check module location parameters 91.12 and 91.14. | |
| | 0008 | Speed feedback configuration has changed.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings. | |
| | 0009 | No encoders configured in the encoder module.<br>Configure the encoder in group 92 Encoder 1 configuration or 93 Encoder 2 configuration. | |
| | 000A | Non-existing emulation input.<br>Check input selection parameters 91.31 and 91.41. | |
| | 000B | Echo not supported by the selected input. E.g. resolver or absolute encoder.<br>Check:<br>– The input selection parameters 91.31 and 91.41.<br>– The interface module type against the encoder type. | |
| | 000C | Emulation in continuous mode not supported.<br>Check:<br>– The input selection parameters 91.31 and 91.41.<br>– The serial link mode parameters 92.30 and 93.30. | |
| A798 | Encoder interface communication.<br>Programmable, see 31.35 Motor feedback | Measured motor/load feedback via an encoder interface module is lost.<br>Check:<br>– That the encoder interface module is properly seated in its slot. | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | fault and 31.38 Load feedback fault. | – That the encoder interface module or slot connectors are not damaged. To pinpoint the problem, try installing the module into another slot.<br>– The AUX code (format XXXXYYYY).<br>YYYY indicates the problem. Actions see below. | |
| | 0001 | Failed answer to encoder configuration message.<br>Contact your local ABB representative. | |
| | 0002 | Failed answer to adapter watchdog disable message. | |
| | 0003 | Failed answer to adapter watchdog enable message. | |
| | 0004 | Failed answer to adapter configuration message. | |
| | 0005 | Too many failed answers inline to speed and position messages. | |
| | 0006 | DDCS driver failed. | |
| A7A1 | Mechanical brake not closed.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, the acknowledge signal for the mechanical brake closed (applied) stage at the DI is missing. See also 71A2.<br>Check:<br>– The mechanical brake itself.<br>– The mechanical brake cable connections.<br>– The mechanical brake settings in group 44 Mechanical brake control.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| A7A2 | Mechanical brake not opened.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, the acknowledge signal for the mechanical brake opened (applied) stage at the DI is missing. See also 71A3.<br>Check:<br>– The mechanical brake itself.<br>– The mechanical brake cable connections.<br>– The mechanical brake settings in group 44 Mechanical brake control.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| A7A5 | Mechanical brake opening not allowed.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, open (lift) conditions of the mechanical brake are not fulfilled. See also 71A5.<br>The brake has been prevented from opening (lifting) by 44.11 M1 keep brake closed, 44.12 Brake close request or torque actual does not reach 44.10 M1 brake open torque, during torque proving.<br>Check:<br>– The mechanical brake settings in group 44 Mechanical brake control. Especially 44.11 M1 keep brake closed and 44.12 Brake close request.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| A7AA | Extension AI parameterization. | The hardware current/voltage and parameter settings do not match for an analog input on an I/O extension module.<br>Check the AUX code (format XX0000YY). | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | XX specifies the number of the I/O extension module.<br>– 01: Group 14 I/O extension module 1.<br>– 02: Group 15 I/O extension module 2.<br>– 03: Group 16 I/O extension module 3.<br>YY specifies the analog input on the module.<br>**Example:** In case of I/O extension module 1 and analog input AI1 the AUX code is 01000001). The hardware current/voltage setting on the module is shown by 14.29 AI1 HW switch position. The corresponding parameter setting is in 14.30 AI1 unit selection. Adjust either the hardware setting on the module or the parameter to solve the mismatch. | |
| A7AB | I/O extension configuration. Programmable, see 70.07 DCSLink comm loss function. | The I/O extension module/DCSLink board (SDCS-DSL-H1x) types and locations specified by parameters do not match the detected configuration or do not communicate with the drive. See also 7082.<br>Check:<br>– The type and location settings of the modules/board. See parameters 14.01, 14.02, 15.01, 15.02, 16.01, 16.02, 70.01, 70.02, 70.05 and 70.07.<br>– That the module/board is properly seated in its slot.<br>– That the module/board and the slot connector is not damaged.<br>– Try installing the module into another slot.<br>– Check the AUX code (format XXYYYYYY).<br>XX specifies the number of the I/O extension module.<br>– 01: Group 14 I/O extension module 1.<br>– 02: Group 15 I/O extension module 2.<br>– 03: Group 16 I/O extension module 3.<br>– 04: Group 70 DCSLink Communication.<br>YYYYYY indicates the problem. Actions see below. | 4 |
| | 000001 | Communication with module/board failed. | |
| | 000002 | Module/Board not found. | |
| | 000003 | Configuration of module/board failed. | |
| | 000004 | | |
| A7B0 | Motor speed feedback. Programmable, see 31.35 Motor feedback fault. | Selected motor, no motor speed feedback is received. See also 7301.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12.<br>– 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below. | 4 |
| | 0001 | Motor gear definition invalid or outside limits. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | Check motor gear settings. See 90.43 Motor gear numerator and 90.44 Motor gear denominator.<br>This warning is always active independent of 31.35 Motor feedback fault. | |
| | 0002 | Speed feedback device not configured.<br>Check the settings of the speed feedback device:<br>– Encoder 1, see group 92 Encoder 1 configuration.<br>– Encoder 2, see group 93 Encoder 2 configuration.<br>– The OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– The tacho, see group 94 OnBoard speed feedback configuration.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder. | |
| | 0003 | Speed feedback device stopped working.<br>Check the status of the speed feedback device. | |
| | 0004 | Speed feedback device drift detected.<br>Check for slippage between speed feedback device and motor. | |
| | 0007 | The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed.<br>Check:<br>– The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01.<br>– At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances.<br>– EMF: The armature cable connection form the drive to the motor and the polarity. | |
| A7B1 | Load speed feedback.<br>Programmable, see 31.38 Load feedback fault. | Selected motor, no load speed feedback is received. See also 73A1.<br>**Attention:** The warning can only be reset by setting 96.27 Control board boot = Reboot or by cycling the auxiliary power.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12.<br>– 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below. | 1 |
| | 0001 | Load gear definition invalid or outside limits. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | Check load gear settings. See 90.53 Load gear numerator and 90.54 Load gear denominator.<br>This warning is always active independent of 31.38 Load feedback fault. | |
| | 0002 | Feed constant definition invalid or outside limits.<br>Check feed constant settings. See 90.63 Feed constant numerator and 90.64 Feed constant denominator.<br>This warning is always active independent of 31.38 Load feedback fault. | |
| | 0003 | Motor/load gear definition invalid or outside limits.<br>Check motor/load gear settings. See 90.61 Gear numerator and 90.62 Gear denominator.<br>This warning is always active independent of 31.38 Load feedback fault. | |
| | 0004 | Speed feedback device not configured.<br>Check the settings of the speed feedback device:<br>– Encoder 1, see group 92 Encoder 1 configuration.<br>– Encoder 2, see group 93 Encoder 2 configuration.<br>– The OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– The tacho, see group 94 OnBoard speed feedback configuration.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder. | |
| | 0005 | Speed feedback device stopped working.<br>Check the status of the speed feedback device. | |
| | 0007 | The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed.<br>Check:<br>– The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01.<br>– At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances.<br>– EMF: The armature cable connection form the drive to the motor and the polarity. | |
| A7C1 | FBA A communication. Programmable, see 50.02 FBA A comm loss func. | Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between drive and fieldbus adapter module A is lost. See also 7510.<br>7510 FBA A communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7C1 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus communication. See user documentation of the fieldbus interface.<br>– The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out.<br>– The cable connections. | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The fieldbus termination.<br>– The fieldbus adapter.<br>– That the master is able to communicate. | |
| A7C2 | FBA B communication. Programmable, see 50.32 FBA B comm loss func. | Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between drive and fieldbus adapter module B is lost. See also 7520.<br>7520 FBA B communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7C2 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus communication. See user documentation of the fieldbus interface.<br>– The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out.<br>– The cable connections.<br>– The fieldbus termination.<br>– The fieldbus adapter.<br>– That the master is able to communicate. | 4 |
| A7CA | DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function. | Cyclical communication between DDCS controller and drive is lost or there is no communication at all. The drive is waiting for the very first dataset. See also 7581.<br>Check:<br>– The status/settings of the DDCS controller. See user documentation of the DDCS controller.<br>– The adapters between DDCS controller and drive.<br>– The setting of 20.01 Command location.<br>– The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data.<br>– The fiber optic cable connections. | 4 |
| A7CB | Master-follower communication. Programmable, see 60.09 M/F comm loss function. | Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The drive is waiting for the very first dataset. See also 7682.<br>Check:<br>– The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive.<br>– The setting of 20.01 Command location.<br>– The settings of group 60 DDCS communication.<br>– The cable connections. | 4 |
| A7CE | EFB communication. Programmable, see 58.14 Communication loss action. | Cyclical communication to the embedded fieldbus (EFB) is lost. See also 6681.<br>6681 EFB communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7CE EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus master (online, offline, error etc.).<br>– The settings of group 58 FBA Embedded fieldbus. | 4 |

| Code | Warning/Notice | Cause and what to do | | Warning level |
|---|---|---|---|---|
| | | – The cable connections to connector XD2D on the control board.<br>– The fieldbus termination. | | |
| A7E1 | Speed feedback device.<br>Programmable, see 31.35 Motor feedback fault. | Speed feedback device error. See also 7381.<br><br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12.<br>– 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>– 05: EMF, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below. | | 1 |
| | 0001 | Cable fault.<br>If the encoder was working previously, check the encoder, encoder cable and encoder interface module for damage.<br>Check:<br>– The conductor order at both ends of the encoder cable.<br>– The groundings of the encoder cable.<br>– 92.21 Encoder cable fault mode.<br>– 94.29 OnBoard encoder cable fault mode. | | |
| | 0002 | No encoder signal.<br>Check the condition of the encoder. | | |
| | 0003 | Overspeed. | Contact your local ABB representative. | |
| | 0004 | Overfrequency. | | |
| | 0005 | Resolver ID run failed. | | |
| | 0006 | Resolver overcurrent fault. | | |
| | 0008 | Absolute encoder communication error. | Contact your local ABB representative. | |
| | 0009 | Absolute encoder initialization error. | | |
| | 000A | Absolute SSI encoder configuration error. | | |
| | 000B | Encoder reported an internal error. | See the documentation of the encoder. | |
| | 000C | Encoder reported a battery error. | | |
| | 000D | Encoder reported overspeed or decreased resolution due to overspeed. | | |
| | 000E | Encoder reported a position counter error. | | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | 000F | Encoder reported an internal error. | |
| | 0010 | Speed feedback device.<br>Speed feedback was change from speed feedback device to EMF.<br>This warning is always active independent of 31.35 Motor feedback fault. | |
| | 0011 | Encoder speed feedback.<br>Speed feedback was change from one encoder to the other encoder (only valid if 2 encoders are connected).<br>This warning is always active independent of 31.35 Motor feedback fault. | |
| | 0012 | Selected motor, wrong direction of speed feedback.<br>The speed feedback direction of tacho and encoders is checked against the speed feedback direction of the EMF. See 90.41 M1 feedback selection.<br>Check:<br>– The real direction of motor rotation.<br>– The settings of 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– The connection of the tacho cable. To correct, swap the two wires.<br>– The connection of the encoder cable. To correct, swap e.g. channels A and A-.<br>– The connection of armature and field cables. | |
| | 0013 | Selected motor, tacho range.<br>Check:<br>– That the tacho voltage at overspeed fits to the tacho input. It should not be higher than 270 V. | |
| | 0014 | Re-do the tacho fine-tuning.<br>31.30 M1 overspeed trip margin or 42.25 M2 overspeed trip margin have been changed.<br>Use 99.20 Tuning request = Tacho fine-tuning.<br>This warning is always active independent of 31.35 Motor feedback fault. | |
| A7EE | Control panel/PC tool link communication. Programmable, see 49.05 Communication loss action. | Control panel/PC tool has stopped communicating. See also 7081.<br>Check:<br>– The setting of 49.05 Communication loss action.<br>– The control panel/PC tool connection cable.<br>– The control panel connector.<br>– The mounting platform if being used.<br>– Disconnect and reconnect the control panel/PC tool. | 4 |
| A880 | Motor bearings. Programmable, see 33.14 On-time 1 warn message, 33.24 On-time 2 warn message, 33.55 Value counter 1 warn message and 33.65 Value counter 2 warn message | Warning generated by an on time timer or a value counter. See group 33 Generic timer & counter.<br>Check the AUX code for the source of the warning.<br>– 0: 33.13 On-time 1 source.<br>– 1: 33.23 On-time 2 source.<br>– 4: 33.53 Value counter 1 source.<br>– 5: 33.63 Value counter 2 source. | 4 (default)<br>1 … 5 user selectable |
| A881 | Any relay. | Warning generated by an edge counter. See group 33 Generic timer & counter. | 4 (default)<br>1 … 5 user selectable |
| A882 | Motor starts. | | |
| A883 | Power ups. | | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| A884 | Mains contactor. | Programmable warnings, see 33.35 Edge counter 1 warn message and 33.45 Edge counter 2 warn message.<br>Check the AUX code for the source of the warning.<br>– 2: 33.33 Edge counter 1 source.<br>– 3: 33.43 Edge counter 2 source. | |
| A885 | DC-breaker. | | |
| A886 | On-time 1.<br>(Editable message text)<br>Programmable, see 33.14 On-time 1 warn message. | Warning generated by on-time timer 1. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.13 On-time 1 source. | 4 (default)<br>1 … 5 user selectable |
| A887 | On-time 2.<br>(Editable message text)<br>Programmable, see 33.24 On-time 2 warn message. | Warning generated by on-time timer 2. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.23 On-time 2 source. | 4 (default)<br>1 … 5 user selectable |
| A888 | Edge counter 1.<br>(Editable message text)<br>Programmable, see 33.35 Edge counter 1 warn message. | Warning generated by edge counter 1. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.33 Edge counter 1 source. | 4 (default)<br>1 … 5 user selectable |
| A889 | Edge counter 2.<br>(Editable message text)<br>Programmable, see 33.45 Edge counter 2 warn message. | Warning generated by edge counter 2. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.43 Edge counter 2 source. | 4 (default)<br>1 … 5 user selectable |
| A88A | Value counter 1.<br>(Editable message text)<br>Programmable, see 33.55 Value counter 1 warn message. | Warning generated by value counter 1. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.53 Value counter 1 source. | 4 (default)<br>1 … 5 user selectable |
| A88B | Value counter 2.<br>(Editable message text)<br>Programmable, see 33.65 Value counter 2 warn message. | Warning generated by value counter 2. See group 33 Generic timer & counter.<br>Check the source of the warning. See 33.63 Value counter 2 source. | 4 (default)<br>1 … 5 user selectable |
| A88C | Clean device. | Warning generated by an on time timer. See group 33 Generic timer & counter.<br>Programmable warnings, see 33.14 On-time 1 warn message and 33.24 On-time 2 warn message.<br>Check the AUX code for the source of the warning.<br>– 0: 33.13 On-time 1 source.<br>– 1: 33.23 On-time 2 source.<br>– 10: 05.04 Fan on-time counter. | 4 (default)<br>1 … 5 user selectable |
| A88D | Any fan. | | |
| A88E | Cabinet fan. | | |
| A88F | Cooling fan. | | |
| A890 | Additional cooling. | | |
| A8A0 | AI supervision.<br>Programmable, see 12.03 AI supervision function. | An analog signal is outside the limits specified for the analog input. See also 80A0.<br>Check:<br>– The AUX code (format XYY).<br>X specifies the location of the input.<br>– 0: Control board.<br>– 1: I/O extension module 1.<br>– 2: I/O extension module 2<br>– 3: I/O extension module 3.<br>– 4: ….<br>YY specifies the input and limit.<br>– 01: AI1 under minimum. | 4 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – 02: AI1 over maximum.<br>– 03: AI2 under minimum.<br>– 04: AI2 over maximum.<br>– 05: AI3 under minimum.<br>– 06: AI3 over maximum.<br>– The signal level at the analog input.<br>– The wiring connected to the input.<br>– Polarity of the connection.<br>– The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3. | |
| A8B0 | Signal supervision 1.<br>(Editable message text)<br>Programmable, see 32.06 Supervision 1 action. | Warning generated by signal supervision 1. See group 32 Supervision. See also 80B0.<br>Check the source of the warning. See 32.07 Supervision 1 signal. | 4 (default)<br>1 … 5 user selectable |
| A8B1 | Signal supervision 2.<br>(Editable message text)<br>Programmable, see 32.16 Supervision 2 action. | Warning generated by signal supervision 2. See group 32 Supervision. See also 80B1.<br>Check the source of the warning. See 32.17 Supervision 2 signal. | 4 (default)<br>1 … 5 user selectable |
| A8B2 | Signal supervision 3.<br>(Editable message text)<br>Programmable, see 32.26 Supervision 3 action. | Warning generated by signal supervision 3. See group 32 Supervision. See also 80B2.<br>Check the source of the warning. See 32.27 Supervision 3 signal. | 4 (default)<br>1 … 5 user selectable |
| A8BE | ULC overload.<br>Programmable, see 37.03 ULC overload actions. | Selected signal has exceeded the user overload curve. See group 37 User load curve. See also 8002.<br>Check:<br>– For any operating conditions increasing the monitored signal. E.g., the load of the motor if the torque or current is being monitored.<br>– The definition of the load curve. | 4 (default)<br>1 … 5 user selectable |
| A8BF | ULC underload.<br>Programmable, see 37.04 ULC underload actions. | Selected signal has fallen below the user underload curve. See group 37 User load curve. See also 8001.<br>Check for any operating conditions decreasing the monitored signal. E.g., the loss of load if the torque or current is being monitored.<br>Check the definition of the load curve. | 4 (default)<br>1 … 5 user selectable |
| A8C0 | Fan service counter | A cooling fan has reached the end of its estimated lifetime. See 05.41 Main fan service counter.<br>Check the AUX code for the fan to be replaced.<br>– 0: Main cooling fan.<br>Refer to the *DCS880 Service Manual (3ADW000488)* of the drive for fan replacement instructions. | 4 |
| A981 | External warning 1.<br>(Editable message text)<br>Programmable, see 31.01 External event 1 source and 31.02 External event 1 type. | There is no problem with the drive itself!<br>Warning generated by external device 1. See group 31 Fault functions and fault levels. See also 9081.<br>Check:<br>– External device 1.<br>– 31.01 External event 1 source. | 4 (default)<br>1 … 5 user selectable. |
| A982 | External warning 2.<br>(Editable message text)<br>Programmable, see 31.03 External event 2 | There is no problem with the drive itself!<br>Warning generated by external device 2. See group 31 Fault functions and fault levels. See also 9082.<br>Check: | 4 (default)<br>1 … 5 user selectable |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | source and 31.04 External event 2 type. | – External device 2.<br>– 31.03 External event 2 source. | |
| A983 | External warning 3.<br>(Editable message text)<br>Programmable, see 31.05 External event 3 source and 31.06 External event 3 type. | There is no problem with the drive itself!<br>Warning generated by external device 3. See group 31 Fault functions and fault levels. See also 9083.<br>Check:<br>– External device 3.<br>– 31.05 External event 3 source. | 4 (default)<br>1 … 5 user selectable |
| A984 | External warning 4.<br>(Editable message text)<br>Programmable, see 31.07 External event 4 source and 31.08 External event 4 type. | There is no problem with the drive itself!<br>Warning generated by external device 4. See group 31 Fault functions and fault levels. See also 9084.<br>Check:<br>– External device 4.<br>– 31.07 External event 4 source. | 4 (default)<br>1 … 5 user selectable |
| A985 | External warning 5.<br>(Editable message text)<br>Programmable, see 31.09 External event 5 source and 31.10 External event 5 type. | There is no problem with the drive itself!<br>Warning generated by external device 5. See group 31 Fault functions and fault levels. See also 9085.<br>Check:<br>– External device 5.<br>– 31.09 External event 5 source. | 4 (default)<br>1 … 5 user selectable |
| AF8C | Process PID sleep mode. | The drive is entering sleep mode.<br>Informative warning. See parameters 40.41 … 40.48. | 4 |
| AF90 | Autotuning. | The autotuning or assistant did not complete successfully.<br>To clear the warning, either finish an autotuning/assistant successfully or keep Reset (e.g. via DI) depressed for over 3 seconds.<br>Check the AUX code (format XXXXYYYY).<br>XXXX specifies the autotuning or assistant.<br>– 0001: Field current autotuning.<br>– 0002: Armature current autotuning.<br>– 0003: Speed feedback assistant.<br>– 0004: Speed controller autotuning.<br>– 0006: Flux linearization autotuning.<br>– 0007: Thyristor test.<br>– 0008: Tacho fine tuning.<br>YYYY indicates the problem. Actions see below. | 4 |
| | 00010001 | – The drive was stopped before the autotuning finished.<br>– The On command (06.09.b00 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00010002 | Motor is turning. No speed zero indication. | |
| | 00010003 | Armature current not zero. | |
| | 00010004 | Field current autotuning wrongly started in armature drive, please use the field exciter. | |
| | 00010005 | No field exciter selected. See 99.07 M1 used field exciter type. | |
| | 00010006 | Autotuning timeout, On command (06.09.b00 Used main control word) was not set in time. | |
| | 00010007 … 0001000A | – Measured field current does not reach the field current reference.<br>– No detection of field resistance.<br>– Field circuit open (e.g. not connected) respectively interrupted. | |
| | 0001000B | Unable to detect a field inductance. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | 0001000C | Firmware fault.<br>Contact your local ABB representative. | |
| | 00020002 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00020003 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00020004 | – Invalid nominal armature current setting.<br>– Armature current 99.11 M1 nominal current is set to zero. | |
| | 00020005 | Motor is turning. No speed zero indication. | |
| | 00020006 | Armature circuit and/or armature voltage measurement circuit wrongly connected (e.g. at C1/D1 or at the SDCS-PIN-H51). | |
| | 00020007 | No load connected to armature circuit. | |
| | 00020008 | Armature voltage measurement circuit open (e.g. not connected at C1/D1 or at the SDCS-PIN-H51) or interrupted. This can be checked by measuring the motor resistance at C1/D1 and the SDCS-PIN-H51. Check also current and torque limits. | |
| | 00020009 | Firmware fault.<br>Contact your local ABB representative. | |
| | 00030001 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00030002 | Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to speed limitation - see 30.11 M1 minimum speed and 30.12 M1 maximum speed. | |
| | 00030003 | Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to voltage limitation.<br>During the tuning of the speed controller, the speed feedback assistant or the tacho fine-tuning base speed, 99.14 M1 nominal (base) speed, might be reached. Thus full armature voltage, 99.12 M1 nominal voltage, is necessary. In case the mains voltage is too low to provide for the needed armature voltage the autotuning procedure is canceled.<br>Check and adapt if needed:<br>– 99.10 Nominal mains voltage.<br>– 99.12 M1 nominal voltage.<br>– 99.14 M1 nominal (base) speed. | |
| | 00030004 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00030005 | Motor could not accelerate to base speed.<br>Decrease 23.12 Acceleration time 1 to get more torque and current.<br>Increase torque step or decrease speed step. See 25.38 Autotune torque step and 25.39 Autotune speed step. | |
| | 00030006 | Tacho adjustment faulty or not OK or the tacho voltage is too high during autotuning | |
| | 00040001 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | Repeat autotuning until successful. | |
| | 00040002 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00040003 | Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to speed limitation - see 30.11 M1 minimum speed and 30.12 M1 maximum speed. | |
| | 00040004 … 00040006 | Motor is turning. No speed zero indication. | |
| | 00040007 | Motor could not decelerate with full autotuning torque.<br>Decrease 23.13 Deceleration time 1 to get more torque and current.<br>Decrease torque step or speed step. See 25.38 Autotune torque step and 25.39 Autotune speed step. | |
| | 00040008 | Armature current not zero. | |
| | 00040009 | Tuning of speed controller, speed feedback assistant or tacho fine-tuning not possible due to voltage limitation.<br>During the tuning of the speed controller, the speed feedback assistant or the tacho fine-tuning base speed, 99.14 M1 nominal (base) speed, might be reached. Thus full armature voltage, 99.12 M1 nominal voltage, is necessary. In case the mains voltage is too low to provide for the needed armature voltage the autotuning procedure is canceled.<br>Check and adapt if needed:<br>– Mains voltage<br>– 99.12 M1 nominal voltage<br>– 99.14 M1 nominal (base) speed | |
| | 0004000A | Required torque reference could not be reached before the drive reached base speed.<br>Decrease torque step or increase speed step. See 25.38 Autotune torque step and 25.39 Autotune speed step. | |
| | 0004000B | Drive is not in speed control mode. See 19.01 Actual operation mode. | |
| | 0004000C | Motor could not accelerate to base speed.<br>Decrease 23.12 Acceleration time 1 to get more torque and current.<br>Increase torque step or decrease speed step. See 25.38 Autotune torque step and 25.39 Autotune speed step. | |
| | 0004000D | No writing of control parameters of speed controller possible. | |
| | 0004000E | Firmware fault.<br>Contact your local ABB representative. | |
| | | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault. | |
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| | 00060001 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00060002 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00060003 | Field weakening not allowed. See 90.41 M1 feedback selection and 28.41EMF/Field control mode. | |
| | 00060004 | Motor is turning. No speed zero indication. | |
| | 00060005 | Drive is not in speed control mode. See 19.01 Actual operation mode. | |
| | 00060006 | Requested speed was not reached after 300 seconds. | |
| | 00060007 | Wrong order of measurement results in the flux linearization parameters. See 28.31 Field current at 40 % flux, 28.32 Field current at 70 % flux and 28.33 Field current at 90 % flux. | |
| | 00060008 | Firmware fault.<br>Contact your local ABB representative. | |
| | 00070002 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00070003 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00070004 | Field current not zero. | |
| | 00070005 | Armature current not zero. | |
| | 00070006 | Motor is turning. No speed zero indication. | |
| | 00070007 | Thyristor block test failed. | |
| | 00070008 | Motor connected to ground (near terminal C). | |
| | 00070009 | Motor connected to ground (near terminal D). | |
| | 00070010 | Armature winding is not connected (terminals C and D are open). | |
| | 00070011 | V11 short circuit. | |
| | 00070012 | V12 short circuit. | |
| | 00070013 | V13 short circuit. | |
| | 00070014 | V14 short circuit. | |
| | 00070015 | V15 short circuit. | |
| | 00070016 | V16 short circuit. | |
| | 00070C11 | V11 not conducting. | |
| | 00070C12 | V12 not conducting. | |
| | 00070C13 | V13 not conducting. | |
| | 00070C14 | V14 not conducting. | |
| | 00070C15 | V15 not conducting. | |
| | 00070C16 | V16 not conducting. | |
| | 00070C21 | V21 not conducting. | |
| | 00070C22 | V22 not conducting. | |
| | 00070C23 | V23 not conducting. | |
| | 00070C24 | V24 not conducting. | |
| | 00070C25 | V25 not conducting. | |
| | 00070C26 | V26 not conducting. | |
| | 00071124 | V11 or V24 short circuit | |
| | 00071225 | V12 or V25 short circuit. | |
| | 00071326 | V13 or V26 short circuit. | |
| | 00071421 | V14 or V21 short circuit. | |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | 00071522 | V15 or V22 short circuit. | |
| | 00071623 | V16 or V23 short circuit. | |
| | 00072000 | Armature winding is short-circuited (short circuit between terminals C and D). | |
| | 0007FFFF | Thyristor test finishes successful, stack okay. | |
| | 00080001 | – The drive was stopped before the autotuning finished.<br>– The Run command (06.09.b03 Used main control word) was prematurely removed.<br>– Autotuning aborted by a fault.<br>Repeat autotuning until successful. | |
| | 00080002 | Autotuning timeout, Run command (06.09.b03 Used main control word) was not set in time or is missing. | |
| | 00080003 | Drive in On state (06.09.b0 Used main control word = 1) when autotuning was requested. Remove the on command. | |
| | 00080004 | A fault happened during the autotuning. For details see event logger. | |
| AFE1 | Off 2 (emergency off). | The drive has received an Off2 command (emergency off/fast current off).<br>There is no problem with the drive itself!<br>Check:<br>– The AUX code (format 00XXYYYY).<br>XX specifies the source of the Off2 command.<br>– 04: 20.04 Off2 source 1 (emergency off).<br>– 08: 20.08 Off2 source 2 (emergency off).<br>– 09: 06.09.b01 Used main control word.<br>YYYY specifies the digital input or bit.<br>– 0000: Other [bit]; source selection.<br>– 0100: Off2 command; 0, emergency off/fast current off.<br>– 0101: Off2 inactive; 1, normal operation.<br>– 0103: DI1; 10.02.b00 DI delayed status.<br>– 0104: DI2; 10.02.b01 DI delayed status.<br>– 0105: DI3; 10.02.b02 DI delayed status.<br>– 0106: DI4; 10.02.b03 DI delayed status.<br>– 0107: DI5; 10.02.b04 DI delayed status.<br>– 0108: DI6; 10.02.b05 DI delayed status.<br>– 0111: DIO1; 11.02.b00 DIO delayed status.<br>– 0112: DIO2; 11.02.b01 DIO delayed status.<br>– 0119: DIL; 10.02.b15 DI delayed status.<br>– 1001: 06.09.b01 Used main control word.<br>– That it is safe to continue operation.<br>– That it is safe to reset the source of the Off2 command. E.g. a push button. Then restart the drive.<br>– If necessary, invert the signal, since the signal should be low active.<br>– If On/Run command is still high. | 1 |
| | | Follower drive in a master-follower configuration.<br>The drive has received an Off2 command from the master.<br>Informative warning. After stopping on an Off2 command, the master sends a short, 10 ms Off2 command to the follower(s). Thus, the Off2 event is stored in the event log of the follower. | |
| AFE2 | Off 3 (emergency stop). | The drive has received an Off3 command (emergency stop).<br>There is no problem with the drive itself!<br>Check: | 1 |

| Code | Warning/Notice | Cause and what to do | Warning level |
|---|---|---|---|
| | | – The AUX code (format 00XXYYYY).<br>XX specifies the source of the Off3 command.<br>– 05: 20.05 Emergency stop source.<br>– 09: 06.09.b02 Used main control word.<br>YYYY specifies the digital input or bit.<br>– 0000: Other [bit]; source selection.<br>– 0100: Off2 command; 0, emergency off/fast current off.<br>– 0101: Off2 inactive; 1, normal operation.<br>– 0103: DI1; 10.02.b00 DI delayed status.<br>– 0104: DI2; 10.02.b01 DI delayed status.<br>– 0105: DI3; 10.02.b02 DI delayed status.<br>– 0106: DI4; 10.02.b03 DI delayed status.<br>– 0107: DI5; 10.02.b04 DI delayed status.<br>– 0108: DI6; 10.02.b05 DI delayed status.<br>– 0111: DIO1; 11.02.b00 DIO delayed status.<br>– 0112: DIO2; 11.02.b01 DIO delayed status.<br>– 0119: DIL; 10.02.b15 DI delayed status.<br>– 1002: 06.09.b02 Used main control word.<br>– That it is safe to continue operation.<br>– That it is safe to reset the source of the Off2 command. E.g. a push button. Then restart the drive.<br>– If necessary, invert the signal, since the signal should be low active.<br>– If On/Run command is still high. | |
| | | Follower drive in a master-follower configuration.<br>The drive has received an Off3 command from the master.<br>Informative warning. After stopping on an Off3 command, the master sends a short, 10 ms Off3 command to the follower(s). Thus, the Off3 event is stored in the event log of the follower. | |
| AFE7 | Follower. | A follower drive has tripped.<br>Check the AUX code.<br>Add 2 to the code to find out the node address of the faulted follower. Then correct its fault. | 1 |
| AFEB | Run enable command. (Editable message text) | No run enable command received.<br>Check:<br>– The setting of 20.12 Enable run command source.<br>– That the signal of the selected source is enabled.<br>– The wiring of selected source. | 1 |
| B5A0 | Safe torque off. Programmable, see 31.22 STO indication run/stop. | STO active, no drive problem. See safety supplement for functional safety converter DCS880 (3ADW000452). See also A5A0 and 5091. | 4 |
| B5A3 | Safe off main contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. | STO monitor DC current not zero (zero current time out). See safety supplement for functional safety converter DCS880 (3ADW000452). See also A5A3 and 5093. | 4 |
| B5A4 | Firmware internal diagnostics. | Drive control unit rebooted unexpectedly.<br>Notice. | 4 |

## Faults

In case a fault occurs, it stays active until the cause is eliminated and a Reset is given. All fault signals are resetable except of:

- 50FE Type code.
- 6000 Internal firmware.
- F501 Auxiliary undervoltage.
- F547 Drive hardware.

To reset a fault following steps are required:

- The above-mentioned faults can only be reset by cycling the power.
- Remove the Run and On commands.
- Eliminate the faults.
- Acknowledge the fault with Reset via digital input, overriding control system or with Control panel/PC tool.
- Depending on the systems condition, generate Run and On commands again.

### Fault levels

The fault signals will switch the drive off completely or partly depending on its fault level.
The fault handling provides 6 fault levels.

**Fault level 1**

- The main contactor is switched off immediately.
- The field contactor is switched off immediately.
- The fan contactor is switched off immediately.

**Fault level 2**

- The main contactor is switched off immediately.
- The field contactor is switched off immediately.
- The fan contactor stays on as long as the fault is pending or as long as 20.40 Drive/Motor fan delay time is running.

**Fault level 3**

The drive is stopping via 31.14 Fault stop mode fault level 3, thus:

- The main contactor is switched off immediately.
- The field contactor is switched off immediately in case of 31.14 Fault stop mode fault level 3 = Coast stop, but it stays on in case of field heating or 31.14 Fault stop mode fault level 3 = Dynamic braking (this is valid for all level 3 faults).
- The fan contactor stays on.

At standstill:

- The main contactor cannot be switched on again.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

**Fault level 4**

The drive is stopping via 31.15 Fault stop mode fault level 4, thus:

- The main contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop or Dynamic braking, but it stays on in case of 31.15 Fault stop mode fault level 4 = Ramp stop or Torque limit.
- The field contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop, but it stays on in case of field heating or 31.15 Fault stop mode fault level 4 = Ramp stop, Torque limit or Dynamic braking.
- The fan contactor is switched off immediately in case of 31.15 Fault stop mode fault level 4 = Coast stop, but stays on in case of 31.15 Fault stop mode fault level 4 = Ramp stop, Torque limit or Dynamic braking.

At standstill:

- The main contactor is switched off immediately.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

**Fault level 5**

The drive is stopping via any communication loss action - see 49.05 Communication loss action, 50.02 FBA A comm loss func, 50.32 FBA B comm loss func, 58.14 Communication loss action, 60.09 M/F comm loss function, 60.59 DDCS controller comm loss function and 70.07 DCSLink comm loss function - thus:

- The main contactor is switched off immediately or stays on depending on the selected communication loss action.

- The field contactor is switched off immediately or stays on depending on the selected communication loss action, but it stays on in case of field heating.
- The fan contactor is switched off immediately or stays on depending on the selected communication loss action.

At standstill:

- The main contactor is switched off immediately.
- The field contactor stays on in case of field heating.
- The fan contactor stays on as long as 20.40 Drive/Motor fan delay time is running.

**Fault level 6**

- Used for STO related faults. See safety supplement for functional safety converter DCS880 (3ADW000452).

## Fault messages

The list contains the fault code in hex, its name, the cause and hints what to do.

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| 1412 | Fault reset | A fault has been reset.<br>Notice. | - |
| 1414 | Backup/Restore Timeout | The unit encountered problems creating a backup file or restoring one. Please try again. | 1 |
| 2310 | Armature overcurrent. | The armature current has exceeded either 07.63 Drive DC overcurrent level or 31.44 Armature overcurrent level.<br>Check:<br>– That the start-up data in group 99 corresponds to the motor rating plate and that the drive is matching the motor.<br>– The setting of 07.63 Drive DC overcurrent level and 31.44 Armature overcurrent level.<br>– The settings of the current controller in group 27 Armature current control.<br>– The settings of current and torque limits in group 30 Control limits.<br>– The motor and motor cables.<br>– All connections in the armature circuit.<br>– The incoming voltage for synchronizing. If the synchronizing voltage is not taken from the mains directly, but via a synchronizing transformer or the 230 VAC/115 VAC network, check that there is no phase shift between the same phases. Use an oscilloscope to verify.<br>– The mains/branch fuses.<br>– The thyristors.<br>– That there are no contactors opening and closing in the motor cables.<br>– That there are no power factor correction capacitors or surge absorbers between line reactor and drive.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel. In case of a hardparallel configuration.<br>In case of a rebuild kit check:<br>– For proper connection of the firing pulses.<br>– For proper connection of the CTs.<br>– That 95.25 Set: Type code = None.<br>– The setting of 95.27 Set: Drive DC current scaling, because 07.63 Drive DC overcurrent level = 2.3 • 95.27 Set: Drive DC current scaling. | 3 |
| 2330 | Residual current detected.<br>Programmable, see 31.18 Residual current detection type. | The drive has detected an unbalance typically due to a residual current in the motor or the motor cables. Sum of IL1, IL2, IL3 ≠ zero. See also A2B3.<br>Check: | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of 31.17 Residual current detection source, 31.18 Residual current detection type, 31.19 Residual current detection level and 31.20 Residual current detection delay.<br>– The residual current transformer, if necessary change transformer or connected drive hardware.<br>– The insulation resistances of motor and motor cables. Disconnect the mains, verify safe isolation from supply in armature and field circuits and make insulation tests for the complete installation. | |
| 3130 | Mains phase loss. Programmable, see 31.21 Mains phase loss. | One or several mains voltage phase(s) are missing or the mains voltage phases are imbalanced. See also A130.<br>Check:<br>– The condition of the mains (voltage, cabling, fuses, switchgear).<br>– That all 3 phases are present directly at the drive.<br>  – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.<br>  – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51.<br>– For mains supply imbalance.<br>– For loose mains cable connections.<br>– That the mains contactor closes and opens.<br>– The AUX code:<br>  – 0: All phase voltages U (L1), V (L2) and W (L3) are missing.<br>  – 1: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{UV}$ is the smallest voltage.<br>  – 2: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{VW}$ is the smallest voltage.<br>  – 3: Phase V (L2) is missing.<br>  – 4: Mains voltage phases are imbalanced. Phase-to-phase voltage $U_{WU}$ is the smallest voltage.<br>  – 5: Phase U (L1) is missing.<br>  – 6: Phase W (L3) is missing. | 3 |
| 3280 | Mains low voltage. | Mains low (under-) voltage (AC side). See also A111.<br>The firing angle is forced to the value of 30.45 Maximum firing angle and single firing pulses to suppress the DC current are given.<br>Check:<br>– The setting of 31.51.Mains loss mode, 31.52 Mains loss down time, 31.53 Mains loss low level 1 and 31.54 Mains loss low level 2.<br>– That the mains voltage scaling is correct. See 99.10 Nominal mains voltage.<br>– The cutting of the voltage coding resistors on the SDCS-PIN-H51.<br>– The condition of the mains (voltage, cabling, fuses, switchgear).<br>– That all 3 phases are present directly at the drive.<br>  – H1 … H5: measure the fuses F100 … F102 on the SDCS-PIN-H01.<br>  – H6 … H8: check and measure the connections XU1/XU2, XV1/XV2 and XW1/XW2 on the SDCS-PIN-H51. | 3 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – That the mains voltage is within the set tolerance.<br>– For mains supply imbalance.<br>– For loose mains cable connections.<br>– That the mains contactor closes and opens.<br>– For H1 … H4, that the field circuit has no short circuit or ground fault.<br>– In case an On command is given and the measured mains voltage is too low for longer than 500 ms A111 Mains low voltage is set. If the problem persist for longer than 10 s 3280 Mains low voltage is generated. | |
| 4310 | Bridge temperature measured. | Excessive bridge temperature. See also A4B0.<br>Wait until the bridge is cooled down. The fan contactor stays on as long as the fault is pending.<br>Temperature fault level, see 07.65 Drive max bridge temperature set. The bridge overtemperature warning will already appear at approximately 5°C below the temperature fault level.<br>Check:<br>– The values of 05.11 Ch1 bridge temperature … 05.14 Ch4 bridge temperature.<br>– The setting of 20.38 Drive fan acknowledge source.<br>– The setting of 20.40 Drive/Motor fan delay time.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The drive fan supply voltage.<br>– The drive fan direction of rotation.<br>– The drive fan components.<br>– The heatsink fins for dust pick-up.<br>– The drive cooling air inlet (e.g. filters).<br>– The drive cooling air outlet.<br>– For open drive doors.<br>– The motor power against the drive power.<br>– Inadmissible load cycle.<br>– When 95.25 Set: Type code = None, that 95.29 Set: Drive max bridge temperature is set properly.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel. In case of a hardparallel configuration. | 2 |
| 4981 | Motor temperature 1 measured/estimated. (Editable message text) | Measured/Estimated motor temperature 1 has exceeded the fault level. See also A491.<br>Wait until the motor/motor model is cooled down under the warning level. The fan contactor stays on as long as the fault is pending. It is not possible to reset the fault as long as the motor remains too hot.<br>Check:<br>– The value of 35.02 Measured temperature 1.<br>– The real motor temperature. Let motor cool down and restart.<br>– The value of 35.12 Temperature 1 fault level.<br>– The setting of 35.15 Supervision 1 klixon source, if klixons are used.<br>– The cooling of the motor or other temperature measured equipment.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The motor fan supply voltage. | 2 |

<table>
<tr><th>Code</th><th>Fault</th><th colspan="2">Cause and what to do</th><th>Fault level</th></tr>
<tr><td></td><td></td><td colspan="2">– The motor fan direction of rotation.<br>– The motor fan components.<br>– The motor cooling air inlet (e.g. filters).<br>– The motor cooling air outlet.<br>– The motor load and drive ratings.<br>– Inadmissible load cycle.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it.<br>Hint:<br>– The measured/estimated motor temperature is blocked, if 35.11 Temperature 1 source = Disable.</td><td></td></tr>
<tr><td>4982</td><td>Motor temperature 2 measured/estimated.<br>(Editable message text)</td><td colspan="2">Measured/Estimated motor temperature 2 has exceeded the fault level. See also A492.<br>Wait until the motor/motor model is cooled down under the warning level. The fan contactor stays on as long as the fault is pending. It is not possible to reset the fault as long as the motor remains too hot.<br>Check:<br>– The value of 35.03 Measured temperature 2.<br>– The real motor temperature. Let motor cool down and restart.<br>– The value of 35.22 Temperature 2 fault level.<br>– The setting of 35.25 Supervision 2 klixon source, if klixons are used.<br>– The cooling of the motor or other temperature measured equipment.<br>– The ambient conditions (e.g. ambient temperature).<br>– The airflow and fan operation.<br>– The motor fan supply voltage.<br>– The motor fan direction of rotation.<br>– The motor fan components.<br>– The motor cooling air inlet (e.g. filters).<br>– The motor cooling air outlet.<br>– The motor load and drive ratings.<br>– Inadmissible load cycle.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it.<br>Hint:<br>– The measured/estimated motor temperature is blocked, if 35.21 Temperature 2 source = Disable.</td><td>2</td></tr>
<tr><td>4990</td><td>FPTC-xx module not found.</td><td colspan="2">A thermistor protection module (FPTC-xx) was activated in 35.30 FPTC configuration word, but it is not detected.<br>Power down the drive control unit and make sure that the module is properly inserted in the correct slot.<br>The last digit of the AUX code identifies the slot.</td><td>4</td></tr>
<tr><td>4991</td><td>Motor temperature slot 1 measured.<br>(Editable message text)</td><td>The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 1 indicates overtemperature.</td><td rowspan="3">Depending on the used module, a PTC and/or KTY temperature sensor can be attached. See also A497 … A499.<br>Check:<br>– The cooling of the motor or other temperature measured equipment.<br>– The motor load and drive ratings.</td><td>2</td></tr>
<tr><td>4992</td><td>Motor temperature slot 2 measured.<br>(Editable message text)</td><td>The thermistor protection module (FEN-xx or FPTC-xx) installed in slot 2 indicates overtemperature.</td><td>2</td></tr>
<tr><td>4993</td><td>Motor temperature slot 3 measured.</td><td>The thermistor protection module (FEN-xx or FPTC-</td><td>2</td></tr>
</table>

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | (Editable message text) | xx) installed in slot 3 indicates overtemperature.<br>– The wiring of the temperature sensor.<br>– The resistance of the temperature sensor by measuring it. | |
| 5080 | Drive fan acknowledge. Programmable, see 31.41 Drive fan fault function. | Drive cooling fan feedback at the DI is missing. See also A581. Check:<br>– The settings of 20.38 Drive fan acknowledge source and 20.40 Drive/Motor fan delay time.<br>– The drive fan operation and connection.<br>– The drive fan contactor.<br>– The drive fan circuit.<br>– The drive fan klixon.<br>– The drive fan components.<br>– The drive fan supply voltage.<br>– The drive fan direction of rotation.<br>– The drive door open.<br>– The drive cooling air inlet (e.g. filter).<br>– The drive cooling air outlet.<br>– H7 an H8 pressure switch (setting should be 2 mbar).<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| 5090 | STO hardware fault. | STO redundancy circuit control board fault. See safety supplement for functional safety converter DCS880 (3ADW000452). | 6 |
| 5091 | Safe torque off. Programmable, see 31.22 STO indication run/stop. | STO active, no drive problem. See safety supplement for functional safety converter DCS880 (3ADW000452). See also A5A0 and B5A0. | 6 |
| 5092 | STO overall fault. | Or function 5090, 5093, FA81, FA82. See safety supplement for functional safety converter DCS880 (3ADW000452).<br>It becomes active when any of the following faults is detected in the STO related circuits:<br>– 5090 STO hardware fault.<br>– 5093 Safe off main contactor XSMC:STO (zero current time out).<br>– FA81 Safe torque off 1 loss fault.<br>– FA82 Safe torque off 2 loss fault. | 6 |
| 5093 | Safe off main contactor XSMC:STO. Programmable, see 31.90 XSMC:STO Indication. | STO monitor DC current not zero (zero current time out). See safety supplement for functional safety converter DCS880 (3ADW000452). See also A5A3 and B5A3. | 6 |
| 5094 | Measurement circuit bridge temperature. | Problem with the internal temperature measurement of the bridge.<br>Check:<br>– The wiring of the temperature sensor.<br>– The temperature sensor.<br>– The (format XXXYYYZZ). YYY identifies the power unit channel. In case of a hardparallel configuration. | 4 |
| 50FE | Type code. | The hardware of the drive/SDCS-CON-H01 does not match the information stored in the memory unit. This may occur e.g. after a firmware update, memory unit replacement or replacement of the SDCS-CON-H01.<br>To reset, cycle the auxiliary power of the drive.<br>Check: | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of 95.14 Set: Power unit (if shown and available), 95.25 Set: Type code, 95.27 Set: Drive DC current scaling and 95.28 Set: Drive AC voltage scaling.<br>– The AUX code (format ZZ).<br>ZZ indicates the AUX code category.<br>– 6 = Power unit rating ID invalid.<br>– 7 = Reading power unit rating ID or power unit type failed on power unit connection.<br>– 8 = Power unit not supported (illegal rating ID).<br>– 10 = Type code out of range. For module sizes H1 … H5 the current and voltage range of the type code setting is limited to max 1190 $A_{DC}$ and max 600 $V_{AC}$.<br>– 20 = Saving of 95.25 Set: Type code failed.<br>– 21:= Saving of 95.14 Set: Power unit failed. | |
| 5681 | Power unit, communication. | Communication errors between the control unit and a power unit.<br>Check:<br>– The connections between the control unit and the power unit.<br>– The auxiliary code (format XXXYYYZZ).<br>XXX specifies the transmitter FIFO error code.<br>– 000: No transmitter FIFO error.<br>– 001: Internal error [invalid call parameter].<br>– 002: Internal error [configuration not supported].<br>– 003: Transmission buffer full.<br>YYY identifies the power unit.<br>– 000: Broadcast.<br>– 001: Power unit connected to channel 1 on SDCS-DSL-H1x.<br>– 002: Power unit connected to channel 2 on SDCS-DSL-H1x.<br>– 003: Power unit connected to channel 3 on SDCS-DSL-H1x.<br>– 004: Power unit connected to channel 4 on SDCS-DSL-H1x.<br>ZZ specifies the error source.<br>– 01: Transmitter side [link error] from power unit to control unit.<br>– 02: Transmitter side [no communication] from power unit to control unit.<br>– 03: Receiver side [link error] from control unit to power unit.<br>– 04: Receiver side [no communication] from control unit to power unit.<br>– 05: Transmitter FIFO error, see XXX.<br>– 06: SDCS-OPL-H01 not found. | 1 |
| 5692 | Power unit, power board failure. | Power unit, SDCS-POW-H01 failure. See also A5EB.<br>Check the AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel. In case of a hardparallel configuration. | 1 |
| 6000 | Internal firmware. | Internal firmware error.<br>To reset, cycle the auxiliary power of the drive. If the problem persist, contact your local ABB representative, quoting the AUX code.<br>Check the AUX code (format YYYY).<br>YYYY indicates the problem. Actions see below. | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | 0001 | Default setting of parameters wrong. | |
| | 0002 | Parameter flash image too small for all parameters. | |
| | 0004 | Illegal write attempt on a signal or write-protected parameter, e.g. writing on 06.01 Main control word or 06.09 Used main control word. | |
| | 0006 | Wrong type code. | |
| | 0007 | An un-initialized interrupted has occurred. | |
| | 0010 | Wrong parameter value. | |
| | 0101 … 9999 | The read only parameter, which is being written to by means of a pointer parameter, e.g. 62.51 Data set 10 data 1 selection, Adaptive Program or application program, can be identified by means of the last 4 digits. | |
| 6306 | FBA A mapping file. | Fieldbus adapter A mapping file read error.<br>Contact your local ABB representative. | 5 |
| 6307 | FBA B mapping file. | Fieldbus adapter B mapping file read error.<br>Contact your local ABB representative. | 5 |
| 6481 | Internal task overload. | Internal fault.<br>Cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 6487 | Internal stack overflow. | Internal fault.<br>Cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 64A1 | Internal file load. | File read error.<br>Cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 64A2 | Internal record load. | Internal record load error.<br>Contact your local ABB representative. | 1 |
| 64A3 | Application loading. | Application file incompatible or corrupted.<br>Check the AUX code. Actions see below. | 1 |
| | 8006 | Not enough memory for the application. | |
| | 8007 | The application contains the wrong library version. | |
| | 800A | The application contains an unknown target (system) library function. | |
| | 800B … XXXX | The application load failed.<br>For more details, check 05.22 Diagnostic. | |
| 64A5 | Licensing. | Running the control program is prevented either because a restrictive license exists, or because a required license is missing.<br>Record the AUX codes of all active licensing faults and contact your product vendor for further instructions. | 1 |
| 64A6 | Adaptive program. | Error running the adaptive program.<br>Check the AUX code (format XXXXYYYY).<br>XXXX specifies the number of the function block. XXXX = 0000 is a generic error.<br>YYYY indicates the problem. Actions see below. | 1 |
| | 000A | Program corrupted or block non-existent.<br>Restore the template program or download the program to the drive. | |
| | 000E | Program corrupted or block non-existent.<br>Restore the template program or download the program to the drive. | |
| | 0011 | Program too large.<br>Remove blocks until the error stops. | |
| | 001C | A nonexistent parameter or block is used in the program. | |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | Edit the program to correct the parameter reference, or to use an existing block. | |
| | 001E | Output to parameter failed because the parameter was write-protected.<br>Check:<br>The parameter reference in the program.<br>For other sources affecting the target parameter. | |
| | 0023<br>0024 | Program file incompatible with current firmware version.<br>Adapt the program to current block library and firmware version. | |
| | Other | Contact your local ABB representative, quoting the AUX code. | |
| 64B0 | Memory unit detached. | The memory unit was detached while the drive control unit is powered.<br>Switch off the power to the drive control unit and reinstall the memory unit.<br>In case the memory unit was not actually removed when the fault occurred, check that the memory unit is properly inserted into its connector and its mounting screw is tight. Then cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 64B1 | Internal firmware. | Internal firmware fault.<br>Cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 64B2 | User set fault. | Loading of user parameter set failed.<br>Ensure that a valid user parameter set exists. Reload if uncertain.<br>Check:<br>– That the requested set does exists. See 96.14 Macro select.<br>– That the set is compatible with the control program.<br>– If the drive was switched off during loading.<br>– The memory unit. | 1 |
| 64E1 | Kernel overload. | Operating system error.<br>Cycle the power to the drive or use 96.27 Control board boot. If the problem persists, contact your local ABB representative. | 1 |
| 6581 | Parameter system. | Parameter load or save failed.<br>Try forcing a save using 96.16 Parameter save manually. | 3 |
| 65A1 | FBA A parameter conflict. | Fieldbus adapter A (FBA A): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. See also A6D1.<br>The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings are not set according to the fieldbus adapter or the device has not been selected.<br>Check:<br>– The PLC programming.<br>– The settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings.<br>– The configuration of the fieldbus adapter. | 5 |
| 65A2 | FBA B parameter conflict. | Fieldbus adapter B (FBA B): The drive does not have a functionality requested by a PLC or a requested functionality has not been activated. See also A6D2.<br>The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings are not set according to the fieldbus adapter or the device has not been selected.<br>Check:<br>– The PLC programming. | 5 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of parameter groups 50 Fieldbus adapter (FBA) and 54 FBA B settings.<br>– The configuration of the fieldbus adapter. | |
| 65B1 | Reference source parametrization. | A reference source is simultaneously connected to multiple parameters with different units. See also A6DA.<br>Check:<br>– The reference source selection parameters.<br>– The AUX code (format YYZZ).<br>YY specifies the parameter group.<br>ZZ specifies the parameter number. | 3 |
| 6681 | EFB communication. Programmable, see 58.14 Communication loss action. | Cyclical communication to the embedded fieldbus (EFB) is lost. See also A7CE.<br>6681 EFB communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7CE EFB communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus master (online, offline, error etc.).<br>– The settings of group 58 FBA Embedded fieldbus.<br>– The cable connections to connector XD2D on the control board.<br>– The fieldbus termination. | 5 |
| 6682 | EFB configuration file. | Embedded fieldbus (EFB) configuration file could not be read. Contact your local ABB representative. | 5 |
| 6683 | EFB invalid parameterization. | Embedded fieldbus (EFB) parameter settings are inconsistent or not compatible with the selected protocol.<br>Check the settings of group 58 FBA Embedded fieldbus. | 5 |
| 6684 | EFB load fault | Embedded fieldbus (EFB) protocol firmware could not be loaded.<br>Version mismatch between embedded fieldbus (EFB) protocol firmware and drive firmware.<br>Contact your local ABB representative. | 5 |
| 6881 | Text data overflow. | Internal fault.<br>Reset the fault. Contact your local ABB representative if the fault persists. | 5 |
| 6882 | Text 32-bit table overflow. | | 5 |
| 6883 | Text 64-bit table overflow. | | 5 |
| 6885 | Text file overflow. | | 5 |
| 7081 | Control panel/PC tool link communication. Programmable, see 49.05 Communication loss action. | Control panel/PC tool has stopped communicating. See also A7EE.<br>Check:<br>– The setting of 49.05 Communication loss action.<br>– The control panel/PC tool connection cable.<br>– The control panel connector.<br>– The mounting platform if being used.<br>– Disconnect and reconnect the control panel/PC tool.<br>– Check the AUX code.<br>The code specifies the I/O port used as follows:<br>– 0: Panel/PC tool.<br>– 1: Fieldbus interface A.<br>– 2: Fieldbus interface B.<br>– 3: Ethernet.<br>– 4: D2D/EFB port. | 5 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| 7082 | I/O extension communication. Programmable, see 70.07 DCSLink comm loss function. | The I/O extension module/DCSLink board (SDCS-DSL-H1x) types and location specified by parameters do not match the detected configuration or do not communicate with the drive. See also A7AB.<br>Check:<br>– The type and location settings of the modules/board. See parameters 14.01, 14.02, 15.01, 15.02, 16.01, 16.02, 70.01, 70.02, 70.05 and 70.07.<br>– That the module/board is properly seated in its slot.<br>– That the module/board and the slot connector is not damaged.<br>– Try installing the module into another slot.<br>– Check the AUX code (format XXYYYYYY).<br>XX specifies the number of the I/O extension module/board.<br>– 01: Group 14 I/O extension module 1.<br>– 02: Group 15 I/O extension module 2.<br>– 03: Group 16 I/O extension module 3.<br>– 04: Group 70 DCSLink Communication.<br>YYYYYY indicates the problem.<br>– 00 0001: Communication with module/board failed.<br>– 00 0002: Module/Board not found.<br>– 00 0003: Configuration of module/board failed.<br>– 00 0004: Configuration of module/board failed. | 1 |
| 7083 | Panel reference conflict. | Use of saved control panel reference in multiple control modes attempted.<br>The control panel reference can only be saved for one reference type at a time. Consider the possibility of using a copied reference instead of saved reference (see the reference selection parameter). | 3 |
| 7084 | Control panel/PC tool version conflict. | The current version of the control panel/PC tool does not support a function. E.g. older control panel versions cannot be used as a source of external references.<br>Update the control panel/PC tool. Contact your local ABB representative if necessary. | 4 |
| 7085 | Incompatible option Module. | Option module not supported. E.g. type Fxxx-xx-M fieldbus adapters are not supported.<br>Replace the module with a supported type. Check the AUX code. It specifies the interface to which the unsupported module is connected:<br>– 1: Fieldbus interface A.<br>– 2: Fieldbus interface B. | 4 |
| 7121 | Motor stall. Programmable, see 31.24 Stall function. | Selected motor, the motor is operating in the stall region because of excessive load or insufficient motor power. See also A780.<br>The motor torque exceeded 31.25 Stall torque level for a time longer than 31.28 Stall time while the speed feedback was below 31.26 Stall speed level.<br>Check:<br>– The motor load/mechanics (e.g. brake).<br>– The drive ratings.<br>– For correct field current.<br>– The settings of 31.24 Stall function, 31.25 Stall torque level, 31.26 Stall speed level and 31.28 Stall time.<br>– The settings for current and torque limits in group 30 Control limits. | 4 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| 71A2 | Mechanical brake not closed.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, the acknowledge signal at the DI for the mechanical brake closed (applied) stage is missing. See also A7A1.<br>Check:<br>– The mechanical brake itself.<br>– The mechanical brake cable connections.<br>– The mechanical brake settings in group 44 Mechanical brake control.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 3 |
| 71A3 | Mechanical brake not opened.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, the acknowledge signal at the DI for the mechanical brake opened (applied) stage is missing. See also A7A2.<br>Check:<br>– The mechanical brake itself.<br>– The mechanical brake cable connections.<br>– The mechanical brake settings in group 44 Mechanical brake control.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 3 |
| 71A5 | Mechanical brake opening not allowed.<br>Programmable, see 44.17 M1 brake fault function. | Selected motor, open (lift) conditions of the mechanical brake are not fulfilled. See also A7A5.<br>The brake has been prevented from opening (lifting) by 44.11 M1 keep brake closed, 44.12 Brake close request or torque actual does not reach 44.10 M1 brake open torque, during torque proving.<br>Check:<br>– The mechanical brake settings in group 44 Mechanical brake control. Especially 44.11 M1 keep brake closed and 44.12 Brake close request.<br>– That the acknowledgement signal, if used, matches actual status of brake.<br>– The used digital inputs and outputs (groups 10 and 11). | 3 |
| | | Selected motor, open (lift) conditions of the mechanical brake are not fulfilled.<br>The brake has been prevented from opening (lifting) by an FSO-xx safety functions module.<br>Check the safety circuits connected to the FSO-xx safety functions module. | |
| 71B1 | Motor fan acknowledge.<br>Programmable, see 20.39 Motor fan acknowledge source. | Motor/External cooling fan feedback at the DI is missing. See also A781.<br>Check:<br>– The setting of 20.39 Motor fan acknowledge source.<br>– The fan operation and connection. Replace the motor/external fan if faulty.<br>– The fan contactor.<br>– The fan supply voltage. | 4 |
| 7301 | Motor speed feedback.<br>Programmable, see 31.35 Motor feedback fault. | Selected motor, no motor speed feedback is received. See also A7B0.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12. | 3 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below. | |
| | 0002 | Speed feedback device not configured.<br>Check the settings of the speed feedback device:<br>– Encoder 1, see group 92 Encoder 1 configuration.<br>– Encoder 2, see group 93 Encoder 2 configuration.<br>– The OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– The tacho, see group 94 OnBoard speed feedback configuration.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder. | |
| | 0003 | Speed feedback device stopped working.<br>Check the status of the speed feedback device. | |
| | 0004 | Speed feedback device drift detected.<br>Check for slippage between speed feedback device and motor. | |
| | 0007 | The comparison of measured speed feedback from pulse encoder or analog tacho to measured EMF has failed.<br>Check:<br>– The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01.<br>– At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances.<br>– EMF: The armature cable connection form the drive to the motor and the polarity. | |
| 7310 | Overspeed. | Selected motor, the motor is turning faster than highest allowed speed due to incorrectly set minimum/maximum speed, insufficient braking torque or changes in load when in torque control.<br>Check:<br>– The settings of 30.11 M1 minimum speed, 30.12 M1 maximum speed and 31.30 M1 overspeed trip margin.<br>– The settings of the speed controller in group 25 Speed control.<br>– The setting of 46.02 M1 speed scaling actual.<br>– The torque control settings.<br>– For correct speed feedback when using an encoder or a tacho. Thus, compare the value of 90.01 Motor speed for control vs. the measured motor speed (hand held tacho). | 3 |

<table>
<tr><th>Code</th><th>Fault</th><th colspan="3">Cause and what to do</th><th>Fault level</th></tr>
<tr><td></td><td></td><td colspan="3">– For proper connection of the speed feedback measurement.<br>– For correct field current.<br>– If the motor was accelerated by the load.<br>– If the DC-voltage measurement (C1, D1) might be swapped when EMF speed feedback is used.<br>– If the armature circuit is open (e.g. DC-fuses, DC-breaker, …) when EMF speed feedback is used.</td><td></td></tr>
<tr><td>7380</td><td>Encoder internal.</td><td colspan="3">Internal encoder fault.<br>See the documentation of the encoder.<br>Contact your local ABB representative.</td><td>3</td></tr>
<tr><td rowspan="15">7381</td><td>Speed feedback device.<br>Programmable, see 31.35 Motor feedback fault.</td><td colspan="3">Speed feedback device error. See also A7E1.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12.<br>– 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>– 05: EMF, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below.</td><td rowspan="15">3</td></tr>
<tr><td>0001</td><td colspan="3">Cable fault.<br>If the encoder was working previously, check the encoder, encoder cable and encoder interface module for damage.<br>Check:<br>– The conductor order at both ends of the encoder cable.<br>– The groundings of the encoder cable.<br>– 92.21 Encoder cable fault mode.<br>– 94.29 OnBoard encoder cable fault mode.</td></tr>
<tr><td>0002</td><td colspan="3">No encoder signal.<br>Check the condition of the encoder.</td></tr>
<tr><td>0003</td><td>Overspeed.</td><td colspan="2" rowspan="4">Contact your local ABB representative.</td></tr>
<tr><td>0004</td><td>Overfrequency.</td></tr>
<tr><td>0005</td><td>Resolver ID run failed.</td></tr>
<tr><td>0006</td><td>Resolver overcurrent fault.</td></tr>
<tr><td>0008</td><td colspan="2">Absolute encoder communication error.</td><td rowspan="3">Contact your local ABB representative.</td></tr>
<tr><td>0009</td><td colspan="2">Absolute encoder initialization error.</td></tr>
<tr><td>000A</td><td colspan="2">Absolute SSI encoder configuration error.</td></tr>
<tr><td>000B</td><td colspan="2">Encoder reported an internal error.</td><td rowspan="5">See the documentation of the encoder.</td></tr>
<tr><td>000C</td><td colspan="2">Encoder reported a battery error.</td></tr>
<tr><td>000D</td><td colspan="2">Encoder reported overspeed or decreased resolution due to overspeed.</td></tr>
<tr><td>000E</td><td colspan="2">Encoder reported a position counter error.</td></tr>
<tr><td>000F</td><td colspan="2">Encoder reported an internal error.</td></tr>
</table>

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | 0012 | Selected motor, wrong direction of speed feedback.<br>The speed feedback direction of tacho and encoders is checked against the speed feedback direction of the EMF. See 90.41 M1 feedback selection.<br>Check:<br>– The real direction of motor rotation.<br>– The settings of 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– The connection of the tacho cable. To correct, swap the two wires.<br>– The connection of the encoder cable. To correct, swap e.g. channels A and A-.<br>– The connection of armature and field cables. | |
| | 0013 | Selected motor, tacho range.<br>If Tacho range comes up for longer than 10 s, there is an overflow at the tacho input.<br>Check:<br>– That the tacho voltage at overspeed fits to the tacho input. It should not be higher than 270 V. | |
| 73A0 | Speed feedback configuration. | The speed feedback configuration via encoder interface modules has changed. See also A797.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the encoder interface module.<br>– 01: For module 1 see parameters 91.11 and 91.12.<br>– 02: For module 2 see parameters 91.13 and 91.14.<br>YY specifies the encoder.<br>– 01: Group 92 Encoder 1 configuration.<br>– 02: Group 93 Encoder 2 configuration.<br>ZZZZ indicates the problem. Actions see below. | 3 |
| | 0001 | Adapter not found in specified slot.<br>Check module location. See parameters 91.12 and 91.14. | |
| | 0002 | Detected type of interface module does not match parameter setting.<br>Check the module type parameters 91.11 and 91.13 against status parameters 91.02 and 91.03. | |
| | 0003 | Logic version too old.<br>Contact your local ABB representative. | |
| | 0004 | Firmware version too old.<br>Contact your local ABB representative. | |
| | 0006 | Encoder type incompatible with interface module type.<br>Check module type parameters 91.11 and 91.13 against encoder type parameters 92.01 and 93.01. | |
| | 0007 | Adapter not configured.<br>Check module location parameters 91.12 and 91.14. | |
| | 0008 | Speed feedback configuration has changed.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings. | |
| | 0009 | No encoders configured in the encoder module.<br>Configure the encoder in group 92 Encoder 1 configuration or 93 Encoder 2 configuration. | |
| | 000A | Non-existing emulation input.<br>Check input selection parameters 91.31 and 91.41. | |
| | 000B | Echo not supported by the selected input. E.g. resolver or absolute encoder.<br>Check: | |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The input selection parameters 91.31 and 91.41.<br>– The interface module type against the encoder type. | |
| | 000C | Emulation in continuous mode not supported.<br>Check:<br>– The input selection parameters 91.31 and 91.41.<br>– The serial link mode parameters 92.30 and 93.30. | |
| 73A1 | Load speed feedback. Programmable, see 31.38 Load feedback fault. | Selected motor, no load speed feedback is received. See also A7B1.<br>Check the AUX code (format XXYYZZZZ).<br>XX specifies the location of the speed feedback device. Either an encoder interface module or the control board.<br>– 01: Encoder interface module 1, see parameters 91.11 and 91.12.<br>– 02: Encoder interface module 2, see parameters 91.13 and 91.14.<br>– 03: Control board, see group 94 OnBoard speed feedback configuration.<br>YY specifies the speed feedback device.<br>– 01: Encoder 1, see group 92 Encoder 1 configuration.<br>– 02: Encoder 2, see group 93 Encoder 2 configuration.<br>– 03: OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– 04: Tacho, see group 94 OnBoard speed feedback configuration.<br>ZZZZ indicates the problem. Actions see below. | 3 |
| | 0004 | Speed feedback device not configured.<br>Check the settings of the speed feedback device:<br>– Encoder 1, see group 92 Encoder 1 configuration.<br>– Encoder 2, see group 93 Encoder 2 configuration.<br>– The OnBoard encoder, see group 94 OnBoard speed feedback configuration.<br>– The tacho, see group 94 OnBoard speed feedback configuration.<br>Use 91.10 Encoder parameter refresh to validate any changes in the settings for an encoder. | |
| | 0005 | Speed feedback device stopped working.<br>Check the status of the speed feedback device. | |
| | 0007 | The comparison of the measured speed feedback from pulse encoder or analog tacho to measured EMF has failed.<br>Check:<br>– The setting of 90.41 M1 feedback selection, 31.14 Fault stop mode fault level 3, 31.35 Motor feedback fault, 31.36 Speed feedback monitor level and 31.37 EMF feedback monitor level.<br>– At the encoder: The encoder itself, alignment, cabling, coupling, power supply (feedback might be too low), mechanical disturbances, jumper J4 on the SDCS-CON-H01.<br>– At the tacho: The tacho itself, tacho polarity and voltage, alignment, cabling, coupling, mechanical disturbances.<br>– EMF: The armature cable connection form the drive to the motor and the polarity. | |
| 73B0 | Emergency ramp stop | Emergency stop did not finish within the expected time.<br>Check:<br>– The settings of 31.31 Emergency ramp supervision and 31.32 Emergency ramp supervision delay. | 3 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of parameters 23.11 … 23.19 for Off3 stop mode 1 (21.03 Emergency stop mode = Ramp stop).<br>– The setting of 23.23 Emergency stop time for Off3 stop mode 2 (21.03 Emergency stop mode = Emergency ramp stop).<br>– The current and torque limits in group 30 Control limits. | |
| 73B1 | Normal ramp stop | Normal (non-emergency) ramp stop did not finish within the expected time.<br>Check:<br>– The settings of 31.33 Ramp stop supervision and 31.34 Ramp stop supervision delay.<br>– The settings of parameters 23.11 … 23.19. | 3 |
| 7510 | FBA A communication. Programmable, see 50.02 FBA A comm loss func. | Fieldbus adapter A (FBA A): Cyclical communication between PLC and fieldbus adapter module A or between drive and fieldbus adapter module A is lost. See also A7C1.<br>7510 FBA A communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7C1 FBA A communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus communication. See user documentation of the fieldbus interface.<br>– The settings of groups 50 Fieldbus adapter (FBA), 51 FBA A settings, 52 FBA A data in and 53 FBA A data out.<br>– The cable connections.<br>– The fieldbus termination.<br>– The fieldbus adapter.<br>– That the master is able to communicate. | 5 |
| 7520 | FBA B communication. Programmable, see 50.32 FBA B comm loss func. | Fieldbus adapter B (FBA B): Cyclical communication between PLC and fieldbus adapter module B or between drive and fieldbus adapter module B is lost. See also A7C2.<br>7520 FBA B communication is only activated after the first data set from the overriding control is received by the drive. Before the first data set is received, only A7C2 FBA B communication is active. The reason is to suppress unnecessary faults (the startup of the overriding control is usually slower than the one of the drive).<br>Check:<br>– The status of the fieldbus communication. See user documentation of the fieldbus interface.<br>– The settings of group 50 Fieldbus adapter (FBA), 54 FBA B settings, 55 FBA B data in and 56 FBA B data out.<br>– The cable connections.<br>– The fieldbus termination.<br>– The fieldbus adapter.<br>– That the master is able to communicate. | 5 |
| 7581 | DDCS controller communication. Programmable, see 60.59 DDCS controller comm loss function. | Cyclical communication between DDCS controller and drive is lost or there is no communication at all. The drive is waiting for the very first dataset. See also A7CA.<br>Check:<br>– The status/settings of the DDCS controller. See user documentation of the DDCS controller.<br>– The adapters between DDCS controller and drive.<br>– The setting of 20.01 Command location. | 5 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of group 60 DDCS communication, 61 D2D and DDCS transmit data and 62 D2D and DDCS receive data.<br>– The fiber optic cable connections. | |
| 7582 | Master-follower communication.<br>Programmable, see 60.09 M/F comm loss function. | Cyclical communication between master and a follower (DDCS/D2D) is lost or there is no communication at all. The drive is waiting for the very first dataset. See also A7CB.<br>Check:<br>– The AUX code. It indicates which node address on the master-follower link is affected. See 60.02 M/F node address in each drive.<br>– The setting of 20.01 Command location.<br>– The settings of group 60 DDCS communication.<br>– The cable connections. | 5 |
| 8001 | ULC underload.<br>Programmable, see 37.04 ULC underload actions. | Selected signal has fallen below the user underload curve. See group 37 User load curve. See also A8BF.<br>Check for any operating conditions decreasing the monitored signal. E.g., the loss of load if the torque or current is being monitored.<br>Check the definition of the load curve. | 1 (default)<br>1 … 6 user selectable |
| 8002 | ULC overload.<br>Programmable, see 37.03 ULC overload actions. | Selected signal has exceeded the user overload curve. See group 37 User load curve. See also A8BE.<br>Check:<br>– For any operating conditions increasing the monitored signal. E.g., the load of the motor if the torque or current is being monitored.<br>– The definition of the load curve. | 1 (default)<br>1 … 6 user selectable |
| 80A0 | AI supervision.<br>Programmable, see 12.03 AI supervision function. | An analog signal is outside the limits specified for the analog input. See also A8A0.<br>Check:<br>– The AUX code (format XYY).<br>X specifies the location of the input.<br>– 0: Control board.<br>– 1: I/O extension module 1.<br>– 2: I/O extension module 2<br>– 3: I/O extension module 3.<br>– 4: ….<br>YY specifies the input and limit.<br>– 01: AI1 under minimum.<br>– 02: AI1 over maximum.<br>– 03: AI2 under minimum.<br>– 04: AI2 over maximum.<br>– 05: AI3 under minimum.<br>– 06: AI3 over maximum.<br>– The signal level at the analog input.<br>– The wiring connected to the input.<br>– Polarity of the connection.<br>– The minimum and maximum limits of the input in groups 12 Standard AI, 14 I/O extension module 1, 15 I/O extension module 2 and 16 I/O extension module 3. | 4 |
| 80B0 | Signal supervision 1.<br>(Editable message text)<br>Programmable, see 32.06 Supervision 1 action. | Fault generated by signal supervision 1. See group 32 Supervision. See also A8B0.<br>Check the source of the warning. See 32.07 Supervision 1 signal. | 1 (default)<br>1 … 6 user selectable |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| 80B1 | Signal supervision 2.<br>(Editable message text)<br>Programmable, see 32.16 Supervision 2 action. | Fault generated by signal supervision 2. See group 32 Supervision. See also A8B1.<br>Check the source of the warning. See 32.17 Supervision 2 signal. | 1 (default)<br>1 … 6 user selectable |
| 80B2 | Signal supervision 3.<br>(Editable message text)<br>Programmable, see 32.26 Supervision 3 action. | Fault generated by signal supervision 3. See group 32 Supervision. See also A8B2.<br>Check the source of the warning. See 32.27 Supervision 3 signal. | 1 (default)<br>1 … 6 user selectable |
| 9081 | External fault 1.<br>(Editable message text)<br>Programmable, see 31.01 External event 1 source and 31.02 External event 1 type. | There is no problem with the drive itself!<br>Fault generated by external device 1. See group 31 Fault functions and fault levels. See also A981.<br>Check:<br>– External device 1.<br>– 31.01 External event 1 source. | 1 (default)<br>1 … 6 user selectable |
| 9082 | External fault 2.<br>(Editable message text)<br>Programmable, see 31.03 External event 2 source and 31.04 External event 2 type. | There is no problem with the drive itself!<br>Fault generated by external device 2. See group 31 Fault functions and fault levels. See also A982.<br>Check:<br>– External device 2.<br>– 31.03 External event 2 source. | 1 (default)<br>1 … 6 user selectable |
| 9083 | External fault 3.<br>(Editable message text)<br>Programmable, see 31.05 External event 3 source and 31.06 External event 3 type. | There is no problem with the drive itself!<br>Fault generated by external device 3. See group 31 Fault functions and fault levels. See also A983.<br>Check:<br>– External device 3.<br>– 31.05 External event 3 source. | 1 (default)<br>1 … 6 user selectable |
| 9084 | External fault 4.<br>(Editable message text)<br>Programmable, see 31.07 External event 4 source and 31.08 External event 4 type. | There is no problem with the drive itself!<br>Fault generated by external device 4. See group 31 Fault functions and fault levels. See also A984.<br>Check:<br>– External device 4.<br>– 31.07 External event 4 source. | 1 (default)<br>1 … 6 user selectable |
| 9085 | External fault 5.<br>(Editable message text)<br>Programmable, see 31.09 External event 5 source and 31.10 External event 5 type. | There is no problem with the drive itself!<br>Fault generated by external device 5. See group 31 Fault functions and fault levels. See also A985.<br>Check:<br>– External device 5.<br>– 31.09 External event 5 source. | 1 (default)<br>1 … 6 user selectable |
| F501 | Auxiliary undervoltage. | The auxiliary voltage is too low, e.g. short dip, while the drive is in operation.<br>To reset, cycle the auxiliary power of the drive.<br>Check:<br>– The auxiliary voltage itself.<br>– The internal auxiliary voltages on the SDCS-CON-H01.<br>– If the problem persist, change SDCS-CON-H01 and/or SDCS-PIN-H01 or SDCS-POW-H01 respectively.<br>Auxiliary supply voltage \| Trip level | 1 |

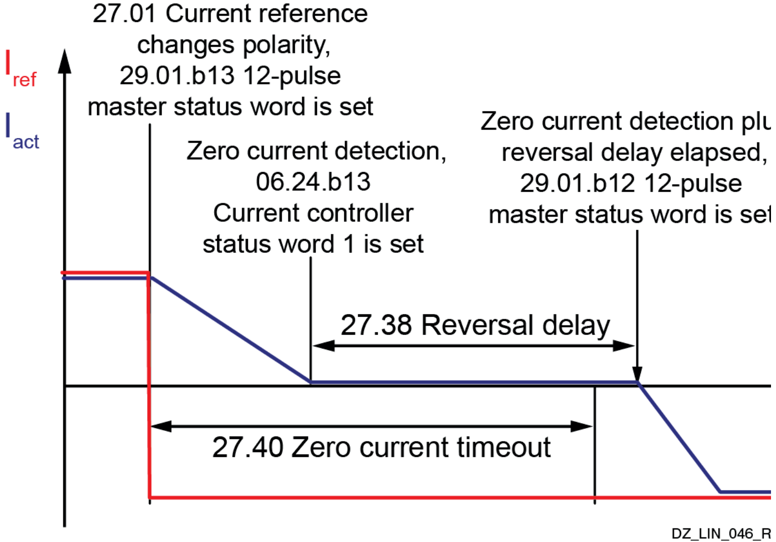
| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | 230 VAC &#124; < 185 VAC<br>115 VAC &#124; < 96 VAC | |
| F503 | Armature overvoltage. | Too high voltage on the armature/DC side.<br>Check:<br>– If the setting of 31.50 Overvoltage level is suitable for the system.<br>– The settings of the field current controller, EMF controller, flux linearization in group 28 EMF and field current control. E.g. field weakening is not activated.<br>– For too high field current (e.g. problems with field weakening).<br>– If the motor was accelerated by the load.<br>– For overspeed.<br>– For proper speed scaling. See 46.02 M1 speed scaling actual.<br>– For proper armature voltage feedback.<br>– The cutting of the voltage coding resistors on the SDCS-PIN-H51. | 1 |
| F513 | Mains overvoltage. | Too high voltage on the mains/AC side. The actual mains voltage is > 1.3 * 99.10 Nominal mains voltage for longer than 10 s while Ready run = 1.<br>Check:<br>– If the mains voltage is within the set tolerance.<br>– If the mains voltage scaling is correct. See 99.10 Nominal mains voltage.<br>– The cutting of the voltage coding resistors on the SDCS-PIN-H51. | 1 |
| F514 | Mains synchronization lost. | The synchronization with the mains has been lost.<br>Check:<br>– The condition of the mains (voltage, cabling, fuses, switchgear).<br>– The mains frequency (50 Hz ±5 Hz; 60 Hz ±5 Hz) and stability (df/dt = 17 %/s) see 95.39 PLL input deviation and 95.40 PLL output, internal mains frequency. | 3 |
| F515 | M1 field exciter overcurrent. | Motor 1 field exciter overcurrent.<br>Check:<br>– In case this fault happens during field exciter autotuning, deactivate the supervision by setting 31.59 M1 field overcurrent level = 325 %.<br>– The setting of 31.59 M1 field overcurrent level.<br>– The settings of the field current controller in group 28 EMF and field current control.<br>– The connections of the field exciter.<br>– The insulation of cables and field winding.<br>– The resistance of the field winding.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. | 1 |
| F516 | M1 field exciter communication. | Motor 1 field exciter loss of communication.<br>Check:<br>– The settings of 99.07 M1 used field exciter type and 70.12 Field exciter timeout.<br>– The auxiliary voltage for integrated and external field exciter.<br>– The DCSLink cable connections. | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The DCSLink termination set dipswitch S1100:1 = ON (DCF803-0016, DCF803-0035 and FEX-425-Int).<br>– The DCSLink node ID settings. See 70.05 DCSLink node ID and 70.13 M1 field exciter node ID or switches S800 and S801 on DCF803-0016, DCF803-0035 and FEX-425-Int respectively.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. | |
| F517 | Armature current ripple. | One or several thyristors may carry no current. See also A117.<br>Check:<br>– The values of 01.50 Current ripple and 01.51 Current ripple filtered1.<br>– The setting of 31.46 Current ripple function and 31.47 Current ripple level.<br>– For too high gain of current controller. See 27.29 M1 current proportional gain.<br>– The positive/negative current feedback with an oscilloscope (6 pulses within one cycle visible?).<br>– The thyristor gate-cathode resistance.<br>– The thyristor gate connection.<br>– The current transformers (T51, T52).<br>– The condition of the mains (voltage, cabling, fuses, switchgear). | 3 |
| F518 | M2 field exciter overcurrent. | Motor 2 field exciter overcurrent.<br>Check:<br>– In case this fault happens during field exciter autotuning, deactivate the supervision by setting 42.63 M2 field overcurrent level = 325 %.<br>– The setting of 42.63 M2 field overcurrent level.<br>– The settings of the field current controller in group 42 Shared motion (2nd motor).<br>– The connections of the field exciter.<br>– The insulation of cables and field winding.<br>– The resistance of the field winding.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. | 1 |
| F519 | M2 field exciter communication. | Motor 2 field exciter loss of communication.<br>Check:<br>– The settings of 42.49 M2 used field exciter type and 70.12 Field exciter timeout.<br>– The auxiliary voltage for integrated and external field exciter.<br>– The DCSLink cable connections.<br>– The DCSLink termination set dipswitch S1100:1 = ON (DCF803-0016, DCF803-0035 and FEX-425-Int).<br>– The DCSLink node ID settings. See 70.05 DCSLink node ID and 70.14 M2 field exciter node ID or switches S800 and S801 on DCF803-0016, DCF803-0035 and FEX-425-Int respectively.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. | 1 |
| F521 | Field acknowledge missing. | Selected motor, field acknowledge at the DI is missing.<br>Check: | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The setting of 99.07 M1 used field exciter type. The selection must match the connected field exciter type.<br>– The settings of 06.26 M1 field exciter status word.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word.<br>F521 Field acknowledge missing is the sum fault for all field related faults like:<br>– F515 M1 field exciter overcurrent.<br>– F516 M1 field exciter communication.<br>– F529 M1 field exciter not OK.<br>– F537 M1 field exciter ready lost.<br>– F541 M1 field exciter low current. | |
| F524 | Main contactor acknowledge. | Main contactor acknowledge at the DI is missing.<br>Check:<br>– The settings of 20.33 Main contactor control mode and 20.34 Main contactor acknowledge source.<br>– The switch on/off sequence.<br>– The auxiliary contactor/relay switching the main contactor after an On/Off command.<br>– The safety relays if existing.<br>– The used digital inputs and outputs (groups 10 and 11). | 4 |
| F529 | M1 field exciter not OK. | Motor 1 field exciter is not okay. A fault was found during self-diagnosis of the field exciter or a power failure happened in the field exciter.<br>Check:<br>– The field exciter operation. E.g. the field contactor or mains contactor (in case of an OnBoard field exciter) is not closed or closing too late.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. | 1 |
| F530 | M2 field exciter not OK. | Motor 2 field exciter is not okay. A fault was found during self-diagnosis of the field exciter or a power failure happened in the field exciter.<br>Check:<br>– The field exciter operation. E.g. the field contactor or mains contactor (in case of an OnBoard field exciter) is not closed or closing too late.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. | 1 |
| F533 | 12-pulse reversal timeout. | The current direction is not changed before 29.14 12-pulse reversal timeout is elapsed.<br>Check:<br>– For high inductive motor and increase the timeout.<br>– Too high motor voltage compared to mains voltage. | 3 |
| F534 | 12-pulse current difference. | The current of difference of a 12-pulse parallel configuration exceeded the current difference level.<br>Check:<br>– The settings of 29.17 12-pulse parallel current difference level and 29.18 12-pulse parallel current difference delay.<br>– The settings of the current controller in group 27 Armature current control. | 3 |
| F535 | 12-pulse communication. | 12-pulse communication is disturbed:<br>Check: | 3 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The settings of 70.05 DCSLink node ID, 70.07 DCSLink comm loss function, 70.08 12-pulse timeout and 70.09 12-pulse slave node ID.<br>– DCSLink cable connections.<br>– DCSLink termination. | |
| F536 | 12-pulse slave. | The 12-pulse slave has tripped. 12-pulse master is tripped by a fault of the 12-pulse slave.<br>Correct the fault in the 12-pulse slave. | 4 |
| F537 | M1 field exciter ready lost. | Motor 1 field exciter lost the ready-for-operation message while working. The mains voltage of the field exciter is missing or not in synchronism.<br>Check:<br>– If all mains phases are present.<br>– If the mains voltage is within the set tolerance.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. | 1 |
| F538 | M2 field exciter ready lost. | Motor 2 field exciter lost the ready-for-operation message while working. The mains voltage of the field exciter is missing or not in synchronism.<br>Check:<br>– If all mains phases are present.<br>– If the mains voltage is within the set tolerance.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. | 1 |
| F539 | Fast current rise. | The rise of the current (di/dt) is too fast. This indicates a short circuit.<br>Check:<br>– The setting of 31.45 Maximum current rise level. | 1 |
| F541 | M1 field exciter low current. | Motor 1 field exciter low (under-) current.<br>Check:<br>– The settings of 31.57 Minimum field current trip delay and 31.58 M1 field current low level.<br>– The settings of the EMF controller, flux linearization and field current controller in group 28 EMF and field current control.<br>– The motor nameplate for minimum current at maximum field weakening ≡ maximum speed.<br>– The field circuit fuses.<br>– The field auxiliary supply voltage.<br>– The field contactor is not closed.<br>– If the field current oscillates.<br>– If the motor is not compensated and has a high armature reaction.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.26 M1 field exciter fault word and 04.36 M1 field exciter warning word. | 1 |
| F542 | M2 field exciter low current. | Motor 2 field exciter low (under-) current.<br>Check:<br>– The settings of 31.57 Minimum field current trip delay and 42.62 M2 field current low level.<br>– The settings of the EMF controller, flux linearization and field current controller in group 42 Shared motion (2nd motor). | 1 |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The motor nameplate for minimum current at maximum field weakening ≡ maximum speed.<br>– The field circuit fuses.<br>– The field auxiliary supply voltage.<br>– The field contactor is not closed.<br>– If the field current oscillates.<br>– If the motor is not compensated and has a high armature reaction.<br>– For fault messages at the field exciter itself (flashing LEDs), 04.27 M2 field exciter fault word and 04.37 M2 field exciter warning word. | |
| F544 | P2P and M/F communication. Programmable, see 70.07 DCSLink comm loss function. | Peer to peer and master-follower communication loss. See also A112.<br>Check:<br>– DCSLink node ID settings. See 70.05 DCSLink node ID.<br>– The setting of 31.13 Fault stop mode communication and 70.07 DCSLink comm loss function.<br>– The setting of 70.17 Mailbox 1 node ID, 70.23 Mailbox 2 node ID, 70.29 Mailbox 3 node ID and 70.35 Mailbox 4 node ID.<br>– The setting of 70.18 Mailbox 1 cycle time/timeout, 70.24 Mailbox 2 cycle time/timeout, 70.30 Mailbox 3 cycle time/timeout and 70.36 Mailbox 4 cycle time/timeout.<br>– The DCSLink cable connections.<br>– The DCSLink terminations. | 5 |
| F547 | Drive hardware. | Drive hardware failure.<br>To reset, cycle the auxiliary power of the drive. If the problem persists, check the AUX code (format YYYY).<br>YYYY indicates the problem. Actions see below. | 1 |
| | 0050 | Parameter flash faulty (erase). | |
| | 0051 | Parameter flash faulty (program). | |
| | 0052 | Check connector XC12 on SDCS-CON-H01 and connector XC12 on SDCS-PIN-H01/H51. | |
| F556 | Torque proving. | Selected motor, torque proving. The acknowledge signal for torque proving is missing.<br>Check:<br>– The setting of 44.19 M1 brake torque proving time.<br>– The Adaptive Program, application program or overriding control providing the torque proving OK signal. See 06.11.b04 Auxiliary control word 2. | 3 |
| F557 | Reversal time. | The current direction not changed before 27.40 Zero current timeout is elapsed. | 3 |

<table>
<tr><th>Code</th><th>Fault</th><th>Cause and what to do</th><th>Fault level</th></tr>
<tr><td rowspan="2"></td><td></td><td>

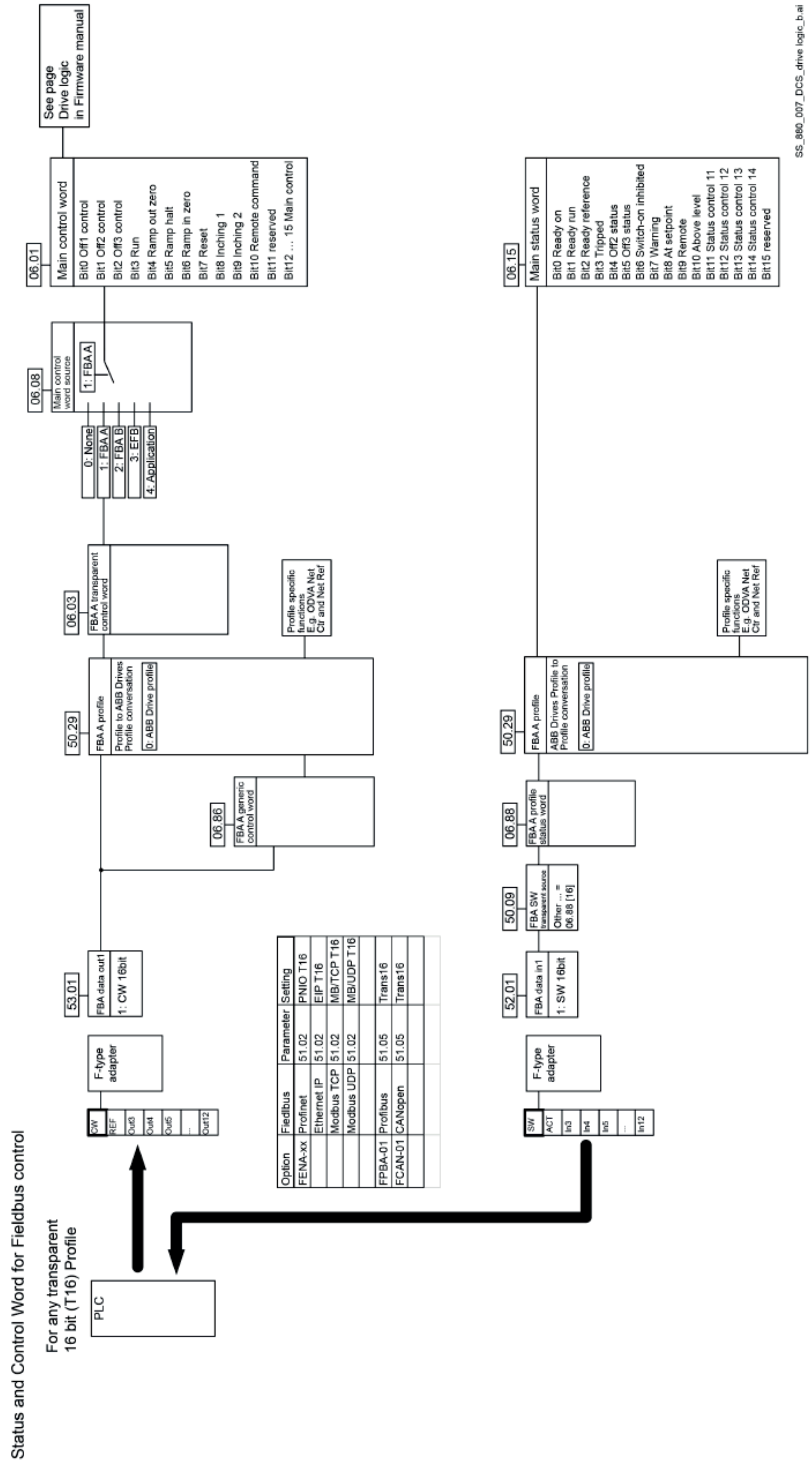
<br>Check:<br>– For high inductive motor and increase the timeout.<br>– Too high motor voltage compared to mains voltage.<br>– If possible lower 27.38 Reversal delay and increase 27.40 Zero current timeout.<br>– The AUX code (format XX).<br>  – 12: Changing current direction from bridge 1 to bridge 2 did not take place.<br>  – 10: Extinguishing bride 1 current after switching off the drive did not take place.<br>  – 20: Extinguishing bride 2 current after switching off the drive did not take place.<br>  – 21: Changing current direction from bridge 2 to bridge 1 did not take place.<br>– The following table:</td><td></td></tr>
<tr><td colspan="3">
<table>
<tr><th></th><th>27.31 M1 discontinuous current limit</th><th>27.38 Reversal delay</th><th>Delta</th><th>27.40 Zero current timeout</th></tr>
<tr><td>Default</td><td>50 %</td><td>5 ms</td><td>15</td><td>20 ms</td></tr>
<tr><td></td><td>≤ 35 %</td><td>10 ms</td><td>25</td><td>35 ms</td></tr>
<tr><td></td><td>≤ 20 %</td><td>15 ms</td><td>35</td><td>50 ms</td></tr>
<tr><td></td><td>≤ 10 %</td><td>20 ms</td><td>50</td><td>70 ms</td></tr>
</table>
</td></tr>
<tr><td>F560</td><td>Power unit, unbalanced current. Programmable, see 29.63 Power unit unbalanced current function.</td><td>The unbalanced current between hardparallel connected power units is excessive. See also A560.<br>Check:<br>– That the mains and motor cable routing is according to the specification for hardparallel configurations.<br>– The branch fuses.<br>– The thyristors.<br>– The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel.<br>ZZ identifies the affected thyristor.<br><b>Example:</b> 00000314 means thyristor14 in the power unit connected to channel 3.</td><td>3</td></tr>
<tr><td>F561</td><td>Power unit, thyristor loss function. Programmable, see 29.68 Power unit thyristor loss function.</td><td>Displays the thyristors/branch fuses of a power unit which are lost, in other words not conducting any current. See also A561.<br>Check:<br>– The branch fuses.<br>– The thyristors.</td><td>3</td></tr>
</table>

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| | | – The AUX code (format XXXYYYZZ).<br>YYY identifies the power unit channel.<br>ZZ identifies the affected thyristor.<br>**Example:** 00000314 means thyristor14 in the power unit connected to channel 3. | |
| FA81 | Safe torque off 1 loss fault. | XSTO:IN1 is not equal to XSTO:IN2 or the time delay between the two signals is greater than 20 ms. See safety supplement for functional safety converter DCS880 (3ADW000452). | 6 |
| FA82 | Safe torque off 2 loss fault. | | 6 |
| FB11 | Memory unit missing. | No memory unit is attached to the drive control unit.<br>Power down the drive control unit. Check that the memory unit is properly inserted into the drive control unit. | 1 |
| | | The memory unit attached to the drive control unit is empty.<br>Power down the drive control unit. Attach a memory unit with the appropriate firmware to the drive control unit. | |
| FB12 | Memory unit incompatible. | The memory unit attached to the drive control unit is incompatible.<br>Try to download a compatible firmware.<br>If the problem persist, power down the drive control unit. Attach a compatible memory unit. | 1 |
| - | Panel and Drive not Compatible.<br><br>Panel and Drive not Compatible | The memory unit attached to the drive control unit is incompatible or broken.<br>Try to download a compatible firmware.<br>If the problem persist, power down the drive control unit. Attach a working and compatible memory unit. | 1 |
| FB13 | Memory unit, firmware incompatible. | The firmware on the attached memory unit is incompatible with the drive control unit.<br>Try to download a compatible firmware.<br>If the problem persist, power down the drive control unit. Attach a memory unit with a compatible firmware. | 1 |
| FB14 | Memory unit, firmware load failed. | The firmware on the attached memory unit could not be loaded to the drive control unit.<br>Try to download a compatible firmware.<br>If the problem persist, power down the drive control unit. Check that the memory unit is properly inserted into the drive control unit. If the problem persists, replace the memory unit. | 1 |
| FF7E | Follower | A follower has tripped. Check the AUX code and add 2 for its node address. See 60.02 M/F node address.<br>Correct the fault in the follower. | 4 |
| FF81 | FBA A force fault. | A fault has been forced through fieldbus adapter A.<br>Check the fault information provided by the PLC. | 1 (default)<br>1 … 6 user selectable |
| FF82 | FBA B force fault. | A fault has been forced through fieldbus adapter B.<br>Check the fault information provided by the PLC. | 1 (default)<br>1 … 6 user selectable |

| Code | Fault | Cause and what to do | Fault level |
|---|---|---|---|
| FF8E | EFB force fault. | A fault has been forced through the embedded fieldbus (EFB) interface.<br>Check the fault information provided by the Modbus controller. | 1 (default)<br>1 … 6 user selectable |

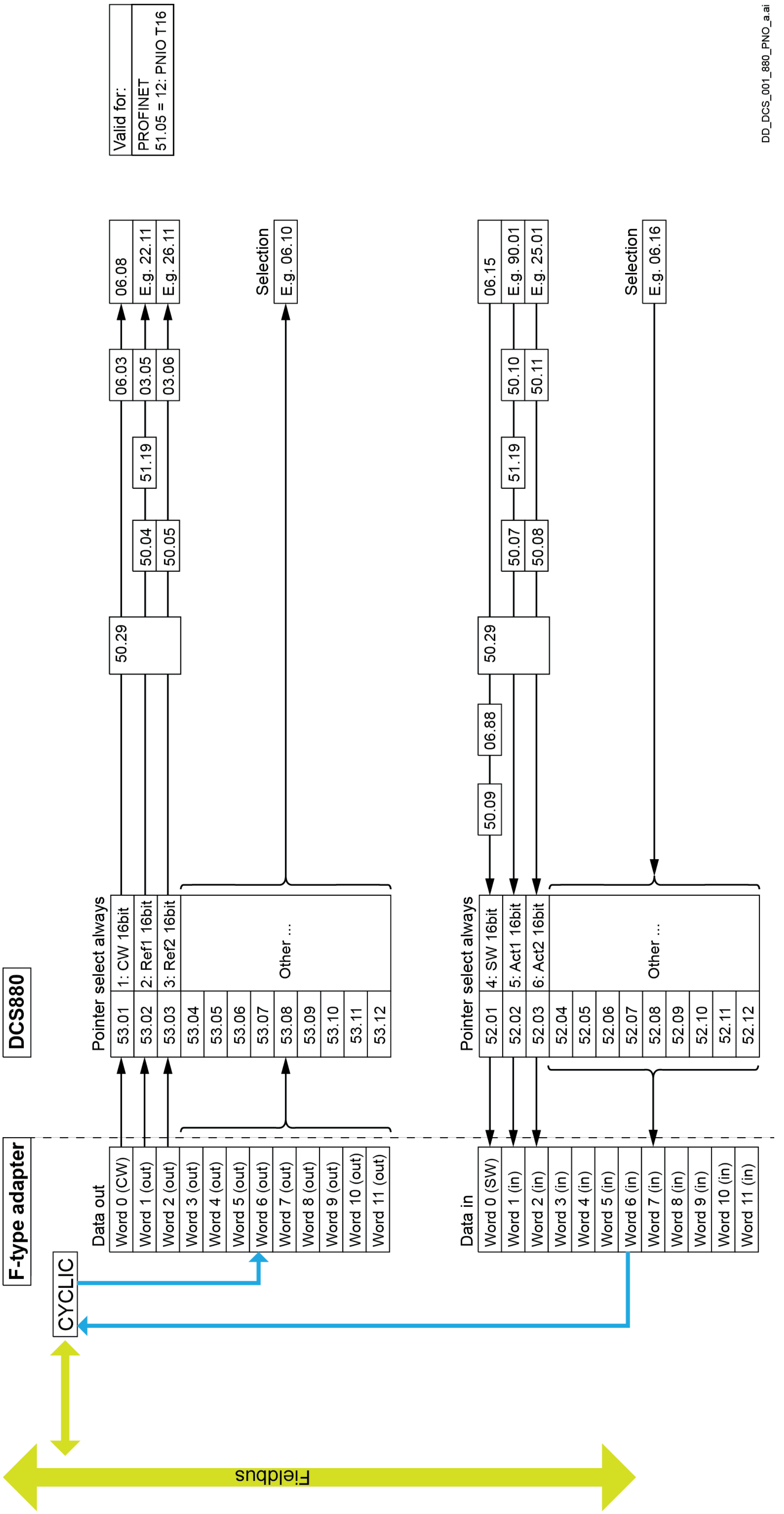
# Fieldbus control via embedded fieldbus (EFB)

# Fieldbus control via fieldbus adapter



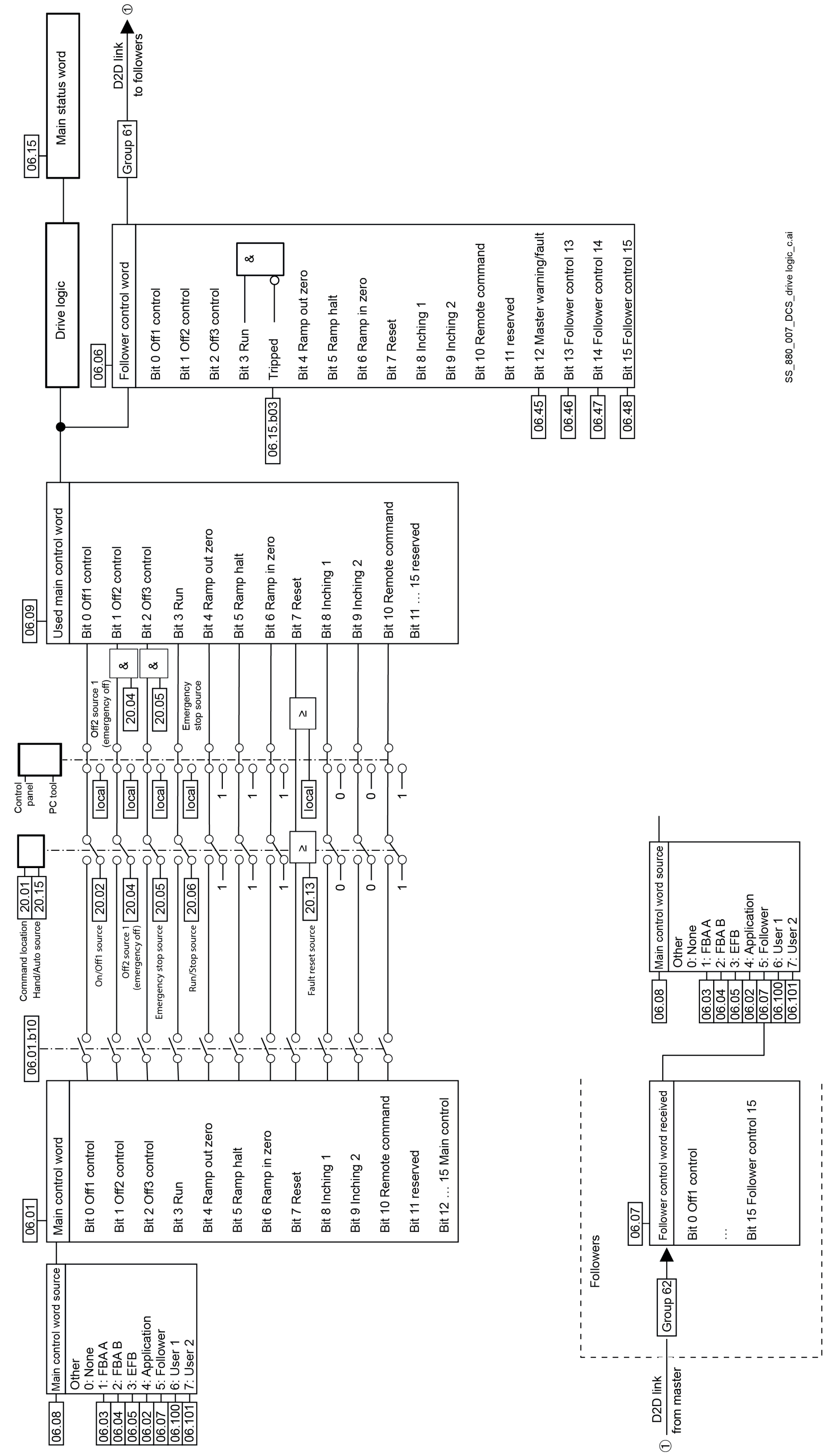
| Option | Fiedlbus | Parameter | Setting |
|---|---|---|---|
| FENA-xx | Profinet | 51.02 | PNIO T16 |
| | Ethernet IP | 51.02 | EIP T16 |
| | Modbus TCP | 51.02 | MB/TCP T16 |
| | Modbus UDP | 51.02 | MB/UDP T16 |
| | | | |
| FPBA-01 | Profibus | 51.05 | Trans16 |
| FCAN-01 | CANopen | 51.05 | Trans16 |
| | | | |

Configuration using CW 16bit, Ref1 16bit, Ref2 16bit and Other...

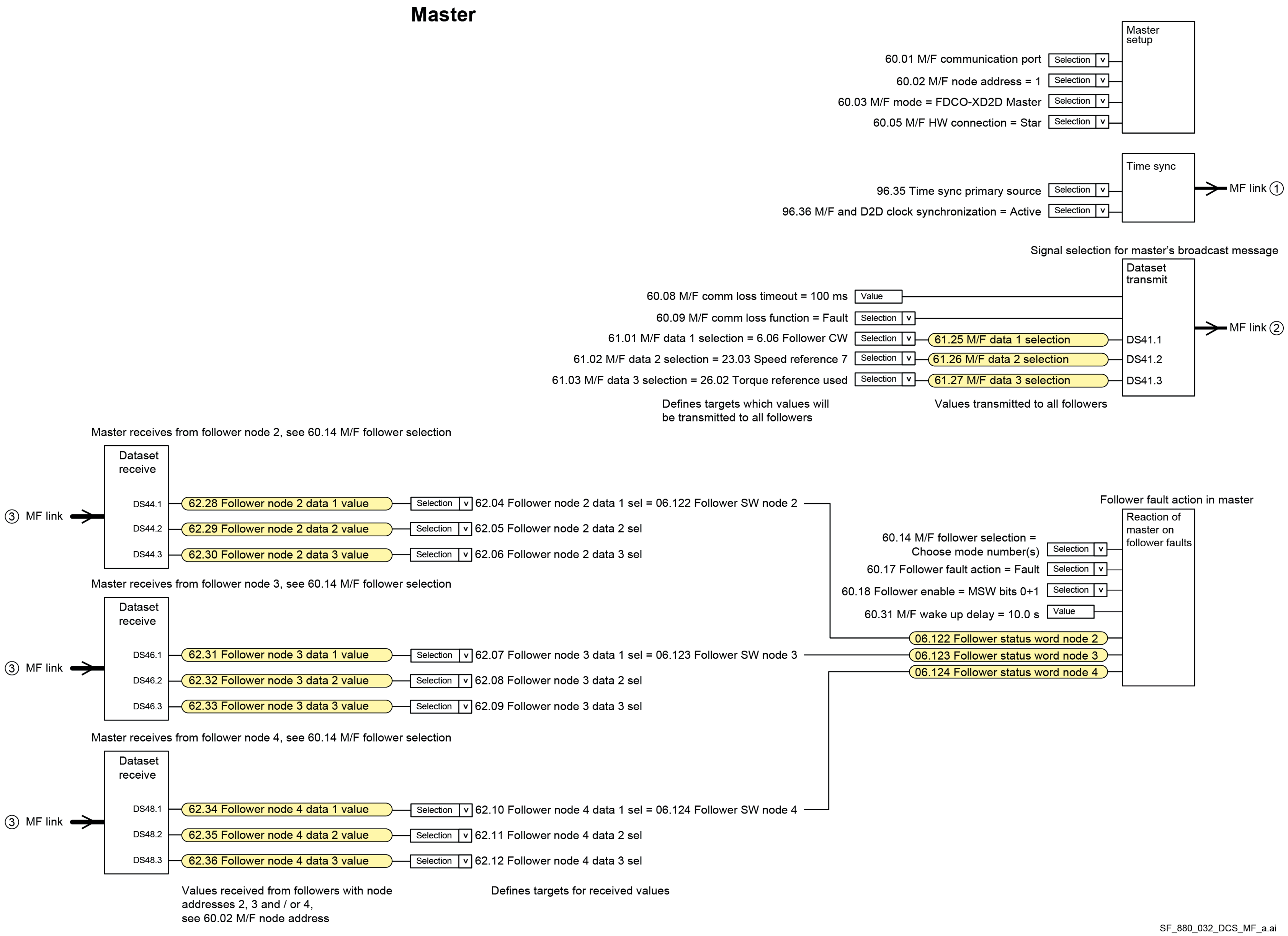


# Firmware structure diagrams

## Drive logic

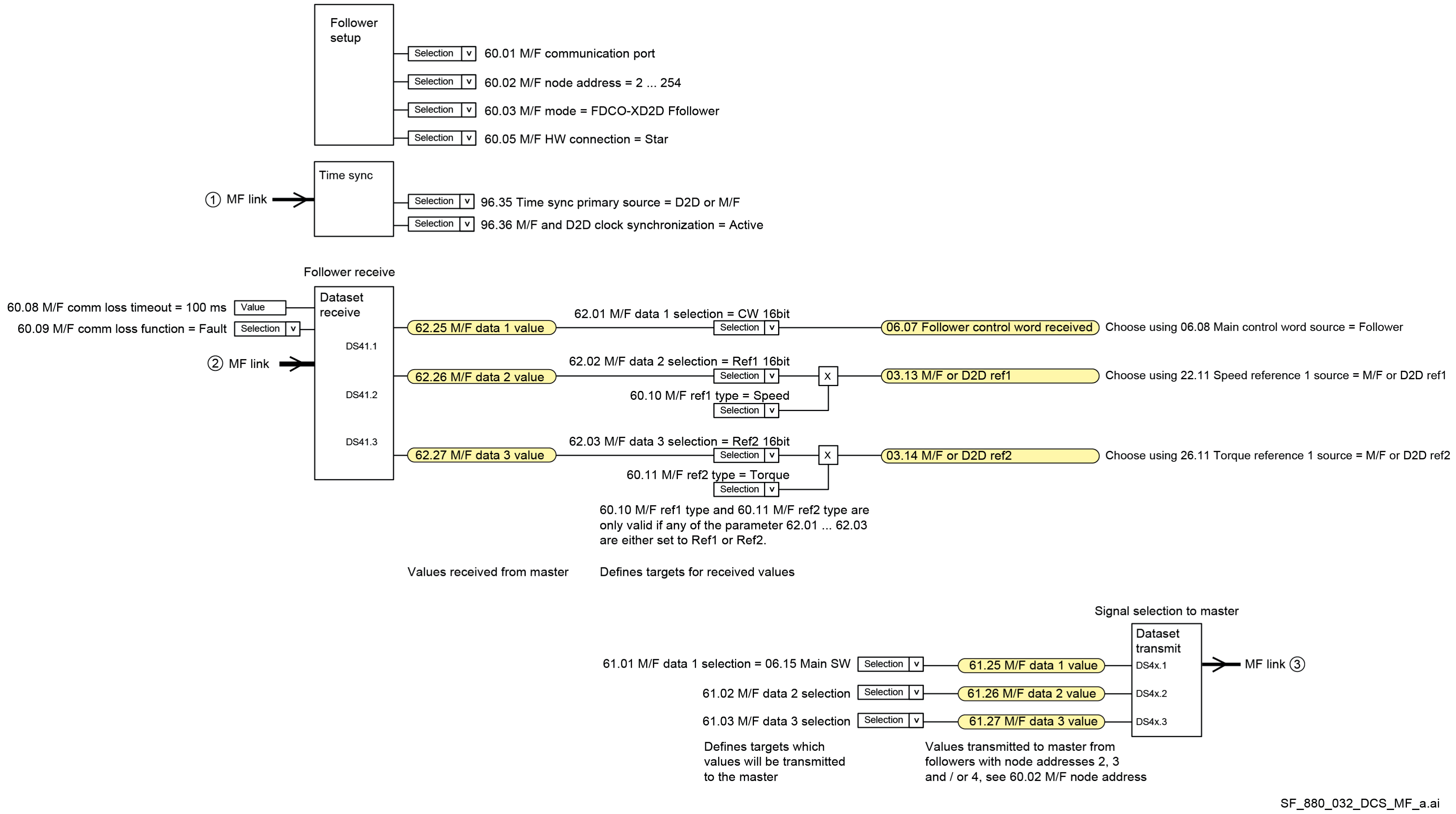


## Master-follower link

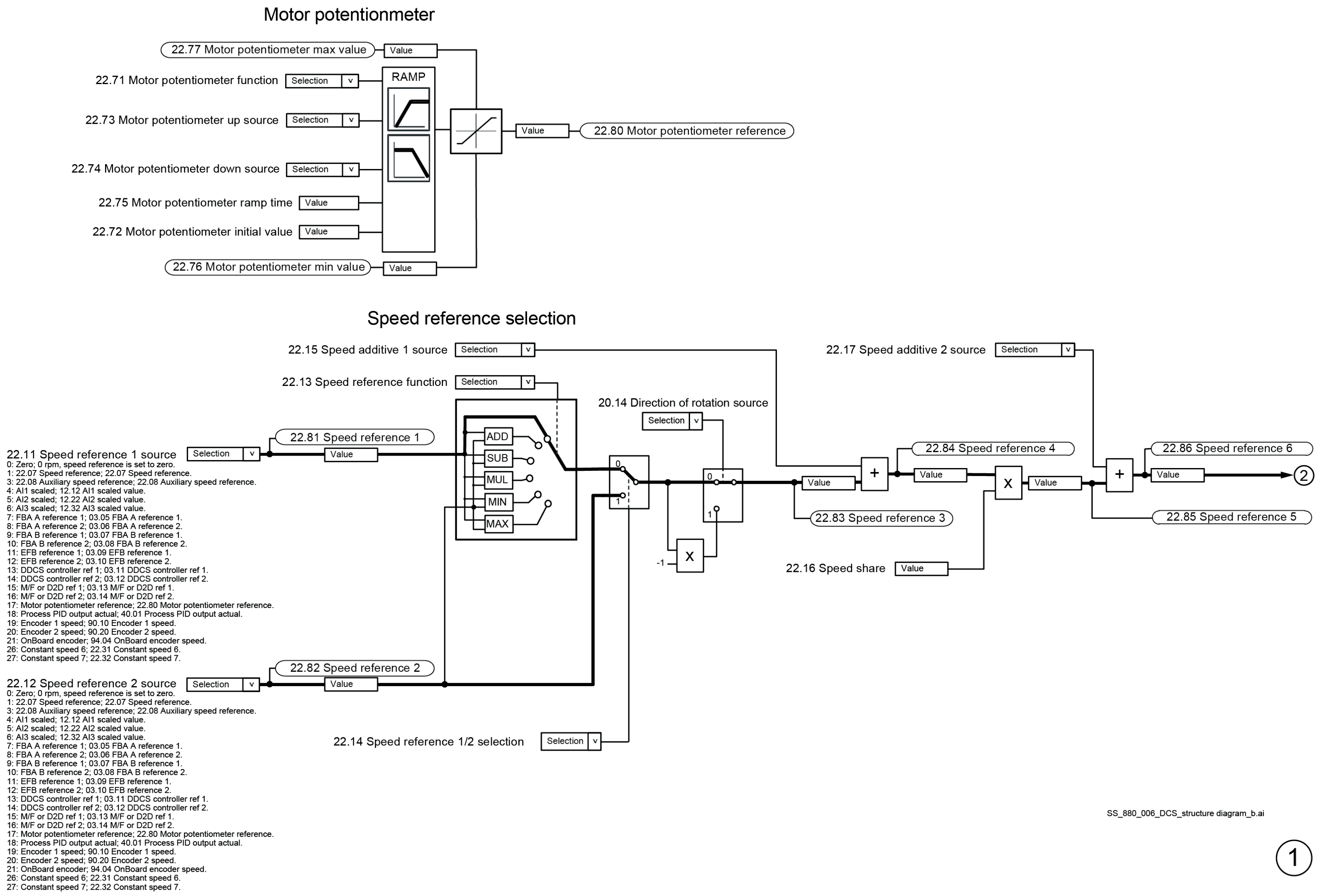


## Master-follower link

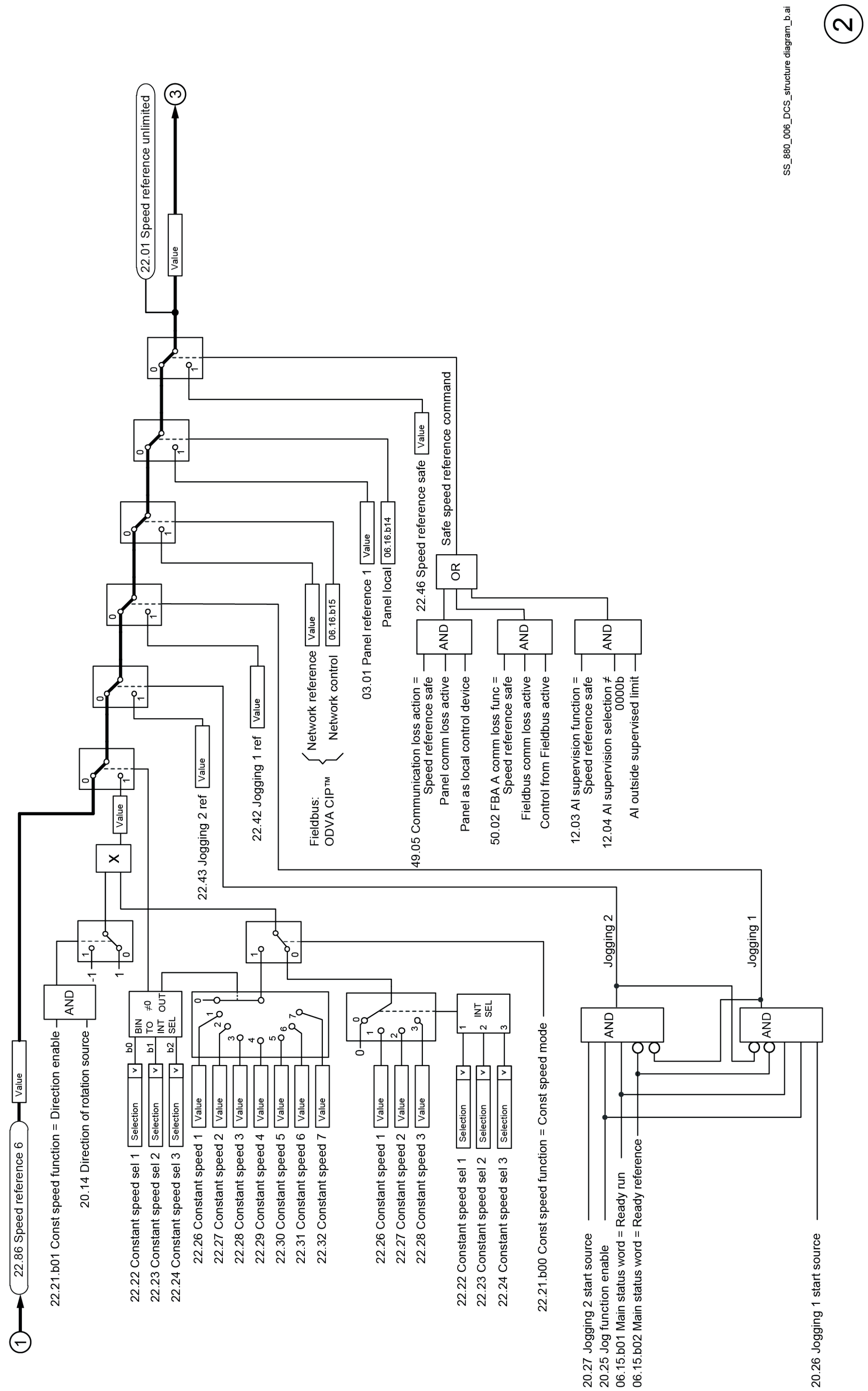
### Follower



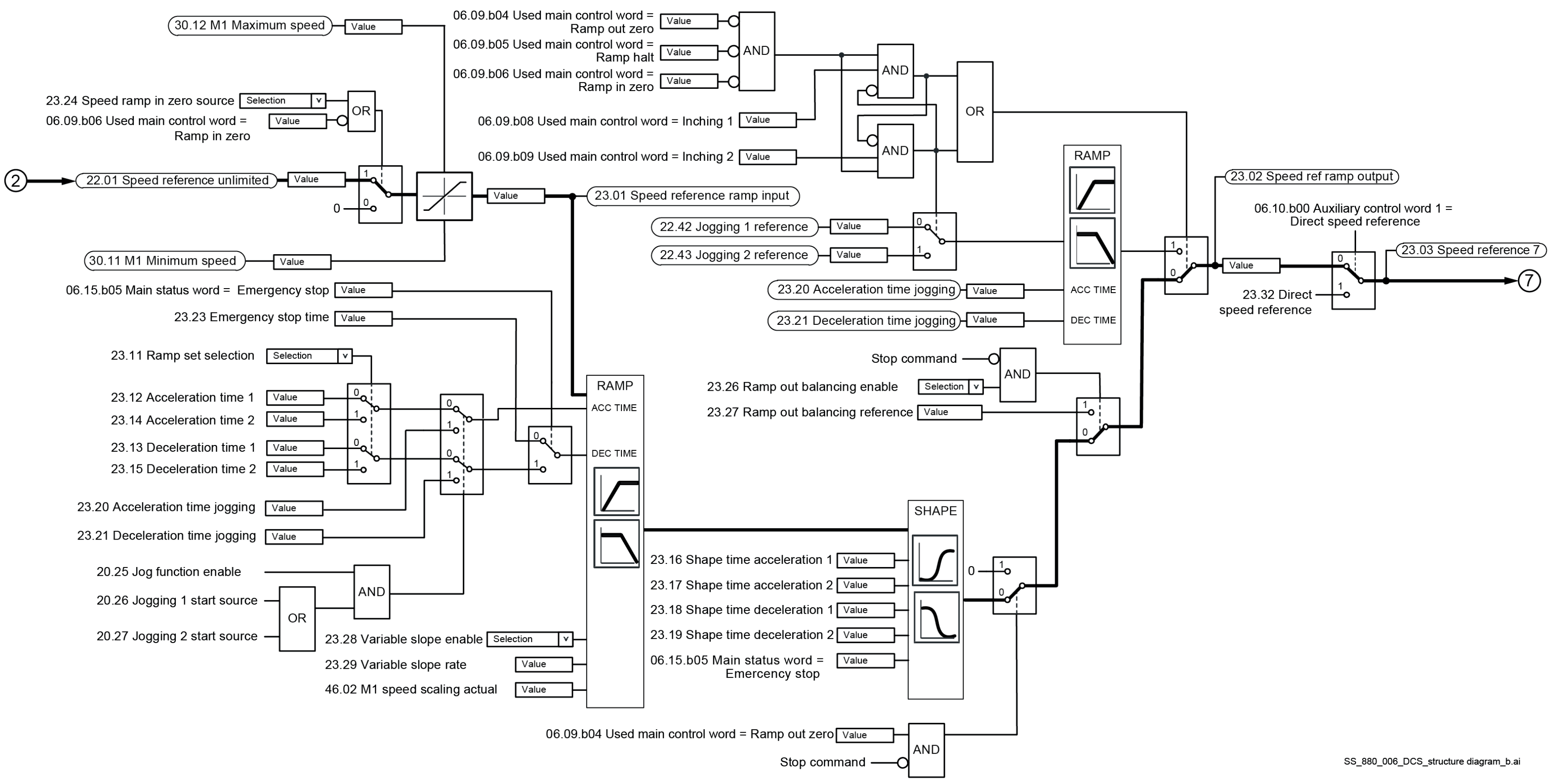
# Diagrams


Motor potentionmeter
22.77 Motor potentiometer max value
Value
22.71 Motor potentiometer function
Selection
v
RAMP
22.73 Motor potentiometer up source
Selection
v
22.74 Motor potentiometer down source
Selection
v
22.75 Motor potentiometer ramp time
Value
22.72 Motor potentiometer initial value
Value
22.76 Motor potentiometer min value
Value
Value
22.80 Motor potentiometer reference
Speed reference selection
22.15 Speed additive 1 source
Selection
v
22.13 Speed reference function
Selection
v
22.17 Speed additive 2 source
Selection
v
20.14 Direction of rotation source
Selection
v
22.81 Speed reference 1
22.11 Speed reference 1 source
Selection
v
0: Zero; 0 rpm, speed reference is set to zero.
1: 22.07 Speed reference; 22.07 Speed reference.
3: 22.08 Auxiliary speed reference; 22.08 Auxiliary speed reference.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
19: Encoder 1 speed; 90.10 Encoder 1 speed.
20: Encoder 2 speed; 90.20 Encoder 2 speed.
21: OnBoard encoder; 94.04 OnBoard encoder speed.
26: Constant speed 6; 22.31 Constant speed 6.
27: Constant speed 7; 22.32 Constant speed 7.
Value
ADD
SUB
MUL
MIN
MAX
0
1
0
1
-1
X
22.84 Speed reference 4
+
Value
X
Value
22.86 Speed reference 6
+
Value
2
Value
22.83 Speed reference 3
22.85 Speed reference 5
22.16 Speed share
Value
22.82 Speed reference 2
22.12 Speed reference 2 source
Selection
v
Value
0: Zero; 0 rpm, speed reference is set to zero.
1: 22.07 Speed reference; 22.07 Speed reference.
3: 22.08 Auxiliary speed reference; 22.08 Auxiliary speed reference.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
19: Encoder 1 speed; 90.10 Encoder 1 speed.
20: Encoder 2 speed; 90.20 Encoder 2 speed.
21: OnBoard encoder; 94.04 OnBoard encoder speed.
26: Constant speed 6; 22.31 Constant speed 6.
27: Constant speed 7; 22.32 Constant speed 7.
22.14 Speed reference 1/2 selection
Selection
v
SS_880_006_DCS_structure diagram_b.ai
1

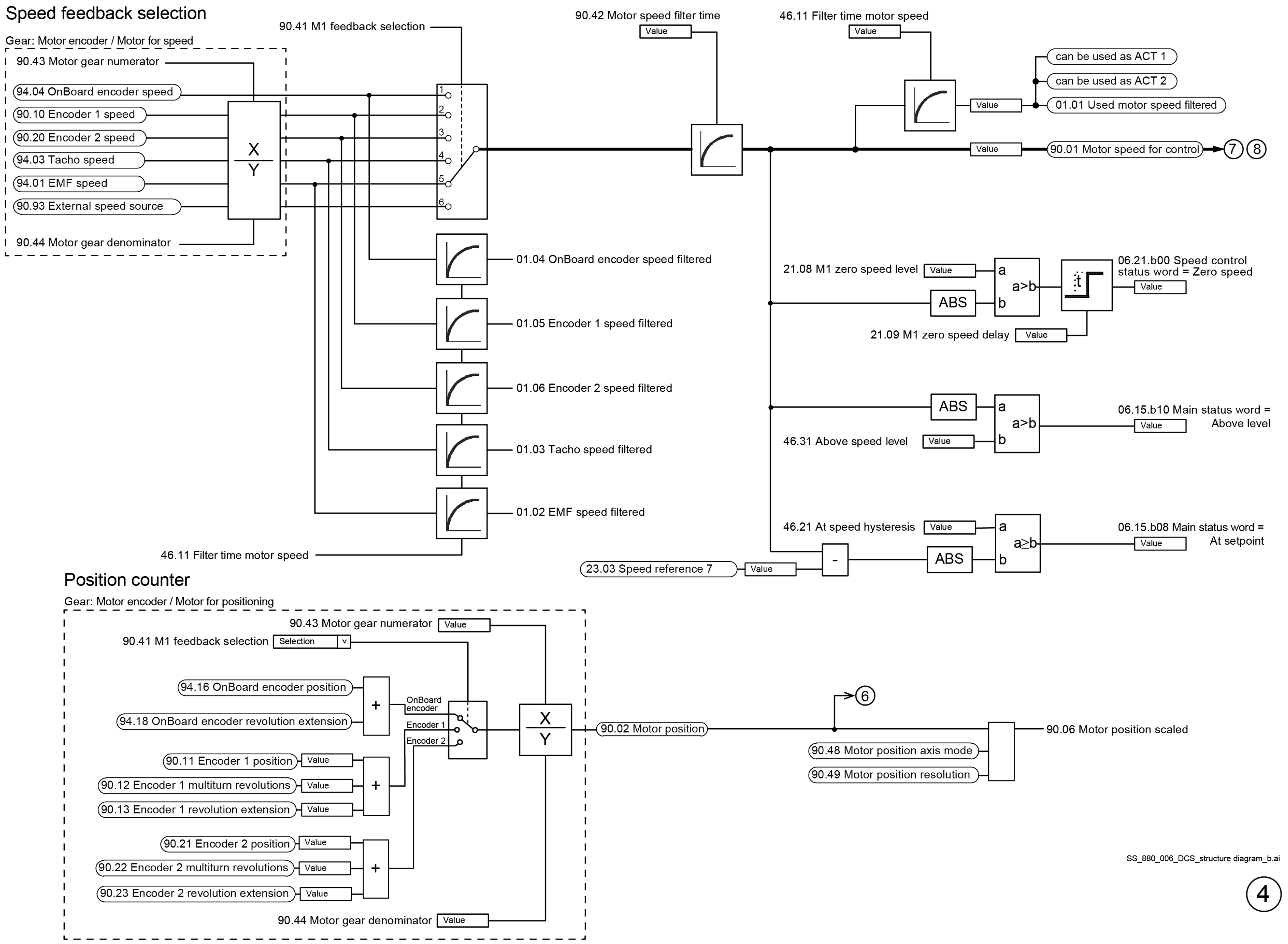
## Jogging, constant speed references and speed reference chain

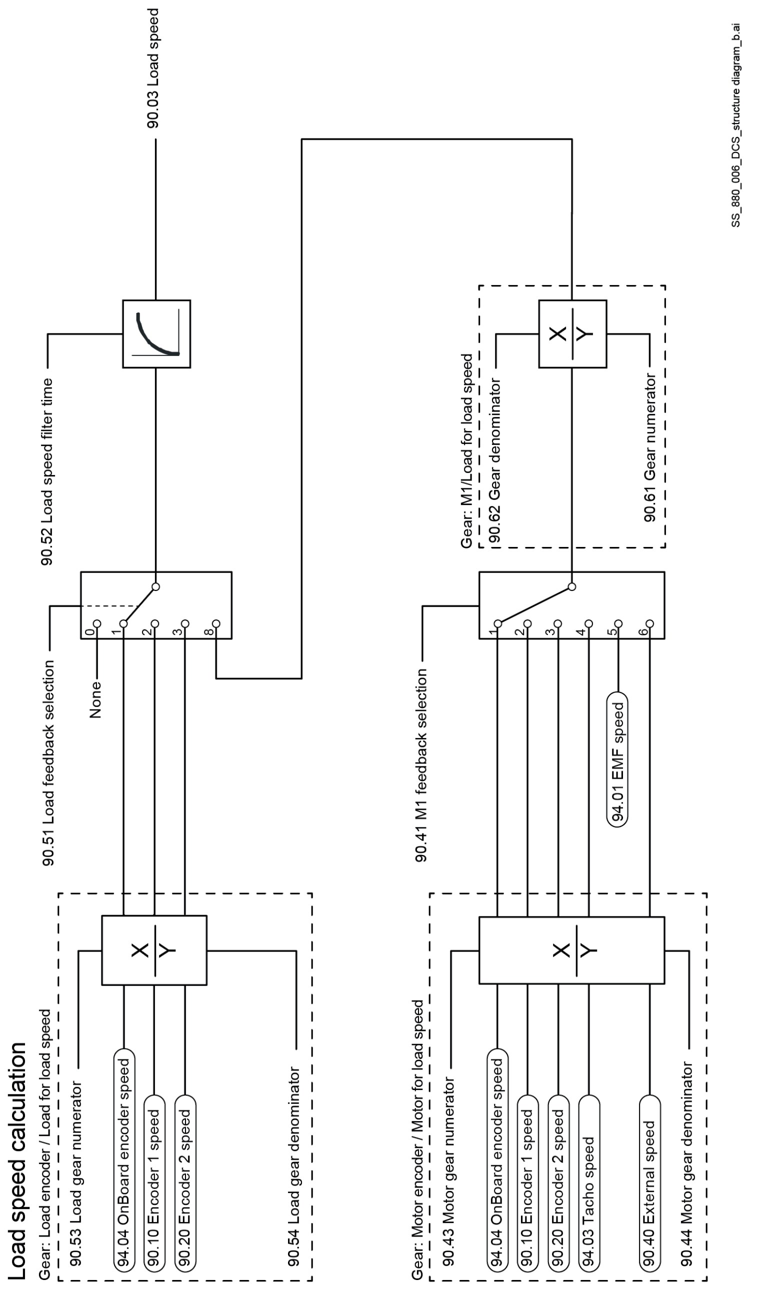


## Speed reference ramp and shaping

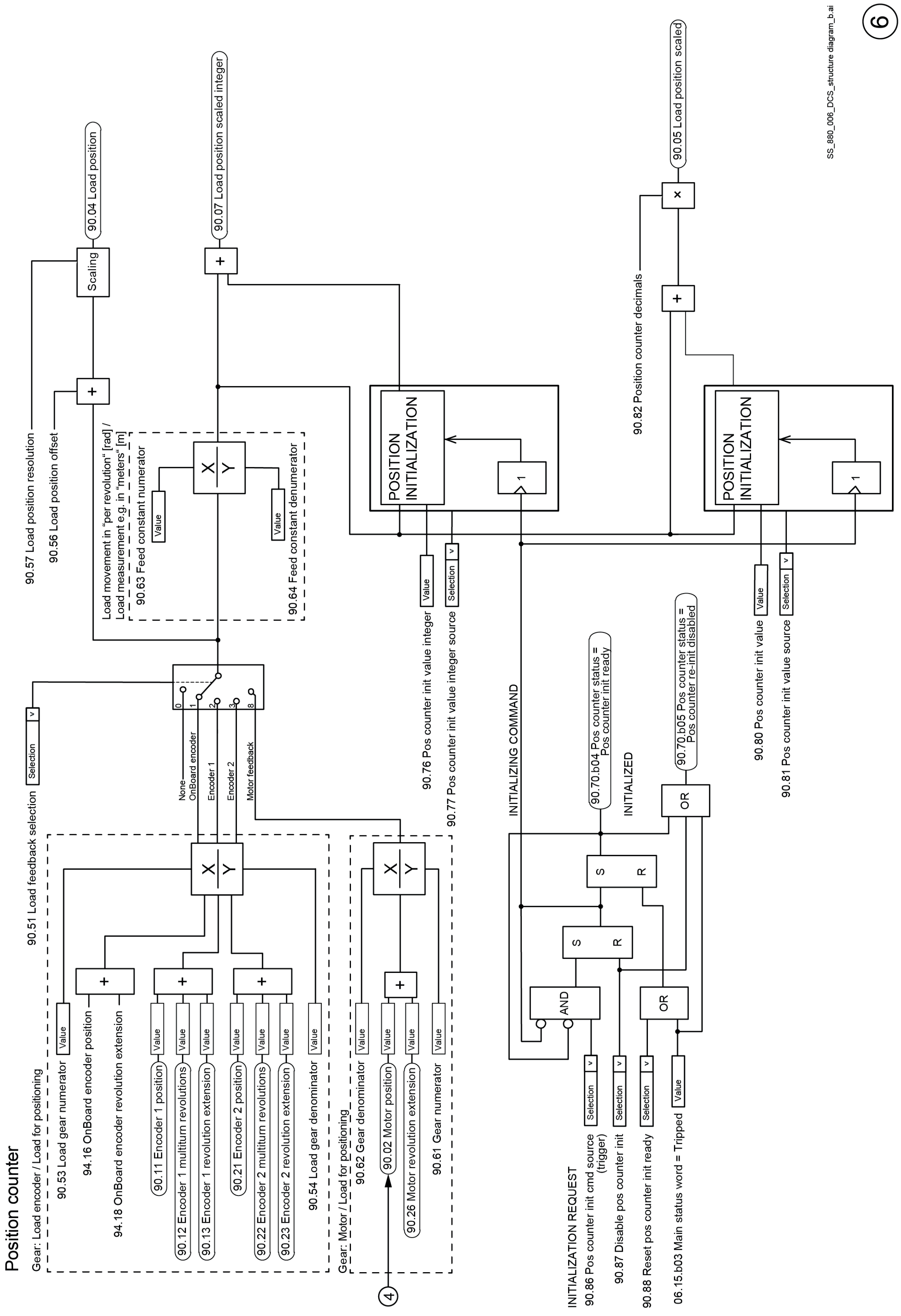


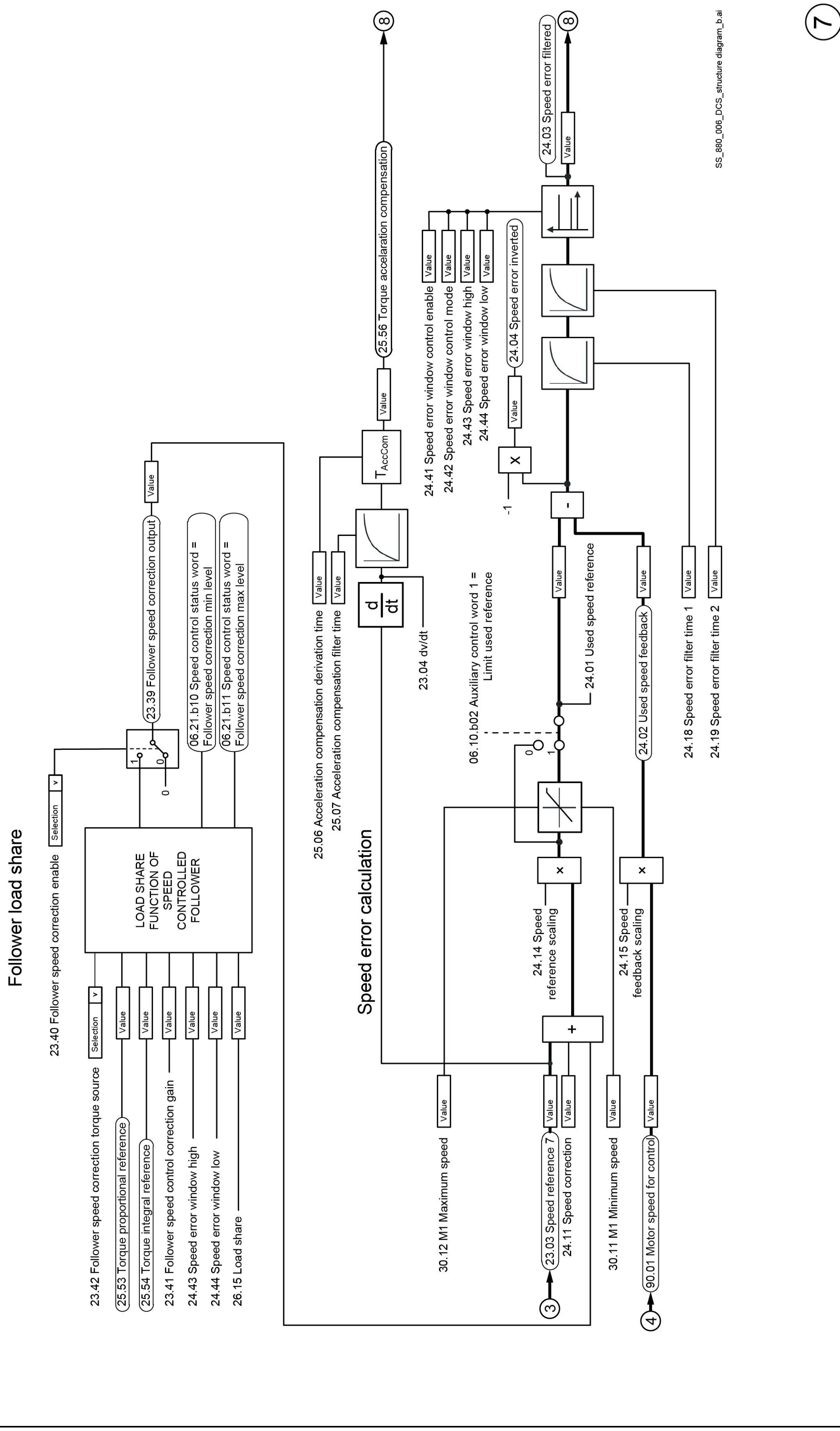
③


Speed feedback selection
Gear: Motor encoder / Motor for speed
90.43 Motor gear numerator
94.04 OnBoard encoder speed
90.10 Encoder 1 speed
90.20 Encoder 2 speed
94.03 Tacho speed
94.01 EMF speed
90.93 External speed source
90.44 Motor gear denominator
X
Y
90.41 M1 feedback selection
1
2
3
4
5
6
90.42 Motor speed filter time
Value
46.11 Filter time motor speed
Value
can be used as ACT 1
can be used as ACT 2
01.01 Used motor speed filtered
Value
Value
90.01 Motor speed for control
7
8
01.04 OnBoard encoder speed filtered
01.05 Encoder 1 speed filtered
01.06 Encoder 2 speed filtered
01.03 Tacho speed filtered
01.02 EMF speed filtered
46.11 Filter time motor speed
21.08 M1 zero speed level
Value
ABS
a
a>b
b
t
06.21.b00 Speed control status word = Zero speed
Value
21.09 M1 zero speed delay
Value
ABS
a
a>b
b
46.31 Above speed level
Value
06.15.b10 Main status word = Above level
Value
46.21 At speed hysteresis
Value
ABS
a
a≥b
b
06.15.b08 Main status word = At setpoint
Value
23.03 Speed reference 7
Value
-
Position counter
Gear: Motor encoder / Motor for positioning
90.43 Motor gear numerator
Value
90.41 M1 feedback selection
Selection
v
94.16 OnBoard encoder position
94.18 OnBoard encoder revolution extension
+
OnBoard encoder
Encoder 1
Encoder 2
90.11 Encoder 1 position
Value
90.12 Encoder 1 multiturn revolutions
Value
90.13 Encoder 1 revolution extension
Value
+
90.21 Encoder 2 position
Value
90.22 Encoder 2 multiturn revolutions
Value
90.23 Encoder 2 revolution extension
Value
+
90.44 Motor gear denominator
Value
X
Y
90.02 Motor position
6
90.06 Motor position scaled
90.48 Motor position axis mode
90.49 Motor position resolution
SS_880_006_DCS_structure diagram_b.ai
4

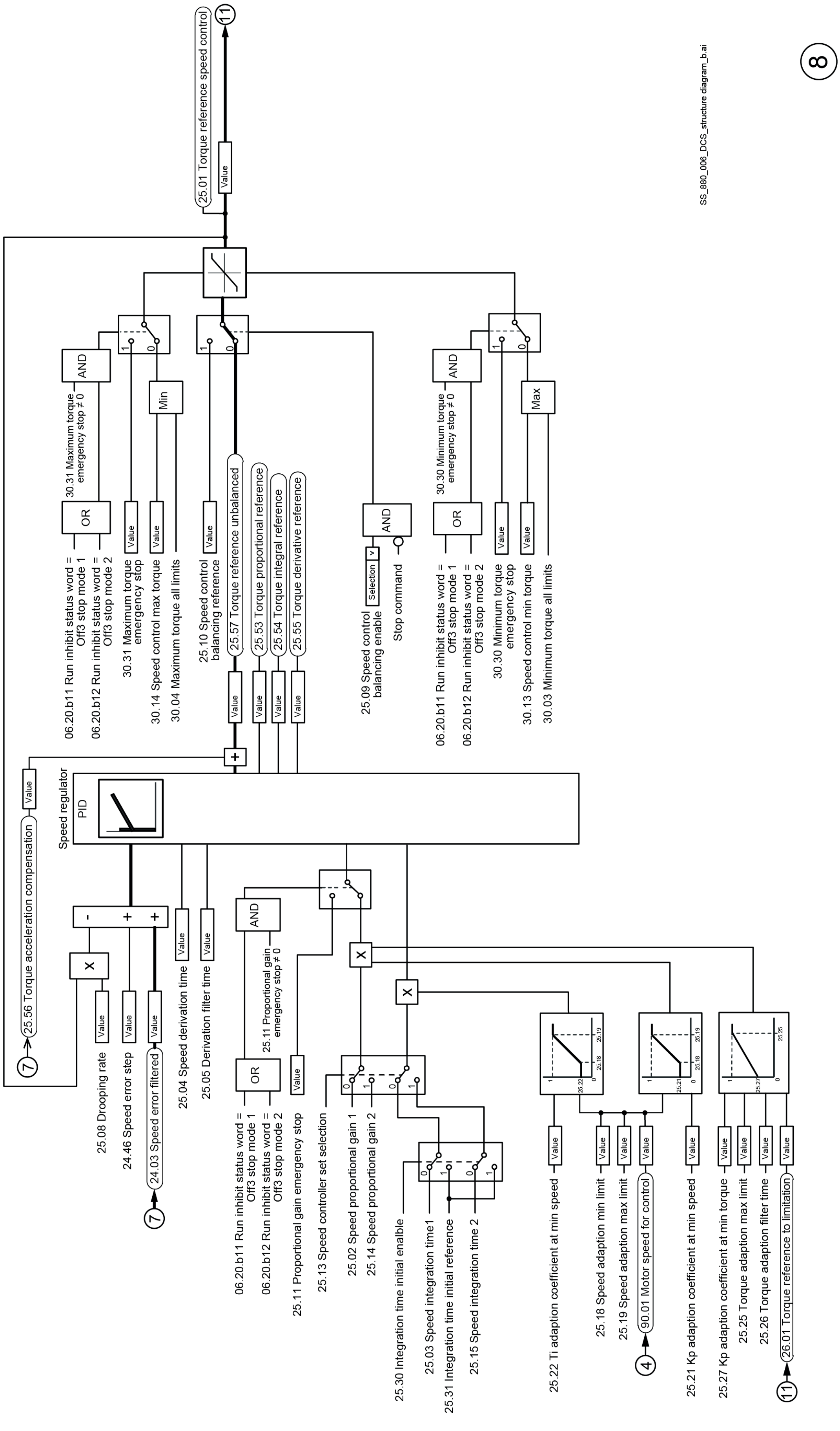

Load speed calculation
Gear: Load encoder / Load for load speed
90.53 Load gear numerator
94.04 OnBoard encoder speed
90.10 Encoder 1 speed
90.20 Encoder 2 speed
90.54 Load gear denominator
X
Y
90.51 Load feedback selection
None
0
1
2
3
8
90.52 Load speed filter time
90.03 Load speed
Gear: Motor encoder / Motor for load speed
90.43 Motor gear numerator
94.04 OnBoard encoder speed
90.10 Encoder 1 speed
90.20 Encoder 2 speed
94.03 Tacho speed
90.40 External speed
90.44 Motor gear denominator
X
Y
90.41 M1 feedback selection
94.01 EMF speed
1
2
3
4
5
6
Gear: M1/Load for load speed
90.62 Gear denominator
90.61 Gear numerator
X
Y
SS_880_006_DCS_structure diagram_b.ai

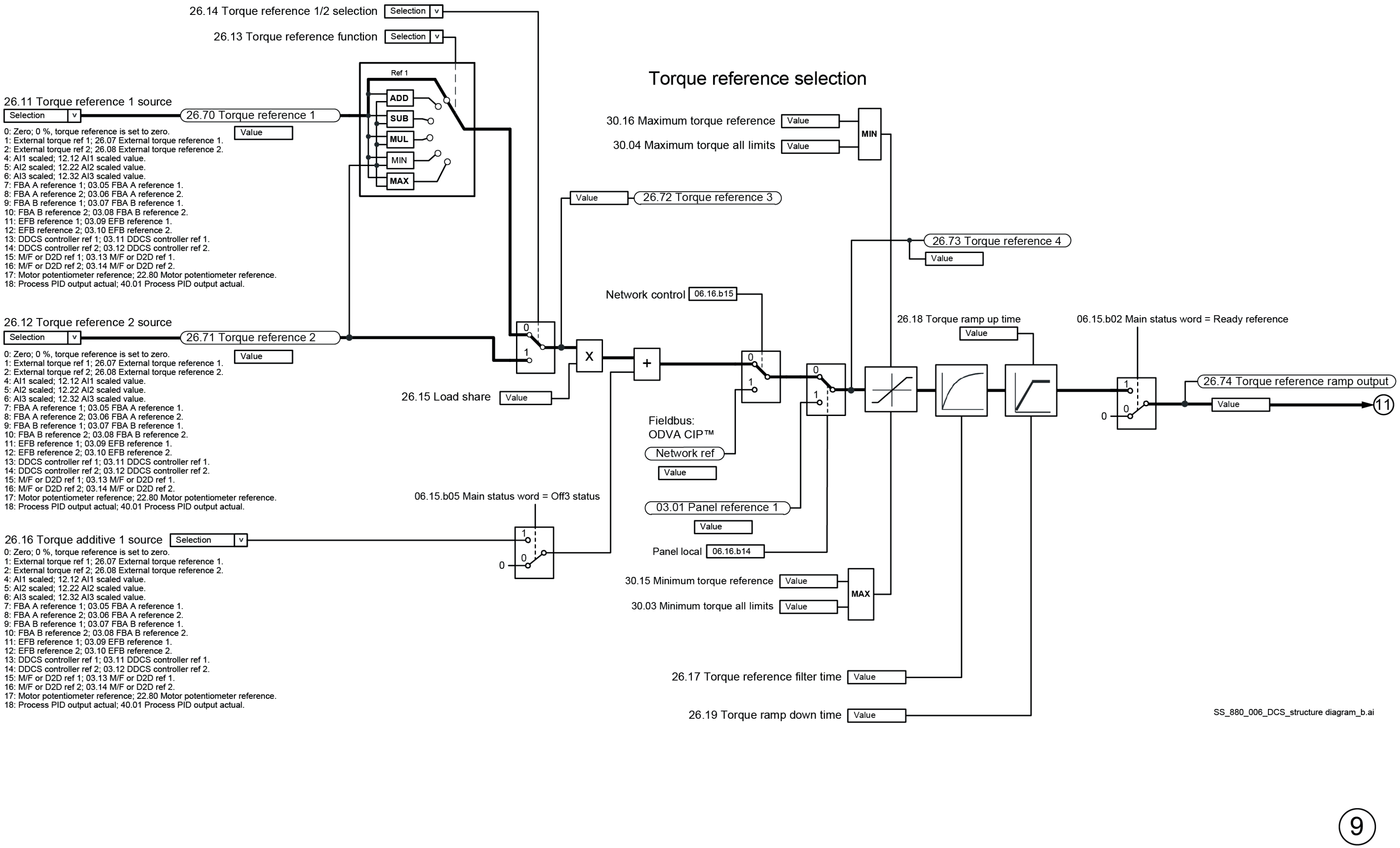
## Position counter

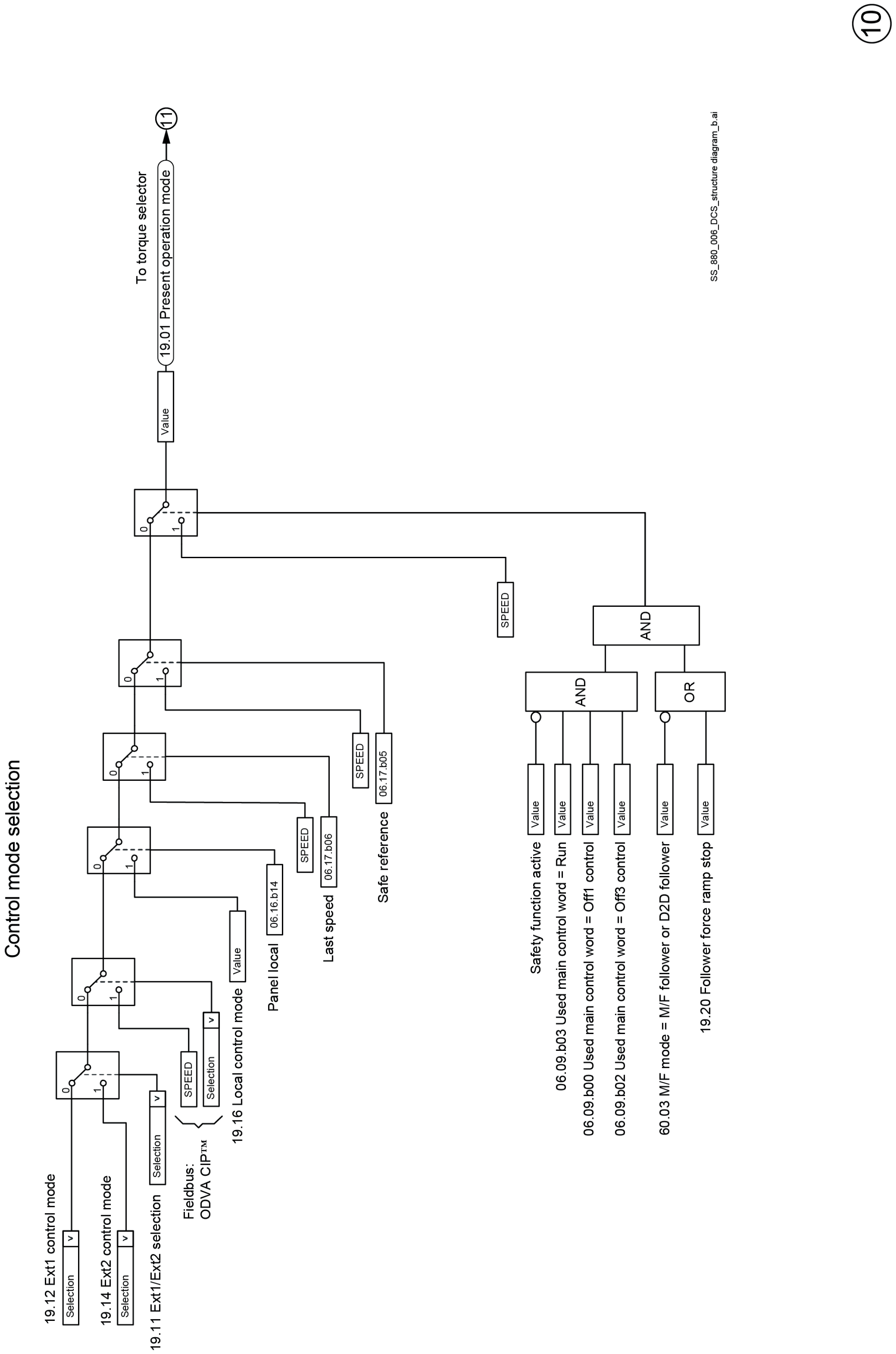


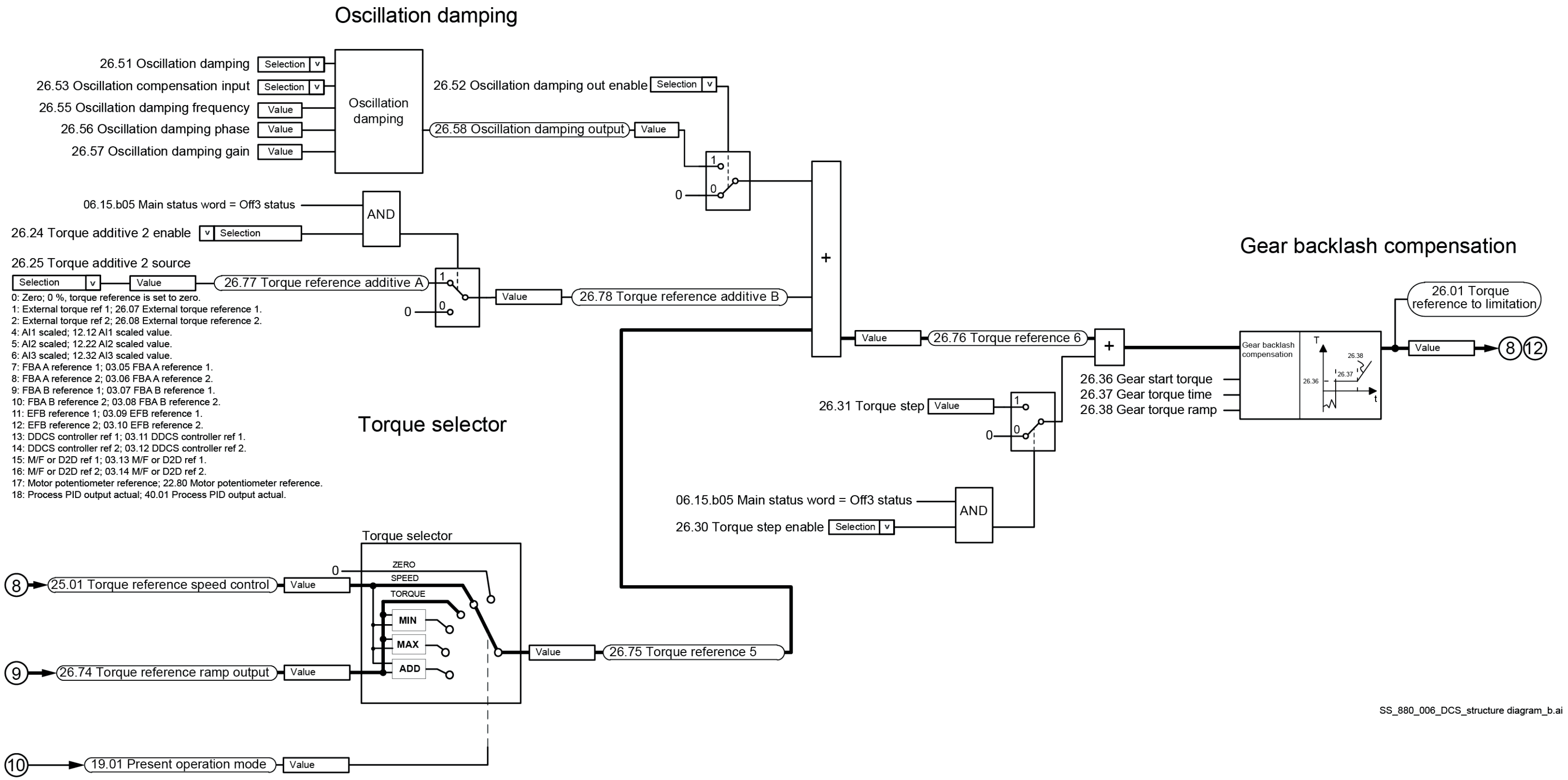

Follower load share
23.40 Follower speed correction enable
Selection
23.42 Follower speed correction torque source
25.53 Torque proportional reference
25.54 Torque integral reference
23.41 Follower speed control correction gain
24.43 Speed error window high
24.44 Speed error window low
26.15 Load share
LOAD SHARE FUNCTION OF SPEED CONTROLLED FOLLOWER
1
0
0
23.39 Follower speed correction output
06.21.b10 Speed control status word = Follower speed correction min level
06.21.b11 Speed control status word = Follower speed correction max level
Value
Speed error calculation
25.06 Acceleration compensation derivation time
25.07 Acceleration compensation filter time
d/dt
23.04 dv/dt
T_AccCom
25.56 Torque accelaration compensation
8
30.12 M1 Maximum speed
3
23.03 Speed reference 7
24.11 Speed correction
+
24.14 Speed reference scaling
×
30.11 M1 Minimum speed
06.10.b02 Auxiliary control word 1 = Limit used reference
0
1
24.01 Used speed reference
-
-1
X
24.04 Speed error inverted
24.41 Speed error window control enable
24.42 Speed error window control mode
24.43 Speed error window high
24.44 Speed error window low
24.03 Speed error filtered
8
4
90.01 Motor speed for control
24.15 Speed feedback scaling
24.02 Used speed feedback
24.18 Speed error filter time 1
24.19 Speed error filter time 2
SS_880_006_DCS_structure diagram_b.ai
7

## Speed controller

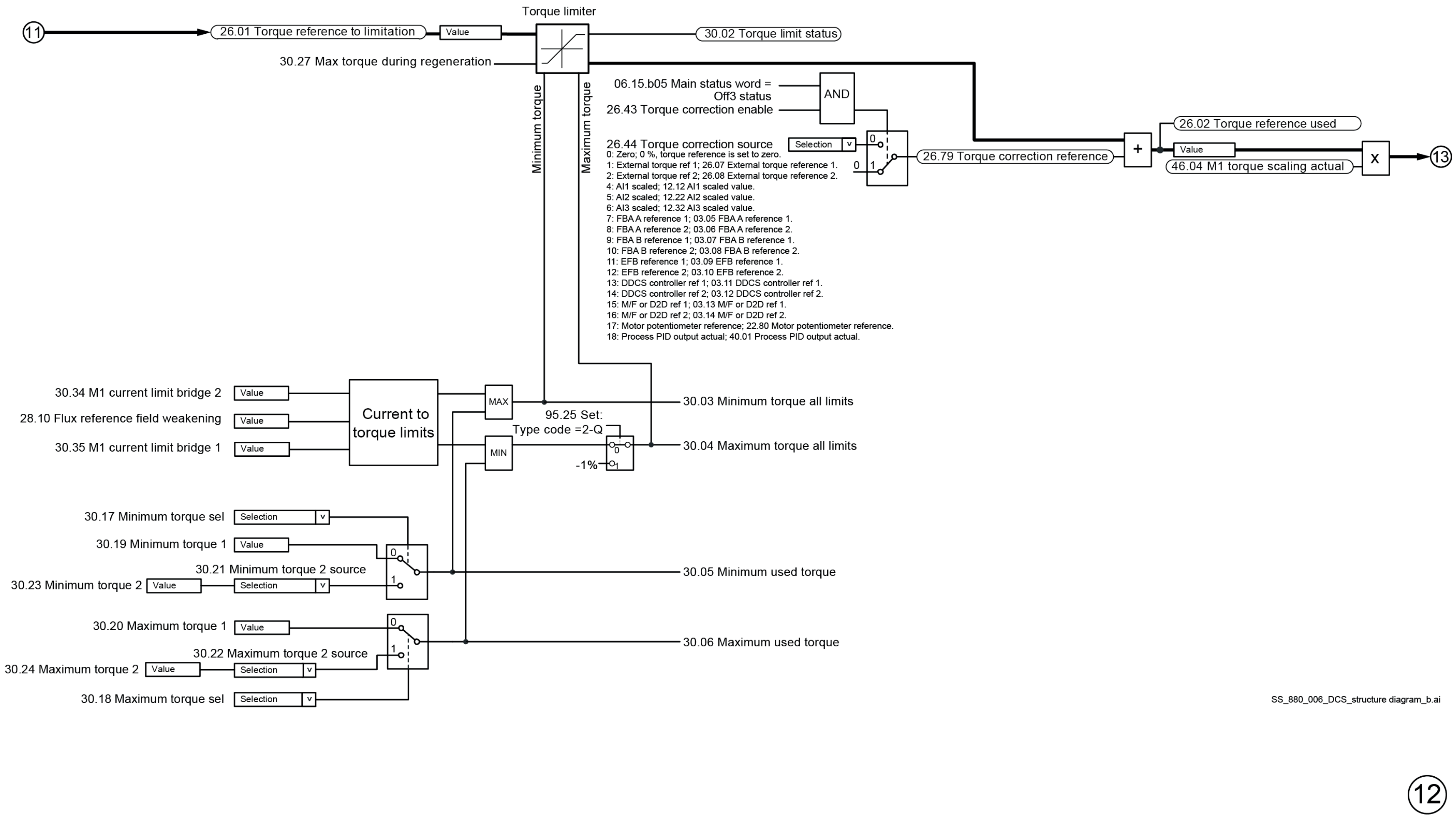



Torque reference selection
26.14 Torque reference 1/2 selection
Selection
v
26.13 Torque reference function
Selection
v
Ref 1
ADD
SUB
MUL
MIN
MAX
26.11 Torque reference 1 source
Selection
v
26.70 Torque reference 1
Value
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
26.12 Torque reference 2 source
Selection
v
26.71 Torque reference 2
Value
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
26.16 Torque additive 1 source
Selection
v
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
0
1
X
+
Value
26.72 Torque reference 3
26.15 Load share
Value
06.15.b05 Main status word = Off3 status
1
0
0
30.16 Maximum torque reference
Value
30.04 Maximum torque all limits
Value
MIN
26.73 Torque reference 4
Value
Network control
06.16.b15
0
1
Fieldbus:
ODVA CIP™
Network ref
Value
03.01 Panel reference 1
Value
Panel local
06.16.b14
0
1
30.15 Minimum torque reference
Value
30.03 Minimum torque all limits
Value
MAX
26.18 Torque ramp up time
Value
26.17 Torque reference filter time
Value
26.19 Torque ramp down time
Value
06.15.b02 Main status word = Ready reference
1
0
0
26.74 Torque reference ramp output
Value
11
SS_880_006_DCS_structure diagram_b.ai
9

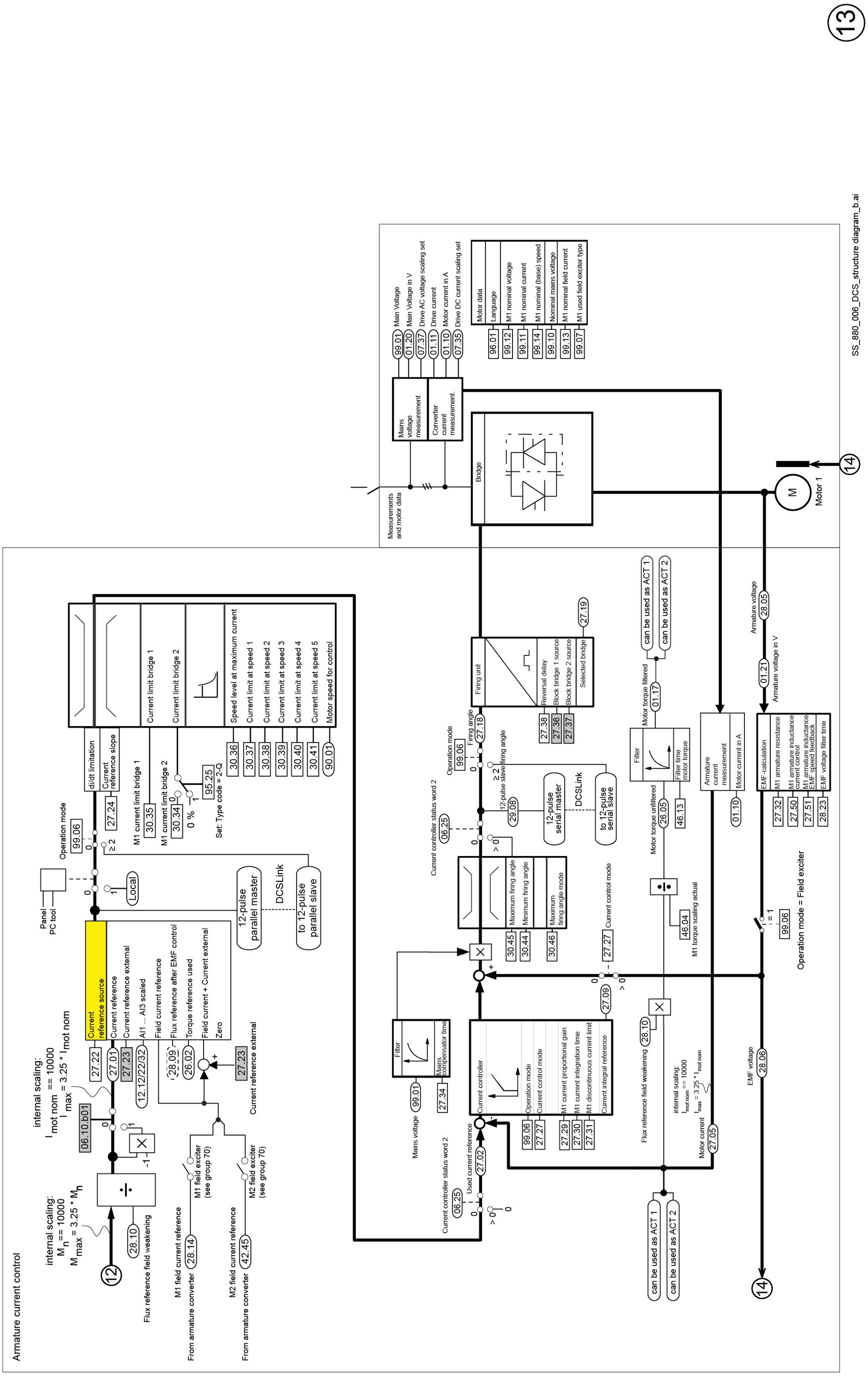

10
Control mode selection
19.12 Ext1 control mode
Selection
19.14 Ext2 control mode
Selection
19.11 Ext1/Ext2 selection
Selection
Fieldbus:
ODVA CIP™
SPEED
Selection
19.16 Local control mode
Value
Panel local
06.16.b14
SPEED
06.17.b06
Last speed
SPEED
06.17.b05
Safe reference
SPEED
0
1
Value
19.01 Present operation mode
To torque selector
11
AND
AND
OR
Value
Safety function active
Value
06.09.b03 Used main control word = Run
Value
06.09.b00 Used main control word = Off1 control
Value
06.09.b02 Used main control word = Off3 control
Value
60.03 M/F mode = M/F follower or D2D follower
Value
19.20 Follower force ramp stop
SS_880_006_DCS_structure diagram_b.ai


Oscillation damping
26.51 Oscillation damping
Selection
26.53 Oscillation compensation input
Selection
26.55 Oscillation damping frequency
Value
26.56 Oscillation damping phase
Value
26.57 Oscillation damping gain
Value
Oscillation damping
26.52 Oscillation damping out enable
Selection
26.58 Oscillation damping output
Value
1
0
0
06.15.b05 Main status word = Off3 status
AND
26.24 Torque additive 2 enable
Selection
26.25 Torque additive 2 source
Selection
Value
26.77 Torque reference additive A
0: Zero; 0 %, torque reference is set to zero.
1: External torque ref 1; 26.07 External torque reference 1.
2: External torque ref 2; 26.08 External torque reference 2.
4: AI1 scaled; 12.12 AI1 scaled value.
5: AI2 scaled; 12.22 AI2 scaled value.
6: AI3 scaled; 12.32 AI3 scaled value.
7: FBA A reference 1; 03.05 FBA A reference 1.
8: FBA A reference 2; 03.06 FBA A reference 2.
9: FBA B reference 1; 03.07 FBA B reference 1.
10: FBA B reference 2; 03.08 FBA B reference 2.
11: EFB reference 1; 03.09 EFB reference 1.
12: EFB reference 2; 03.10 EFB reference 2.
13: DDCS controller ref 1; 03.11 DDCS controller ref 1.
14: DDCS controller ref 2; 03.12 DDCS controller ref 2.
15: M/F or D2D ref 1; 03.13 M/F or D2D ref 1.
16: M/F or D2D ref 2; 03.14 M/F or D2D ref 2.
17: Motor potentiometer reference; 22.80 Motor potentiometer reference.
18: Process PID output actual; 40.01 Process PID output actual.
1
0
0
Value
26.78 Torque reference additive B
+
Value
26.76 Torque reference 6
+
Torque selector
Torque selector
0
ZERO
SPEED
TORQUE
MIN
MAX
ADD
8
25.01 Torque reference speed control
Value
9
26.74 Torque reference ramp output
Value
10
19.01 Present operation mode
Value
Value
26.75 Torque reference 5
26.31 Torque step
Value
1
0
0
06.15.b05 Main status word = Off3 status
AND
26.30 Torque step enable
Selection
Gear backlash compensation
26.36 Gear start torque
26.37 Gear torque time
26.38 Gear torque ramp
Gear backlash compensation
T
26.38
26.37
26.36
t
26.01 Torque reference to limitation
Value
8
12
SS_880_006_DCS_structure diagram_b.ai
11

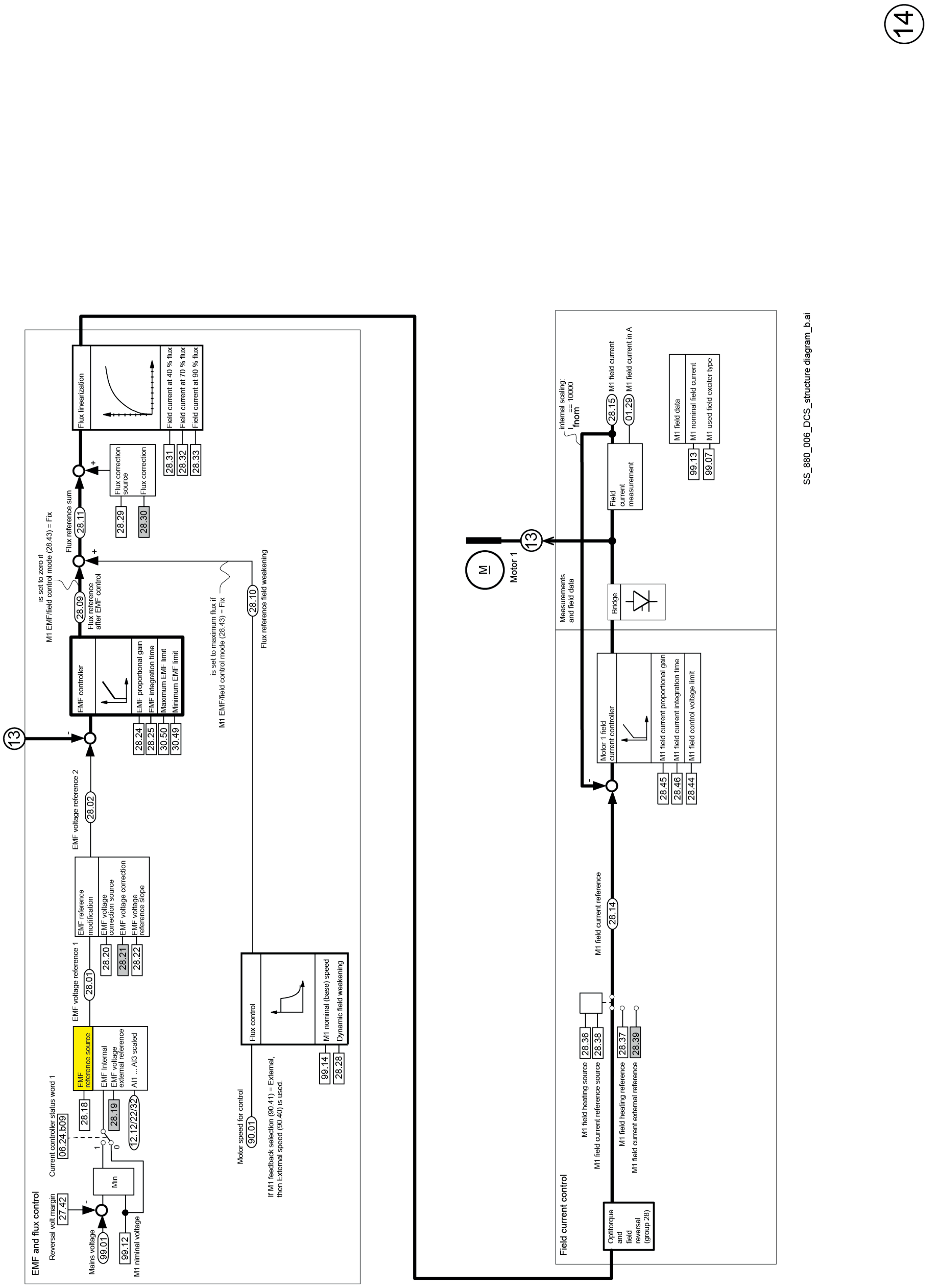
## Torque limitation



# Armature current control



## Field current control (one field exciter)



# DCS Family

**DCS550-S modules**
**The compact drive for machinery application**

20 … 1,000 $A_{DC}$
0 … 610 $V_{DC}$
230 … 525 $V_{AC}$
IP00

- Compact
- Robust design
- Adaptive and winder program
- High field exciter current

**DCS880 modules**
**For safe productivity**

20 … 5,200 $A_{DC}$
0 … 1,600 $V_{DC}$
230 … 1,000 $V_{AC}$
IP00

- Safe torque off (STO) built in as standard
- Compact and robust
- Single drives, 20 A to 5,200 A, up to 1,600 $V_{DC}$
- IEC 61131 programmable
- Intuitive control panel and PC tool with USB connection and start up assistant
- Wide range of options to serve any DC motor application

**DCS800-A enclosed converters**
**Complete drive solutions**

20 … 20,000 $A_{DC}$
0 … 1,500 $V_{DC}$
230 … 1,200 $V_{AC}$
IP21 – IP54

- Individually adaptable to customer requirements
- User-defined accessories like external PLC or automation systems can be included
- High power solutions in 6- and 12-pulse up to 20,000 A, 1,500 V
- In accordance to usual standards
- Individually factory load tested
- Detailed documentation

**DCT880 modules**
**Thyristor controller**

16 … 4,200 $A_{DC}$
110 … 190 $V_{DC}$
IP00

- Precise power control in industrial heating applications
- Two or three phase devices
- Power optimizer for peak load reduction
- Built on ABB's all-compatible drives architecture
- Intuitive control panel and PC tool with USB connection and start up assistant
- Application control programs and drive application programming with IEC 61131 programming

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