ABB INDUSTRIAL DRIVES

ACS880 DC/DC converter control program (YDCLX)

Firmware manual

List of related manuals

General manuals	Code (English)
ACS880 multidrives cabinets and modules safety instructions	3AUA0000102301
ACS880 liquid-cooled multidrives cabinets and modules safety instructions	3AXD50000048633
Hardware manuals	
ACS880-1604LC DC/DC converter modules hardware manual	3AXD50000371631
ACS880-1607LC DC/DC converter units hardware manual	3AXD50000431342
Option manuals	
ACS-AP-I, -S, -W and ACH-AP-H, -W assistant control panels user's manual	3AUA0000085685
Drive composer start-up and maintenance PC tool user's manual	3AUA0000094606
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

You can find manuals and other product documents in PDF format on the Internet. See section Document library on the Internet on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

ACS880 DC/DC converter control program (YDCLX)

Firmware manual

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1

Introduction to the manual

Contents of this chapter

This chapter describes the contents of the manual. It also contains information on the applicability, safety and intended audience.

Applicability

This manual applies to the ACS880 DC/DC converter control program (YDCFX v1.1x or later).

The control program described in this manual is used with the DC/DC converter units of types ACS880-1607 (air-cooled), ACS880-1607LC (liquid-cooled), DC/DC converter modules of types ACS880-1604 (air-cooled) and ACS880-1604LC (liquid-cooled).

Safety instructions

Follow all safety instructions delivered with the DC/DC converter unit.

- Read the **complete safety instructions** before you install, commission, use or service the DC/DC converter unit. See ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]) for air-cooled units, and ACS880 liquid-cooled multidrives cabinets and modules safety instructions (3AXD50000048633 [English]) for liquid-cooled units.
- Read the **software function specific warnings and notes** before changing the default settings of the function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read **task specific safety instructions** before starting the task. See the section describing the task.

WARNING! Make sure the energy storage is disconnected from the DC/DC converter and from the drive DC bus before doing any work on the DC/DC converter module or on any other device connected to the common DC bus. When the energy storage is connected to the DC/DC converter, the energy storage is also electrically connected to the common DC bus via the freewheeling diodes inside the DC/DC converter.

WARNING! If an energy storage is used for charging a common DC bus from zero, there must be a pre-charging circuit to do this. Otherwise the energy storage is immediately connected to the DC bus via the freewheeling diodes inside the DC/DC converter module, and the direct charging along with the resulting high current can damage the DC bus capacitors.

Target audience

This manual is intended for people who operate, commission, set parameters, monitor or troubleshoot DC/DC converter units and modules. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Contents of the manual

The chapters of this manual are briefly described below.

Start-up describes the basic start-up procedure of the DC/DC converter.

Using the control panel provides the basic instructions for use of the control panel.

Control locations and operating modes describes the control locations and operating modes supported by the control program.

Program features describes the program features of the DC/DC converter control program.

Parameters lists the parameters of the DC/DC converter control program.

Additional parameter data contains more information on the parameters.

Fault tracing lists all alarm and fault messages including possible causes and corrective actions.

Fieldbus control through a fieldbus adapter describes how the DC/DC converter can be controlled by external devices over a communication network.

Drive-to-drive link describes the communication between drives connected together by the drive-to-drive (D2D) link.

Control chain and converter logic diagrams presents the control chain and converter logic diagrams of the control program.

Related documents

See List of related manuals on the inside of the front cover.

Terms and abbreviations

Term/abbreviation	Definition
ACS-AP-I	Types of control panel used with ACS880 drives
ACS-AP-W	
AI	Analog input; interface for analog input signals
AO	Analog output; interface for analog output signals
BAMU-1x	Type of a measuring unit, eg. BAMU-11
BMS	Battery management system
DC bus	DC circuit between rectifier and inverter
DC/DC converter module	DC/DC converter and related components enclosed inside a metal frame or enclosure. Intended for cabinet installation.
DC/DC converter unit	DC/DC converter modules under control of one control unit and related components such as fuses etc. See DC/DC converter module.
DDC	DC/DC converter
DDCS	Distributed drives communication system by ABB; a protocol used in optical fiber communication
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
EFB	Embedded fieldbus
ES	Energy storage
FAIO-01	Optional analog I/O extension module
FBA	Fieldbus adapter
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
FCAN-0x	Optional CANopen® adapter
FCNA-0x	Optional ControlNet™ adapter
FDCO-0x	Optional DDCS communication module
FDIO-01	Optional digital I/O extension module
FDNA-0x	Optional DeviceNet™ adapter
FEA-03	Optional I/O extension adapter
FECA-01	Optional EtherCAT® adapter
FEIP-21	Optional Ethernet adapter module for EtherNet/IP™
FENA-11	Optional Modbus TCP®, EtherNet/IP, PROFINET IO® adapter
FENA-21	Optional dual-port EtherNet/IP, Modbus TCP and PROFINET IO adapter
FEPL-0x	Optional Ethernet POWERLINK adapter
FMBT-21	Optional Ethernet adapter module for Modbus TCP protocol
FPBA-0x	Optional PROFIBUS DP® adapter
FPNO-21	Optional PROFINET IO adapter module
FSCA-0x	Optional Modbus® adapter
Frame (size)	Physical size of the DC/DC converter module, for example, R8i.
FSCA-0x	Optional Modbus RTU adapter
IGBT	Insulated gate bipolar transistor
I/O	Input/Output
Parameter	User-adjustable operation instruction to the DC/DC converter, or signal measured or calculated by the DC/DC converter
PLC	Programmable logic controller
RDCO-04	Optical DDCS communication module
RO	Relay output; interface for a digital output signal. Implemented with a relay.

Term/abbreviation	Definition
UCU	Type of a control unit used in ACS880 drives that consists of a UCON board built into a metal housing.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). 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.

See also section User lock (page 49).

Secure boot

The secure boot system authenticates all software executables including boot binary, control firmware, and FPGA logic. The system runs executables produced and signed by ABB. A secured boot is accomplished by using the hardware root of a trusted boot mechanism. An access control procedure is applied to software production that involves signing operations. The access is limited to relevant personnel only. The signing keys are stored using HSM (Hardware Security Module) mechanism to safeguard and manage digital keys. The software that is modified or downloaded maliciously does not run during the startup.

Control tokens

The control token system enables and controls the usage of ABB's internal features by granting special permission for the device. ABB internal features are mainly used for debugging. The control token is a loading package downloaded to the drive with a unicos loader by an ABB personnel. The system verifies the authenticity before downloading the loading package. The system accepts only control tokens generated with ABB build tools. Note that, only ABB R&D personnel are permitted to generate the control tokens.

The control tokens are valid only in a single device that are identified by the UCU board specific device DNA in parameters 107.60…107.62.

See the below use cases for control tokens on end-user devices:

- Enabling JTAG debugging
- Enabling custom firmware boot

Disabling control tokens by the end user

To disable downloading control tokens using the user lock function, set parameter 196.102 to bit 2 Disable file download.

Removing control tokens from the drive

To remove all active control token from the drive, activate any bit in parameter 107.63 Remove all Control Tokens. The control tokens are removed after rebooting the control unit.

2

Start-up

DC/DC converter hardware start-up

See the hardware manual of the DC/DC converter unit or module for the hardware-related tasks to be done at start-up.

We assume that you have powered up the control unit of the DC/DC converter and you have a PC with the Drive composer PC tool connected to it. See the chapter Start-up in the hardware manual of the DC/DC converter for the control unit power up.

Parameter settings in the DC/DC converter control program

WARNING! Only qualified persons by ABB are allowed to start up the DC/DC converter. Parameter settings need to be adjusted according to the energy storage used. For further information, contact your local ABB representative.

Tasks	☑
Safety	
WARNING! Obey the safety instructions during the start-up procedure. See ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]) for air-cooled units, and ACS880 liquid-cooled multidrives cabinets and modules safety instructions (3AXD50000048633 [English]) for liquid-cooled units. If you ignore the safety instructions, injury or death, or damage to the equipment can occur. Parameter settings must be done before the DC voltage is charged. Before you start, make sure that: • The control unit is powered and you have a PC with Drive composer PC tool connected to the control unit. • DC/DC converter main circuit is not powered up. If there is a DC switch-disconnector ([Q11.1], option +F286), make sure that it is open. If there is no DC switch disconnector, make sure that the main contactor (Q2) or main breaker (Q1) in the supply unit of the drive is open. • Energy storage is disconnected from the DC/DC converter.	☐
Common parameter settings	
Set the following parameters: • 130.112 Maximum DC bus voltage The parameter value must be at least 50 V below the inverter DC overvoltage trip level. In case of 690 V AC, the limit must be 1100…1150 V. • 130.114 Maximum ES voltage The parameter value must be below parameter 130.112 Maximum DC bus voltage. • 130.119 Minimum current The parameter must be set to the short-time maximum discharging current of the energy storage with negative value. The value must not exceed the converter short-time rated current. • 130.120 Maximum current The parameter must be set to the short-time maximum charging current of the energy storage. The value must not exceed the converter short-time rated current. • 130.121 Charge current ESUV The parameter must be set to the charging current when the energy storage voltage is below the undervoltage level (130.113 Minimum ES voltage). • 130.122 Disharge current ESOV The parameter must be set to the discharging current of the energy storage with negative value in case the energy storage voltage is above the parameter 130.114 Maximum ES voltage. • 130.126 Power charging lim The parameter must be set to maximum power allowed to charge the energy storage. • 130.127 Power discharging lim The parameter must be set to maximum power, with negative value, allowed to discharge the energy storage. • 131.23 ES over voltage level The parameter value must be above the parameter 130.114 Maximum ES voltage but not above the maximum energy storage voltage with marginal of 10…50 V.	☐

Tasks	☑
If BAMU-1x board is in use: • 191.30 BAMU 1 channel In case of single DC/DC converter module, set to 2. In case of two parallel-connected DC/DC converter modules, set to 3. If the energy storage voltage measurement is not in use, set to 0.	☐
Set the following parameters: • 195.01 Supply voltage Set according to the supply voltage in use. • 195.09 Fuse switch control If the DC/DC converter has a fuse switch, check that the setting is Yes. If the DC/DC converter does not have a fuse switch, set to No. • 195.20 HW options word 1 Option +C188: Set bit 13 if the DC/DC converter has option +C188 (direct-on-line cooling fan). • 197.13 Control mode Usually the first start-up is done without PLC connection. Then it is recommended to start up using power control mode (selection Power). • 197.14 ES voltage source If BAMU-1x board is used, set to BAMU, else set to Zero for the first start-up with current control. If the PLC sends the energy storage voltage, set to Parameter 197.15.	☐
Parameter settings for power control mode	
Usually the first start-up is done using current control. Voltage control can be used when the DC/DC converter is controlled by PLC. Set the following parameters: • 122.02 Power ref sel Set to User ref for the first start. Change later to FB A ref2 or DDCS ctrl ref2. • 122.04 Power ref scale Use the default value (1.00). • 122.06 Power ref type Use the default value (Ipow ref [A]). • 122.14 Ipower ref ramp up Use the default value (10 ms). • 122.15 Ipower ref ramp down Use the default value (10 ms). Save the parameter settings and reboot the control unit: • 196.07 Parameter save manually to Save • 196.08 Control board boot to 1 After control unit boot, calibrate the current measurement by setting: • 197.04 Calibration request to Do once. The value reverts automatically to Disabled.	☐

Tasks	☑
Testing the operation in local control mode	
Before first start and energy storage connection, check that the DC bus voltage is above the energy storage voltage. Select the local control before start command (see section Local control on page 30), and set • 122.01 User Power ref to 0 A Set current limits to low values, for example: • 130.119 Minimum current to -50 A • 130.120 Maximum current to 50 A Power up the converter, connect the energy storage and start the converter: 1. Make sure that the control panel is in local control mode. 2. Charge and power up the DC/DC converter. See the hardware manual. 3. Connect the energy storage to the DC/DC converter. See the hardware manual. 4. Set the Run enable signal (120.12) to value On (1). The converter is now ready for the start. 5. Press the Start key of the control panel. The converter starts. After start, increase slowly the value of parameter 122.01 User Power ref. Check the following signals: • 102.01 DC voltage • 102.02 ES voltage used (If BAMU-1x board is used, this signal should display the energy storage voltage.) • 102.08 Total current (This signal should be according to 122.01 User Power ref.) • 102.11 Modulation index % • 130.101 DDC limit word 1	☐

Tasks	☑
Parameter settings for DC voltage control mode	
After the first start, set the following parameters: • 123.02 DC voltage ref selection Set to FB A ref1 or DDCS ctrl ref1. • 123.06 DC voltage ref max Set to the same level as 130.112 Maximum DC bus voltage. If the energy storage voltage is controlled, set as 130.114 Maximum ES voltage. • 123.07 DC voltage ref min Set to the same level as 130.111 Minimum DC bus voltage. If the energy storage voltage is controlled, set as 130.114 Maximum ES voltage. • 123.09 DC voltage ref ramp up Use the default value (1000 ms, time from 0 V to nominal DC voltage (101.62 Nominal DC voltage)). • 123.10 DC voltage ref ramp down Use the default value (1000 ms, time from nominal DC voltage (101.62 Nominal DC voltage) to 0 V). • 123.12 DC voltage ref scale Use the default value (1.00). • 123.15 DC voltage ref shape time Use the default value (0.0 ms, no S-ramp). • 128.01 DC voltage control select Usually, set to DC bus voltage (DC bus voltage is controlled). • 128.03 DC voltage error filtering time Use the default value (0 ms, no filtering). • 128.08 DC voltage ctrl proportional gain Use the default value (10.00), and tune if needed. • 128.09 DC voltage ctrl integration time Use the default value (20 ms), and tune if needed. • 128.10 DC voltage control droop Set to Yes if at least two DC/DC converter modules are controlling the same DC bus voltage. • 128.11 DC voltage drooping rate Use the default value (5.0%), and tune if needed.	☐
Final settings	
If the DC/DC converter unit is equipped with an optional fieldbus adapter, or controlled externally through the DDCS link, check and tune the related parameters at start-up. See chapter Fieldbus control through a fieldbus adapter, or parameter group 160 DDCS communication (page 146).	☐

Tasks	☑
Typical parameter settings for 690 V AC DC/DC converter with maximum battery voltage of 900 V and minimum battery voltage of 750 V are listed below. In the list below there are only the parameters which do not use their default values.	☐

Parameter	Setting
• 122.06 Power ref type	Ipow ref [A]
• 128.10 DC voltage control droop	Yes (if at least two DC/DC converter modules are controlling the same DC bus voltage)
• 128.11 DC voltage drooping rate	2.0%
• 130.111 Minimum DC bus voltage	950 V
• 130.112 Maximum DC bus voltage	1100 V
• 130.113 Minimum ES voltage	690 V (battery minimum voltage or zero to avoid limitation)
• 130.114 Maximum ES voltage	900 V (battery maximum voltage or 1100 V to avoid limitation)
• 130.119 Minimum current	-600 A (converter nominal current)
• 130.120 Maximum current	600 A
• 130.121 Charge current ESUV	100 A
• 130.122 Disharge current ESOV	-100 A
• 130.126 Power charging lim	600 kW
• 130.127 Power discharging lim	-600 kW
• 131.23 ES over voltage level	1200 V (to avoid tripping)
• 191.30 BAMU 1 channel	2 (for a single DC/DC converter module)
• 195.01 Supply voltage	690 V
• 197.14 ES voltage source	BAMU

Tasks	☑
Modbus settings	
Modbus contains three data from DC/DC converter to PLC (106.11 Main status word, 102.01 DC voltage and 102.08 Total current), and three data from PLC to DC/DC converter (106.01 Main control word, 150.04 FBA A ref1 type (DC voltage reference) and 150.05 FBA A ref2 type (current reference)). Below are the example settings when using Modbus. You can do the following settings: • 120.01 Ext1 commands to Fieldbus A (command word from PLC to DC/DC converter) • 122.02 Power ref sel to FB A ref2 (current reference from PLC to DC/DC converter) • 123.02 DC voltage ref selection to FB A ref1 (DC voltage reference from PLC to DC/DC converter) • 146.04 DC voltage scaling to 10.00 • 150.01 FBA A enable to Option slot 1 • 150.04 FBA A ref1 type to DC voltage • 150.05 FBA A ref2 type to Active power • 150.07 FBA A actual 1 type to DC voltage (101.01 DC voltage) • 150.08 FBA A actual 2 type to Active power (101.12 Power) • 150.12 FBA A debug mode to Fast • 150.21 FBA A timelevel sel to Very fast • 151.01 FBA A type to Ethernet • 151.02 Protocol/Profile to MB/TCP T16 • 151.05 IP address 1 (Set according to the customer application.) • 151.06 IP address 2 (Set according to the customer application.) • 151.07 IP address 3 (Set according to the customer application.) • 151.08 IP address 4 (Set according to the customer application.) • 151.09 Subnet CIDR (Set according to the customer application.) • 151.19 T16 scale to 99 • 151.20 Timeout time to 20 • 151.21 Timeout mode to Control RW • 151.22 Word order to HiLo • 151.24 FBA par 24 to 128	☐
Data from DC/DC converter to PLC: • 152.01 FBA A data in1 to 102.02[16] (102.02 ES voltage used if BAMU-1x board is used) • 152.02 FBA data in2 to 130.103[16] (130.103 Minimum current available) • 152.03 FBA data in3 to 130.104[16] (130.104 Maximum current available) • 152.04 FBA data in4 to 130.101[16] (130.101 DDC limit word 1) • 152.05 FBA data in5 to 101.20[16] (101.20 Converter current) • 152.06 FBA data in6 to 105.11[16] (105.11 Converter temperature %) • 152.07 FBA data in7 to 104.01[16] (104.01 Tripping fault) • 152.08 FBA data in8 to 104.06[16] (104.06 Active warning 1)	☐
Data from PLC to DC/DC converter: • 153.01 FBA data out1 to 130.109[16] (130.109 Max charge current) • 153.02 FBA data out2 to 130.110[16] (130.110 Max discharge current) • 153.03 FBA data out3 to 197.13[16] (197.13 Control mode) • 153.04 FBA data out4 to197.15[16] (197.15 ES voltage input if BAMU-1x board is not used)	☐

Tasks	☑
DDCS communication settings	
Below are the example settings when using DDCS communication. You can do the following settings: • 120.01 Ext1 commands to DDCS controller (command word from PLC to DC/DC converter) • 122.02 Power ref sel to DDCS ctrl ref2 (current reference from PLC to DC/DC converter) • 123.02 DC voltage ref selection to DDCS ctrl ref1 (DC voltage reference from PLC to DC/DC converter) • 146.04 DC voltage scaling to 10.00 • 160.51 DDCS controller comm port to RDCO CH0 • 160.52 DDCS controller node address (Set according to the customer application.) • 160.58 DDCS controller comm loss time to 300 ms • 160.60 DDCS controller ref1 type to DC voltage • 160.61 DDCS controller ref2 type to Active power • 160.62 DDCS controller act1 type to DC voltage • 160.63 DDCS controller act2 type to Active power	☐
Data from DC/DC converter to PLC: • 161.51 Data set 11 data 1 selection to SW 16bit (106.11 Main status word) • 161.52 Data set 11 data 2 selection toAct1 16bit (101.01 DC voltage) • 161.53 Data set 11 data 3 selection to Act2 16bit (101.12 Power) • 161.54 Data set 13 data 1 selection to 102.02[16] (102.02 ES voltage used if BAMU-1x board is used) • 161.55 Data set 13 data 2 selection to 130.103[16] (130.103 Minimum current available) • 161.56 Data set 13 data 3 selection to 130.104[16] (130.104 Maximum current available) • 161.57 Data set 15 data 1 selection to 130.101[16] (130.101 DDC limit word 1) • 161.58 Data set 15 data 2 selection to 101.20[16] (101.20 Converter current) • 161.59 Data set 15 data 3 selection to 105.11[16] (105.11 Converter temperature %) • 161.60 Data set 17 data 1 selection to 104.01[16] (104.01 Tripping fault) • 161.61 Data set 17 data 2 selection to 104.06[16] (104.06 Active warning 1)	☐
Data from PLC to DC/DC converter: • 162.51 Data set 10 data 1 selection to CW 16bit (106.01 Main control word) • 162.52 Data set 10 data 2 selection to Ref1 16bit (DC voltage reference) • 162.53 Data set 10 data 3 selection to Ref2 16bit (Current reference) • 162.54 Data set 12 data 1 selection to 130.109[16] (130.109 Max charge current) • 162.55 Data set 12 data 2 selection to 130.110[16] (130.110 Max discharge current) • 162.56 Data set 12 data 3 selection to 197.13[16] (197.13 Control mode) If BAMU-1x board is not used, energy storage voltage must be sent in first fast dataset and the voltage reference in slower one: • 162.52 Data set 10 data 2 selection to 197.15[16) (197.15 ES voltage input) • 162.57 Data set 14 data 1 selection to Ref1 16bit (DC voltage reference)	☐

Tasks	☑
Testing the PLC operation	
After setting the fieldbus parameters, make a parameter backup with Drive composer PC tool. Test first the references sent by PLC. The references and the control mode selections can be tested in local control mode. The final scaled power/current reference can be monitored in parameter 122.05 Power ref 2, and the final scaled DC voltage reference can be monitored in parameter 123.05 DC voltage ref 2. Before the first start, set the current limits to low values, for example: • 130.119 Minimum current to -5 A • 130.120 Maximum current to 50 A Check that PLC sends the power selection to parameter • 197.13 Control mode (selection Power) Compare that the actual values on PLC have correct scalings. After testing, make a parameter backup.	☐

Note: If the application changes, you need to adjust the parameter settings again according to the new application.

3

Using the control panel

Refer to ACS-AP-I, -S, -W and ACH-AP-H, -W assistant control panels user's manual (3AUA0000085685 [English]).

4

Control locations and operating modes

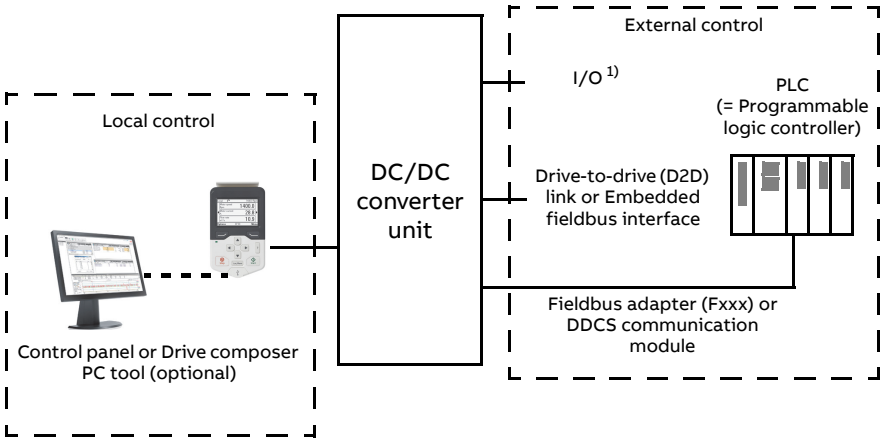
Contents of this chapter

This chapter describes the control locations and operating modes supported by the control program.

Control locations for start/stop

Local control vs. external control

The ACS880 has two main control locations: external and local. The control location is selected with the Loc/Rem key on the control panel or in the PC tool.



1) Extra inputs/outputs can be added by installing optional I/O extension modules (FIO-xx) in the option slots of the control unit.

External control

When the DC/DC converter is in external control, control commands are given through

- the I/O terminals (digital and analog inputs)
- fieldbus interface (via the embedded fieldbus interface or an optional fieldbus adapter module) or
- optional I/O extension modules.

External references are given through the fieldbus interface or analog inputs.

Note: Typically, ABB wires essential external control signals and status monitoring signals of a DC/DC converter of the cabinet-installed drive to its digital inputs and relay outputs at the factory. We also set the parameters related to the external control signals accordingly. The commission engineer must not change these settings or the external control does not operate as planned. See the delivery-specific circuit diagrams.

Local control

Only the start and stop commands are given from the control panel when the DC/DC converter is in local control. If the user does not want to use the power/current or DC voltage references sent by PLC in local control, the power/current reference can be given to parameter 122.01 User Power ref when parameter 122.02 Power ref sel is set to User ref. Correspondingly, the DC voltage reference can be given to parameter 123.01 User DC voltage ref when parameter 123.02 DC voltage ref selection is set to User ref.

Local control is mainly used during commissioning and maintenance. When switched to local control, the control panel Start and Stop keys override the external Start/Stop source defined for the control program. However, to control the DC/DC converter unit on and off by the panel, you must still have the Run enable and Start

enable commands on in the control program. See section Run enable, Start/stop and Start enable control on page 36. Changing the control location to local can be disabled by parameter (119.17).

The user can select by a parameter (149.05) how the DC/DC converter unit reacts to a control panel or PC tool communication break.

Operating modes of the converter

The operating mode is selected with parameter (197.13).

DC voltage control mode

In DC voltage control mode either DC bus voltage or energy storage voltage can be controlled. The converter follows the voltage reference that can be given by parameter or fieldbus.

Settings

Parameter group 123 DC voltage reference (page 108), parameter 197.13 Control mode (page 163)

Power control mode

In the power control mode the converter follows the reference that can be given to the converter by parameter or fieldbus. Under steady load conditions the sum of all three phase average currents of the converter module equals the reference current. The current sign is positive when the current flows towards the positive terminal of the energy storage so that the energy storage is charged.

Settings

Parameter groups 122 Power reference (page 107), 129 Current controller (page 111), parameter 197.13 Control mode (page 163)

Add mode

In the Add mode, the current reference and the voltage controller output are added together to produce the final current reference. This can be useful in stabilizing the voltage control when there is pre-information of the changing load conditions. For example, when the upper control in an overriding controller is about to increase or decrease the torque of an inverter unit connected to the common DC bus, it could also calculate and send an appropriate current feed-forward reference to the DC/DC converter.

Settings

Parameter 197.13 Control mode (page 163)

5

Program features

Contents of this chapter

This chapter describes the features and I/O interface of the DC/DC converter control program.

DC/DC converter configuration and programming

Programming via parameters

Parameters can be set via

- the control panel
- the Drive composer PC tool or
- the fieldbus interface, as described in chapter Fieldbus control through a fieldbus adapter.

All parameter settings are stored automatically to the permanent memory of the DC/DC converter unit. However, if an external +24 V DC power supply is used for the control unit, it is highly recommended to force a save by using parameter (196.07) before powering down the control unit after any parameter changes have been made.

If necessary, the default parameter values can be restored by parameter (196.06).

Adaptive programming

Conventionally, the user can control the operation of the DC/DC converter by parameters. However, the standard parameters have a fixed set of choices or a setting range. To further customize the operation of the DC/DC converter, an adaptive program can be constructed out of a set of function blocks.

The Drive composer PC tool has an Adaptive programming feature with a graphical user interface for building the custom program. The function blocks include the usual arithmetic and logical functions, as well as eg. selection, comparison and timer blocks. The program can contain a maximum of 20 blocks. The adaptive program is executed on a 10 ms time level.

For selecting input to the program, the user interface has pre-selections for the physical inputs, common actual values, and other status information of the DC/DC converter. Parameter values as well as constants can also be defined as inputs. The output of the program can be used eg. as a start signal, external event or reference, or connected to the drive outputs. Note that connecting the output of the adaptive program to a selection parameter will write-protect the parameter.

The status of the adaptive program is shown by parameter 107.30 Adaptive program status. The adaptive program can be disabled by 196.70 Disable adaptive program.

Please note that sequential programming is not supported.

For more information, see the Adaptive programming application guide (3AXD50000028574 [English]).

Control interfaces

Programmable analog inputs

The control unit has two programmable analog inputs. Each of the inputs can be independently set as a voltage (0/2 … 10 V or -10 … 10 V) or current (0/4 … 20 mA) input by a switch on the control unit. Each input can be filtered, inverted and scaled. The number of analog inputs can be increased by using FIO-11 or FAIO-01 I/O extensions.

Note: As standard, the DC/DC converter control program does not use the analog inputs, but they can be used for energy storage voltage measurement. However, there are terminals for two analog inputs, and a parameter group for the signal processing.

Settings

Parameter group 112 Standard AI (page 74).

Programmable analog outputs

The control unit has two current (0 … 20 mA) analog outputs. Each output can be filtered, inverted and scaled. The number of analog outputs can be increased by using FIO-11 or FAIO-01 I/O extensions.

Settings

Parameter group 113 Standard AO (page 76).

Programmable digital inputs and outputs

The DC/DC converter unit has six digital inputs, a digital start interlock input, and two digital input/outputs.

Digital input/output DIO1 can be used as a digital input, relay output or frequency input, DIO2 as a digital input, relay output or frequency output.

The number of digital inputs/outputs can be increased by installing FIO-01, FIO-11 or FDIO-01 I/O extensions.

Note: Do not change the settings of the reserved digital inputs (or outputs, if any).

Settings

Parameter groups 110 Standard DI, RO (page 66) and 111 Standard DIO, FI, FO (page 70).

Programmable relay outputs

The control unit has three relay outputs. The signal to be indicated by the outputs can be selected by parameters. Relay outputs can be added by installing FIO-01 or FDIO-01 I/O extensions.

Note: Do not change the settings of the reserved relay outputs.

Settings

Parameter group 110 Standard DI, RO (page 66).

Programmable I/O extensions

The number of inputs and outputs can be increased by using I/O extension modules. The I/O configuration parameters include the maximum number of DI, DIO, AI, AO and RO that can be in use with different I/O extension module combinations. Slots can be added by connecting an FEA-03 I/O extension adapter.

The table below shows the possible I/O combinations.

Location	Digital inputs (DI)	Digital I/Os (DIO)	Analog inputs (AI)	Analog outputs (AO)	Relay outputs (RO)
Control unit	7	2	2	2	3
FIO-01	-	4	-	-	2
FIO-11	-	2	3	1	-
FAIO-01	-	-	2	2	-
FDIO-01	3	-	-	-	2

Three I/O extension modules can be activated and configured using parameter groups 114 Extension I/O module 1…116 Extension I/O module 3.

Note: Each configuration parameter group contains parameters that display the values of the inputs on that particular extension module. These parameters are the only way of utilizing the inputs on I/O extension modules as signal sources. To connect to an input, choose the setting Other in the source selector parameter, then specify the appropriate value parameter (and bit, for digital signals) in group 114, 115 or 116.

Settings

Parameter groups 114 Extension I/O module 1 (page 79), 115 Extension I/O module 2 (page 96), 112 Standard AI (page 74) and 116 Extension I/O module 3 (page 100).

Fieldbus control

The DC/DC converter unit can be connected to an overriding control system via an optional fieldbus adapter. See chapter Fieldbus control through a fieldbus adapter (page 209).

Settings

Parameter groups 150 FBA (page 137), 151 FBA A settings (page 142), 152 FBA A data in (page 143), 153 FBA A data out (page 144), 154 FBA B settings (page 144), 155 FBA B data in (page 145), and 156 FBA B data out (page 146).

Run enable, Start/stop and Start enable control

The user can control the operation of the DC/DC converter with the Run enable command, Start/Stop command and Start enable command. There are parameters in the control program for defining the value or source for each of the commands. By default, all commands are on.

Note: When you switch the control panel to local control, the control program starts reading the Start/Stop from the panel (Start and Stop keys). The parameter-defined Start/Stop source is not valid until you switch the panel back to remote control. The Loc/Rem key of the panel selects between local and remote control.

WARNING! Do not change the parameter settings related to Run enable, Start/Stop or Start enable unless you are absolutely sure what you are doing. The I/O wirings of the cabinet-installed multidrive are done at the factory.

Settings and diagnostics

Control panel key: Loc/Rem

Parameters: 120.01 Ext1 commands…120.04 Ext1 in2 source, 120.12 Run enable 1 source, 120.19 Enable start command

Warnings: AE5A Enable start signal missing, AE5B Run enable missing

DC/DC converter system

DC/DC converter (DDC) transfers energy from a common DC bus of an ACS880 drive into an external energy storage and discharges energy back to the DC bus. This is useful, for example, if you want to store the braking energy of an high inertia motor and utilize the energy later when accelerating the motor. This saves energy compared to the use of a brake chopper and a resistor where the surplus motor braking energy is dissipated in the brake resistor as heat. The energy storage can be, for example, a battery or super capacitor.

The recommended energy storage operating voltage is

$U_{storage}$ = 150 V… 80% of U_{DC}

It is not optimal to operate with a low energy storage voltage. The normal operation range is indicated in the type designation label. The DC bus voltage cannot be lower than the energy storage voltage.

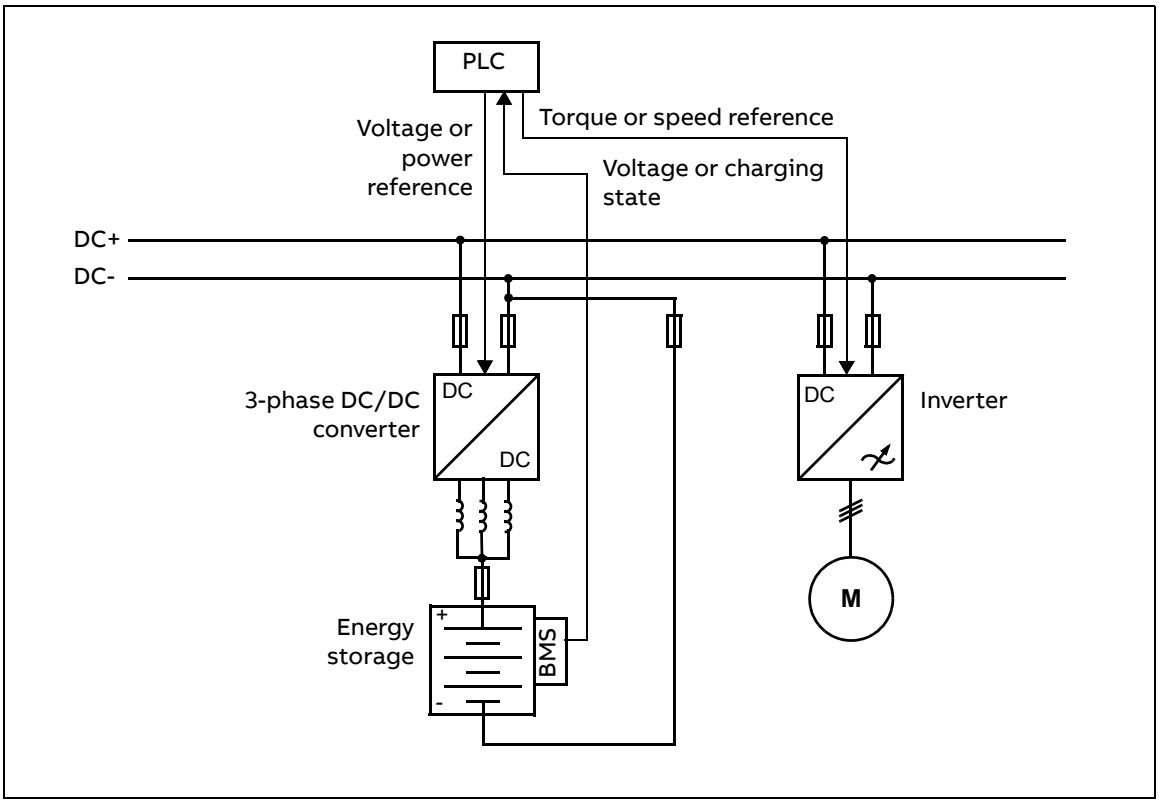
The DC/DC converter consists of a three-phase IGBT bridge, and of three output inductors (chokes), one for each phase. The outputs of the chokes are all connected to the positive terminal of the energy storage. The negative terminal of the energy storage is connected to the negative potential of the drive DC bus.

Example diagrams

The following are example representations of systems where an overriding controller (PLC) supervises the charging state of a battery through the battery management system (BMS) and sends control reference to the DC/DC converter via fieldbus interface.

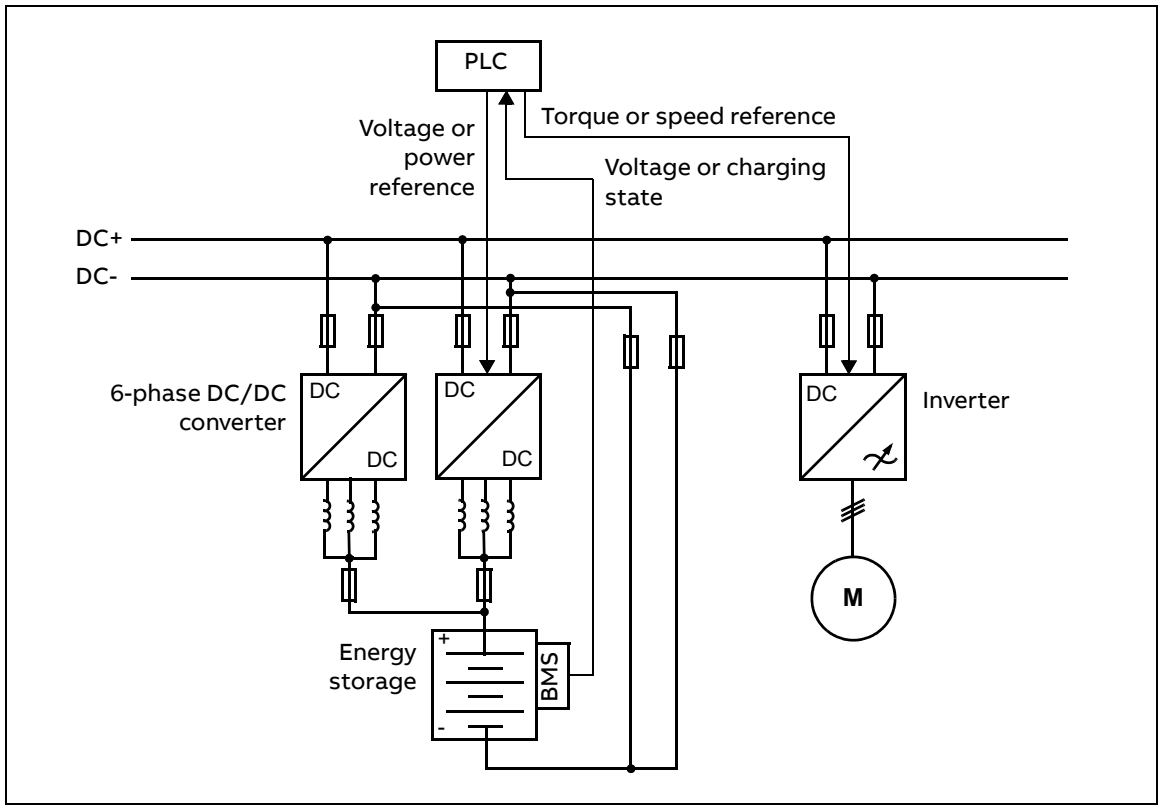
3-phase DC/DC converter

3-phase modulator is used with single DC/DC converter modules. The 3-phase modulator has a phase shift of 120 degrees. For a 6-phase DC/DC converter, see page 39.



6-phase DC/DC converter

6-phase modulator is used with parallel-connected DC/DC converter modules. Parallel connections are limited to two modules. The 6-phase modulator has a phase shift of 60 degrees instead of 120 degrees in the 3-phase modulator. The 6-phase modulator reduces the current ripple remarkably compared to the 3-phase modulator. The modulator type is selected automatically based on the DC/DC converter rating. For a 3-phase DC/DC converter, see page 38.



Summary of measurements

The DC/DC converter control program runs on a UCU control unit. There are following measurements:

- phase currents
- DC bus voltage
- module temperature measurement
- ambient temperature measurement.

Energy storage voltage measurement and estimation

Typically an energy storage must be somehow protected against too high charging or discharging. Depending on the storage type, the possible implementations of the protections differ.

If the energy storage is a battery, there is normally a battery management system (BMS) which alerts the overriding controller of the converter system. The overriding controller must reduce the current reference or update current limits in the DC/DC converter according to the BMS's request so that the DC/DC converter cannot overcharge or overdischarge the battery. If the overriding controller is in charge of the protection and it sends the energy storage voltage data, you do not need to connect the additional battery voltage measurement to the DC/DC converter.

If the energy storage is a super capacitor, there is a risk of overcharging if the highest possible DC bus voltage of the converter system is higher than the maximum allowed voltage for the super capacitor. There are two methods to protect the capacitor from the overvoltage and overcharging:

- Measure the super capacitor voltage, connect the value back to the DC/DC converter and tune an overvoltage protection function in the converter control program.
- Connect an external protective device between the super capacitor and the DC/DC converter which detects an excessive voltage level and disconnects the converter when necessary.

While running, the DC/DC converter can also estimate the energy storage voltage (102.03 ES voltage estimated). The measurement of the energy storage voltage can be supervised by comparing it against the estimated energy storage voltage.

Settings and diagnostics

Parameters: 102.03 ES voltage estimated, 130.114 Maximum ES voltage, 131.22 ES under voltage level, 131.23 ES over voltage level, 131.24 ES voltage difference, 131.25 User current fault limit, 197.14 ES voltage source

Warnings: AE86 Parameters not set

Faults: 2E0C User current fault, 3E11 ES voltage difference, 3E12 ES overvoltage, 3E13 ES undervoltage

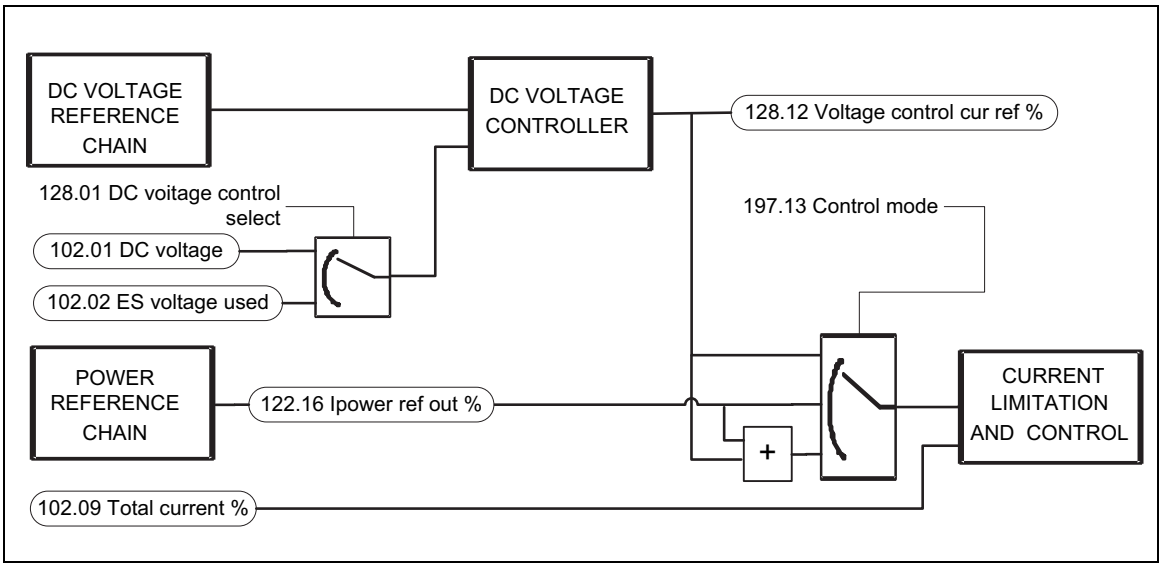
Reference chains

The operating mode selection (197.13) defines which reference chains are in use:

- If DC voltage control mode is in use (197.13 Control mode is set to DC voltage), the DC/DC converter uses DC voltage reference chain.
- If power control mode is in use (197.13 Control mode is set to Power), the DC/DC converter uses power reference chain.

Block diagram

The following diagram describes the operation of the reference chains.



DC voltage reference chain

DC voltage control mode is the default operating mode of the DC/DC converter. It is also the alternative operating mode for the power control mode.

When the DC voltage control mode is on, the converter controls either the drive DC bus voltage or the energy storage voltage. DC voltage control includes DC voltage reference selection, limitation and ramping. In the voltage control mode you can select with a parameter (128.01) whether you want to control the drive DC bus voltage or energy storage voltage.

DC voltage controller

The parameter group 128 DC voltage controller contains the voltage controller tuning parameters. The voltage controller is a PI controller that calculates a current reference for current control loop based on the difference between the measured voltage and the voltage reference.

Control chain diagram

See page 222.

Settings and diagnostics

Parameters: parameter 197.13 Control mode, parameter groups 123 DC voltage reference, 128 DC voltage controller and 130 Limits

Power reference chain

Power control mode is an alternative operating mode for the DC voltage control mode. The power reference chain includes reference selection, limitation and ramping.

The power reference chain modifies the input reference to the active current reference for the current control. Possible input reference types are:

- active current reference in Amperes
- active current reference in percent of the nominal current
- power reference in kW
- power reference in percent of the nominal power.

If power reference type is power in kW or percent, energy storage voltage measurement is needed. The control program contains a limitation feature for limiting the active power based on ambient temperature or the temperature of the IGBTs. The user can tune the limitation parameters.

Control chain diagram

See page 225.

Settings and diagnostics

Parameters: parameter 197.13 Control mode, parameter groups 122 Power reference, 129 Current controller and 130 Limits

Current controller

The current control uses the output of the DC voltage reference chain or the power reference chain as its input. The operating mode selection (197.13) defines which one of the input is in use. The parameter group 129 Current controller contains current limits and signals for showing the unprocessed and processed current reference values.

Control diagram

See pages 226…227.

Settings and diagnostics

Parameters: parameter 197.13 Control mode, parameter groups 129 Current controller and 130 Limits

Operating mode selection and general control settings

The parameter group 197 Chopper control contains the operating mode selection (197.13), and general settings for DC/DC converter control. You can, eg. define the settings for energy storage voltage measurement and DC voltage offset.

Settings and diagnostics

Parameters: parameter group 197 Chopper control

Safety and protections

There are following protections:

- output short circuit
- overcurrent
- energy storage overvoltage
- output phase lost
- DC bus overvoltage
- IGBT overtemperature
- module overtemperature.

There are following protections in parallel-connected DC/DC converter modules:

- phase current difference between parallel modules
- DC voltage difference between parallel modules
- monitoring of temperature difference between parallel modules.

Programmable protection functions

External events (parameters 131.01 and 131.10)

An external event signal can be connected to a selectable input. When the signal is lost, an external event (fault, warning, or a mere log entry) is generated.

Local control loss detection (parameter 149.05)

The parameter selects how the DC/DC converter unit reacts to a control panel or PC tool communication break.

Earth leakage fault source selection (parameter 131.28)

The parameter selects in which digital input or digital input/output earth leakage fault is connected.

Supervision of an earth leakage indication (parameters 131.28 and 131.29)

The control program has a supervision function for an external earth fault leakage monitoring device. There is a source selection parameter (131.28) for the earth leakage indication signal and a parameter for the action (131.29).

DC bus overvoltage limits

The program monitors DC bus voltage level with an internal voltage measurement. When the measured value exceeds the overvoltage limit, the control program trips to a fault. The following table shows the DC bus overvoltage trip limits.

DC/DC converter type	Overvoltage fault limit
	[V DC]
R8i, xxxxA-3	859.5
R8i, xxxxA-5	895.5
R8i, xxxxA-7	1293
R8iLC, xxxxA-7	1293

Temperature supervisions

Choke temperature

Thermal switches supervise the choke temperature outside the DC/DC converter module. The switches are connected in series and wired to a digital input (DI1) of the control unit (1 = OK, 0 = overtemperature). In case of an overtemperature, a switch opens and the control program generates first a warning, and then, if the overtemperature indication remains over a pre-defined delay, the DC/DC converter unit trips to a fault. The user can adjust the delay time with a parameter (110.06).

Settings and diagnostics

Parameters: 101.31 Ambient temperature, 105.11 Converter temperature %, 110.06 DI1 OFF delay

Warnings: AE14 Excess temperature, AE15 Excess temperature difference, AE16 IGBT temperature

Faults: 4E02 IGBT temperature, 4E03 Excess temperature, 4E04 Excess temperature difference, 4E06 Cabinet temperature fault

Control unit temperature

A temperature sensor integrated into the control unit supervises the ambient temperature of the control unit.

Settings and diagnostics

Warnings: AE60 Control board temperature

Faults: 4E07 Control board temperature

Generic timers and counters

The program has six different maintenance timers or counters that can be configured to generate a warning when a pre-defined limit is reached. The contents of the message can be edited on the control panel by selecting **Settings – Edit texts**.

The timer/counter can be set to monitor any parameter. This feature is especially useful as a service reminder.

There are three types of counters:

- On-time timers. Measures the time a binary source (for example, a bit in a status word) is on.
- Signal edge counters. The counter is incremented whenever the monitored binary source changes state.
- Value counters. The counter calculates its actual value by integrating the monitored value with respect to time. For example, if you monitor the actual power with a value counter, the value counter calculates and displays the cumulative energy. You can also define limits and select indication messages for the counter.

Settings

Parameter group 133 Generic timer & counter (page 126).

Load analyzer

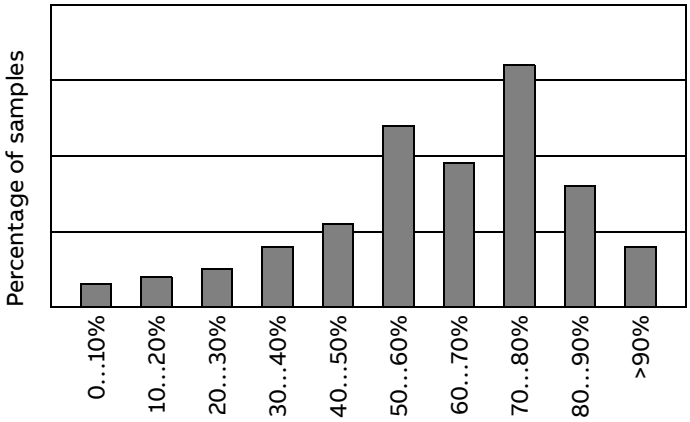
Peak value logger

The user can select a signal to be monitored by a peak value logger. The logger records the peak value of the signal along with the time the peak occurred, as well as line current, DC voltage and power at the time of the peak. The peak value is sampled at 2 ms intervals.

Amplitude loggers

The control program has two amplitude loggers.

For amplitude logger 2, the user can select a signal to be sampled at 200 ms intervals, and specify a value that corresponds to 100%. The collected samples are sorted into 10 read-only parameters according to their amplitude. Each parameter represents an amplitude range 10 percentage points wide, and displays the percentage of the collected samples that have fallen within that range.



Amplitude ranges (parameters 136.40…136.49)

Amplitude logger 1 is fixed to converter current, and cannot be reset. With amplitude logger 1, 100% corresponds to the maximum current of the drive. The measured current is logged continuously. The distribution of samples is shown by parameters 136.20…136.29.

Settings

Parameter group 136 Load analyzer (page 131).

Default I/O connection diagram (UCU)

Terminal		Description
XD2D		**Drive-to-drive link**
1	D2D_B	Drive-to-drive link (not in use by default)
2	D2D_A	
3	BGND	
4	SHIELD	
XD2D TERM		Drive-to-drive link termination switch [1].
X485		**RS485 connection**
5	B	Not in use (not in use by default)
6	A	
7	BGND	
8	SHIELD	
X485 BIAS		X485 bias selection switch.
X485 TERM		X485 termination switch.
XCAN		**CAN bus**
9	CAN_H	Not supported
10	CAN_L	
11	CAN_CGND	
12	CAN_SHLD	Control cable shield
XCAN TERM		CANopen termination switch.
XRO1...XRO4		**Relay outputs**
11	NC1	XRO1: Not in use 250 V AC / 30 V DC / 2 A
12	COM1	
13	NO1	
21	NC2	XRO2: **Fault(-1)** [2] (Energized = no fault) 250 V AC / 30 V DC / 2 A
22	COM2	
23	NO2	
31	NC3	XRO3: **Running** [2] (DDC running, fan control on) 250 V AC / 30 V DC / 2 A
32	COM3	
33	NO3	
41	NC4	XRO4: Not supported 250 V AC / 30 V DC / 2 A
42	COM4	
43	NO4	
XSTO		**XSTO connector**
1	OUT	XSTO connector. Both circuits (power module, control unit) must be closed for the unit to start. (IN1 and IN2 must be connected to OUT.) [7]
2	SGND	
3	STO1	
4	STO2	
XSTO OUT		**XSTO OUT connector**
5	OUT1	Not in use by default.
6	SGND	
7	OUT2	
8	SGND	
XDI		**Digital inputs**
1	DI1	Temp fault [2] (0 = choke overtemperature)
2	DI2	Not in use by default.
3	DI3	
4	DI4	
5	DI5	
6	DI6	Reset [2] (0 -> 1 = fault reset)
7	DIIL	Not in use by default.
XDIO		**Digital input/outputs**
1	DIO1	Not in use by default
2	DIO2	Not in use by default
3	DIOGND	Digital input/output ground
4	DIOGND	Digital input/output ground
XD24		**Auxiliary voltage output**
5	+24VD	+24 V DC 200 mA [5]
6	DICOM	Digital input ground
7	+24VD	+24 V DC 200 mA [5]
8	DIOGND	Digital input/output ground
DICOM=DIOGND		Ground selection switch [6]
XAI		**Analog inputs, reference voltage output**
1	+VREF	10 V DC, R_L 1...10 kohm
2	-VREF	-10 V DC, R_L 1...10 kohm
3	AGND	Ground
4	AI1+	Not in use by default.
5	AI1-	0(2)...10 V, R_{in} > 200 kohm [3]
6	AI2+	Not in use by default.
7	AI2-	0(4)...20 mA, R_{in} = 100 ohm [4]

Terminal		Description
XAO		**Analog outputs**
1	AO1	**Zero** [2] 0…20 mA, R_L < 500 ohm
2	AGND	
3	AO2	**Zero** [2] 0…20 mA, R_L < 500 ohm
4	AGND	
XPOW		**External power input**
1	+24V	24 V DC, 2.05 A
2	GND	
3	+24V	
4	GND	
XFSO		Safety functions module connection (not in use in DC/DC converter)
XETH1		Ethernet ports for fieldbus. Not in use by default.
XETH2		
XETH3		Ethernet ports for tool communication. Not in use by default.
XETH4		
XPAN		Control panel connection
XPAN TERM		Control panel connection termination switch
MEM		Memory unit connection

The table above shows the control connections of the DC/DC converter, and the default meaning or use of the signals in the control program.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (24…12 AWG). Tightening torque is 0.45 N·m (4 lbf·in).

Notes:

[1] Must be set to ON when the converter is the first or last unit on the drive-to-drive (D2D) link.

[2] Default use of the signal in the control program. The use can be changed by a parameter. For the delivery-specific use, see the delivery-specific circuit diagrams.

[3] Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI1. Change of setting requires reboot of control unit.

[4] Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI2. Change of setting requires reboot of control unit.

[5] Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.

[6] Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats).
DICOM=DIOGND ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.

[7] This input only acts as a true Safe torque off input in control units controlling a motor. In other applications (such as a supply or brake unit), de-energizing the STO1 and/or STO2 terminal will stop the unit but not constitute a SIL/PL classified safety function.

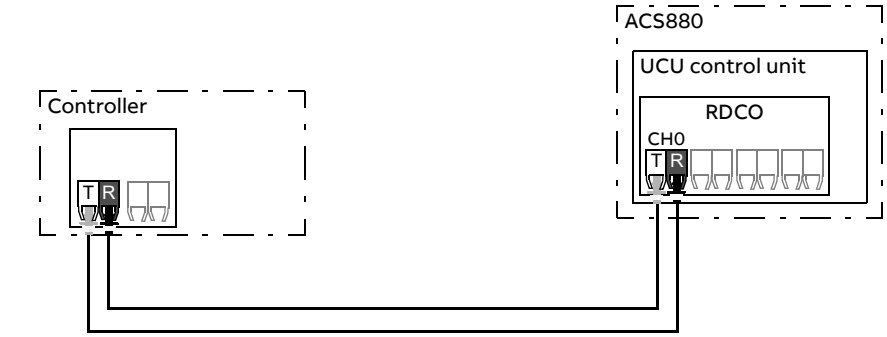
DDCS communication

General

The DC/DC converter can be connected to an external controller that supports the ABB DDCS communication (such as the ABB AC 800M) using fiber optic cables. UCU control unit requires an RDCO module.

Topology

An example connection with a UCU-based converter is shown below. Ring and star configurations are also possible, and the external controller connects to channel CH0 on the RDCO module.



T = Transmitter; R = Receiver

Communication

The communication between the controller and the converter consists of data sets of three 16-bit words each. The controller sends a data set to the converter, which returns the next data set to the controller.

The communication uses data sets 10…33. Data sets with even numbers are sent by the controller to the converter, while data sets with odd numbers are sent by the converter to the controller. The contents of the data sets are freely configurable, but data set 10 typically contains the control word and one or two references, while data set 11 returns the status word and selected actual values.

The word that is defined as the control word is internally connected to the drive logic; the coding of the bits is as presented in section Contents of the fieldbus Control word (page 215). Likewise, the coding of the status word is as shown in section Contents of the fieldbus Status word (page 216).

By default, data sets 32 and 33 are dedicated for the mailbox service. By parameter (160.64), data sets 24 and 25 can be selected instead of data sets 32 and 33.

For the DC/DC converter modules, the system integrator can acquire the necessary cables and adapters for the physical link of the DDCS communication from ABB and install and set up the link on his/her own. Consult ABB for more information.

Settings and diagnostics

Parameters: parameter groups 160 DDCS communication, 161 DDCS transmit, 162 DDCS receive

Warnings: AE6D DDCS controller comm loss

Faults: 7E11 DDCS controller comm loss

Data storage (DDCS controller) parameters

Twenty-four (sixteen 32-bit, eight 16-bit) parameters are reserved for data storage. These parameters are unconnected and can be used for linking, testing and commissioning purposes. They can be written to and read from using other parameters' source or target selections.

Settings

Parameter group 147 Data storage (page 134).

User lock

For better cybersecurity, it is highly recommended that you set a master pass code to prevent eg. the changing of parameter values and/or the loading of firmware and other files.

WARNING! ABB will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. See Cybersecurity disclaimer (page 14).

To activate the user lock for the first time,

- Enter the default pass code, 10000000, into 196.02 Pass code. This will make parameters 196.100…196.102 visible.
- Enter a new pass code into 196.100 Change user pass code. Always use eight digits; if using Drive composer, finish with Enter.
- Confirm the new pass code in 196.101 Confirm user pass code.

WARNING! Store the pass code in a safe place – the user lock cannot be opened even by ABB if the pass code is lost.

- In 196.102 User lock functionality, define the actions that you want to prevent (we recommend you select all the actions unless otherwise required by the application).
- Enter an invalid (random) pass code into 196.02 Pass code.
- Activate 196.08 Control board boot, or cycle the power to the control unit.
- Check that parameters 196.100…196.102 are hidden. If they are not, enter another random pass code into 196.02.

To reopen the lock, enter your pass code into 196.02 Pass code. This will again make parameters 196.100…196.102 visible.

The control program generates warning AE7F User pass code not changed until user pass code 10000000 has been changed, or the warning is disabled with parameter 131.40, bit 7 (Default pass code).

Settings

Parameters 196.02 (page 157) and 196.100…196.102 (page 160).

Distributed I/O bus

Distributed I/O bus controls and supervises each cabinet fan separately. It detects malfunctioning fans and indicates them with warning or fault messages. The distributed I/O bus is controlled by CIO-01 I/O module. For more information, see CIO-01 I/O module for distributed I/O bus control user's manual (3AXD50000126880 [English]).

Settings

Parameter groups 206 I/O bus configuration, 207 I/O bus service, 208 I/O bus diagnostics and 209 I/O bus fan identification (page 164)

Similar supervisions to the ones activated from parameters 131.38 Fuse trip fault source and 131.39 Brake chopper fault source (page 124) via standard I/O can be activated also via distributed I/O.

Distributed I/O is available for liquid-cooled units only.

6

Parameters

Contents of this chapter

The chapter describes the parameters, including actual signals, of the control program.

Terms and abbreviations

Term	Definition
Actual signal	Type of parameter that is the result of a measurement or calculation by the DC/DC converter unit, or contains status information.
Def	(In the following table, shown on the same row as the parameter name.) Default value of a parameter.
FbEq16	(In the following table, shown on the same row as the parameter range, or for each selection.) 16-bit fieldbus equivalent. Scaling between the value shown on the panel and the integer used in fieldbus communication when a 16-bit value is selected for transmission to an external system. Dash (-) indicates that the parameter is not accessible in 16-bit format. Corresponding 32-bit scalings are listed in chapter Additional parameter data (page 165).
Other	The value is taken from another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter. **Note:** The source parameter must be a 32-bit real (floating point) number. To use a 16-bit integer (for example, received from an external device in data sets) as the source, data storage parameters 147.01…147.08 (page 134) can be used.
Other [bit]	Value is taken from a specific bit in another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter and bit.

Term	Definition
Parameter	Either an user-adjustable operating instruction for the DC/DC converter unit, or an actual signal.
p.u.	Per unit

Summary of parameter groups

Group	Contents	Page
101 Actual values	Basic signals for monitoring of the DC/DC converter unit.	55
102 Actual values	Basic signals for monitoring of the DC/DC converter used by the converter control.	56
103 Input references	Values of references received from various sources.	57
104 Warnings and faults	Information on warnings and faults that occurred last.	58
105 Diagnostics	Various run-time-type counters and measurements related to DC/DC converter unit maintenance.	59
106 Control and status words	Control and status words.	60
107 System info	Hardware and firmware information.	65
110 Standard DI, RO	Status and configuration of digital inputs and relay outputs.	66
111 Standard DIO, FI, FO	Configuration of digital input/outputs and frequency inputs/outputs.	70
112 Standard AI	Configuration of analog inputs.	74
113 Standard AO	Configuration of analog outputs.	76
114 Extension I/O module 1	Configuration of I/O extension module 1.	79
115 Extension I/O module 2	Configuration of I/O extension module 2.	96
116 Extension I/O module 3	Configuration of I/O extension module 3.	100
119 Operation mode	Selection of external control location sources.	104
120 Start/stop	Start/stop, run/enable and start enable signal source selection.	104
121 Start/stop mode	Emergency stop mode and signal source selection.	106
122 Power reference	Settings and signals for the power reference chain.	107
123 DC voltage reference	Settings and signals for the DC voltage reference chain.	108
128 DC voltage controller	Settings and signals for the DC voltage controller.	110
129 Current controller	Settings and signals of the current controller.	111
130 Limits	Converter operation limits.	112
131 Fault functions	Settings that define the behavior of the DC/DC converter unit upon fault situations.	118
133 Generic timer & counter	Configuration of maintenance timers/counters.	126
136 Load analyzer	Peak value and amplitude logger settings.	131
146 Monitoring settings	Scaling settings.	134
147 Data storage	Parameters that can be written to and read from by using source and target settings of other parameters.	134
149 Panel port communication	Communication settings for the control panel port on the DC/DC converter unit.	136
150 FBA	General settings for fieldbus communication configuration.	137
151 FBA A settings	Fieldbus adapter A configuration.	142
152 FBA A data in	Selection of data to be transferred from DC/DC converter unit to fieldbus controller through fieldbus adapter A.	143
153 FBA A data out	Selection of data to be transferred from fieldbus controller to the DC/DC converter unit through fieldbus adapter A.	144
154 FBA B settings	Fieldbus adapter B configuration.	144
155 FBA B data in	Selection of data to be transferred from the DC/DC converter unit to fieldbus controller through fieldbus adapter B.	145
156 FBA B data out	Selection of data to be transferred from fieldbus controller to the DC/DC converter unit through fieldbus adapter B.	146
160 DDCS communication	DDCS communication configuration.	146
161 DDCS transmit	Defines the data sent to the DDCS link.	148
162 DDCS receive	Mapping of data received through the DDCS link.	151

Group	Contents	Page
191 BAMU configuration	Configuration of the measuring board (BAMU-1x).	155
192 Additional actual values 2	Actual values for the additional phases of the 6-phase modulator.	155
195 HW configuration	Various hardware-related settings.	155
196 System	Language selection; pass code; parameter save and restore; control unit reboot.	157
197 Chopper control	DC/DC converter control settings.	162
206 I/O bus configuration 207 I/O bus service 208 I/O bus diagnostics 209 I/O bus fan identification	Distributed I/O bus settings.	164

Parameter listing

WARNING! Do not change any parameter settings unless you are absolutely sure what you are doing.

No.	Name/Value	Description	Def/FbEq16
101 Actual values		Basic signals for monitoring of the DC/DC converter unit.	
101.01	DC voltage	Shows the filtered intermediate circuit voltage [V].	-
	0.00…2000.00 V	Intermediate circuit voltage.	1 = 1 V
101.12	Power	Shows the filtered power [kW].	-
	-30000.00… 30000.00 kW	Power.	1 = 1 kW
101.13	Power %	Shows the power in percent of nominal [%].	-
	-1000.0…1000.0%	Power in percent of nominal.	1 = 1 %
101.20	Converter current	Shows the filtered converter module current in Amperes.	-
	0.00…30000.00 A	Converter module current.	1 = 1 A
101.21	Converter current %	Shows the filtered converter module current in percent.	-
	0.0…1000.0%	Converter module current in percent.	1 = 1%
101.22	kWh supply	Counts the net kWh.	-
	-1000…1000 kWh	kWh value.	10 = 1 kWh
101.23	MWh supply	Counts the net MWh.	-
	-1000…1000 MWh	MWh value.	1 = 1 MWh
101.24	GWh supply	Counts the net GWh.	-
	-32768… 32767 GWh	GWh value.	1 = 1 GWh
101.25	kWh motoring	Shows the energy (kWh) that the DC/DC converter has transferred from converter DC bus to the energy storage.	-
	0…1000 kWh	kWh value.	10 = 1 kWh
101.26	MWh motoring	Shows the energy (MWh) that the DC/DC converter has transferred from converter DC bus to the energy storage.	-
	0…1000 MWh	MWh value.	1 = 1 MWh
101.27	GWh motoring	Shows the energy (GWh) that the DC/DC converter has transferred from converter DC bus to the energy storage.	-
	0…32767 GWh	GWh value.	1 = 1 GWh
101.28	kWh generating	Shows the energy (kWh) that the DC/DC converter has transferred from the energy storage to the converter DC bus.	-
	0…1000 kWh	kWh value.	10 = 1 kWh
101.29	MWh generating	Shows the energy (MWh) that the DC/DC converter has transferred from the energy storage to the converter DC bus.	-
	0…1000 MWh	MWh value.	1 = 1 MWh
101.30	GWh generating	Shows the energy (GWh) that the DC/DC converter has transferred from the energy storage to the converter DC bus.	-
	0…32767 GWh	GWh value.	1 = 1 GWh

No.	Name/Value	Description	Def/FbEq16
101.31	Ambient temperature	Shows the temperature of module incoming air [°C].	-
	-50…150 °C	Ambient temperature.	1 = 1 °C
101.61	Nominal supply voltage	Shows the nominal supply voltage of the converter [V DC].	-
	0…2000 V	Nominal supply voltage.	1 = 1 V
101.62	Nominal DC voltage	Shows the nominal DC voltage of the converter [V].	-
	0…2000 V	Nominal DC voltage.	1 = 1 V
101.63	Nominal current	Shows the nominal current of the converter [A].	-
	0…30000 A	Nominal current.	1 = 1 A
101.64	Nominal power	Shows the nominal power of the converter [kW].	-
	0…30000 kW	Nominal power.	1 = 1 kW
101.70	Ambient temperature %	Ambient temperature of the DC/DC converter in percent. 0…100% corresponds to 0…60 °C or 32…140 °F. See also 101.31 Ambient temperature.	-
	-200.00…200.00%	Ambient temperature in percent.	100 = 1%
102 Actual values		Basic signals for monitoring of the DC/DC converter used by the converter control.	
102.01	DC voltage	Shows the measured intermediate circuit voltage.	-
	0.0…1500.0 V	Intermediate circuit voltage (V DC).	1 V = 10
102.02	ES voltage used	Shows the energy storage voltage value used by control. Energy storage voltage source is selected with parameter 197.14 ES voltage source.	-
	0.0…1500.0 V	Energy storage voltage value.	1 V = 10
102.03	ES voltage estimated	Shows the estimated energy storage voltage.	-
	0.0…1500.0 V	Energy storage voltage.	1 V = 10
102.05	U phase current	Shows the measured average U phase current with 3 ms filtering.	-
	-30000.0… 30000.0 A	Current U phase.	1 = 1 A
102.06	V phase current	Shows the measured average V phase current with 3 ms filtering.	-
	-30000.0… 30000.0 A	Current V phase.	1 = 1 A
102.07	W phase current	Shows the measured average W phase current with 3 ms filtering.	-
	-30000.0… 30000.0 A	Current W phase.	1 = 1 A
102.08	Total current	Shows the measured average sum current of all phases over the last switching cycle, ie, total current between the converter DC bus and the energy storage. Current is positive when the DC/DC converter transfers energy from the converter DC bus to the energy storage.	-
	-30000.0… 30000.0 A	Sum current.	1 = 1 A

No.	Name/Value	Description	Def/FbEq16
102.09	Total current %	Shows the measured average sum current of all phases over the last switching cycle in percent of nominal current of the DC/DC converter (101.63). Current is positive when the DC/DC converter transfers energy from the converter DC bus to the energy storage.	-
	-1000.00… 1000.00%	Sum current %.	1% = 10
102.10	RMS current	Shows the output sum current RMS value calculated over a period defined by parameter 146.11 Current RMS period. This signal can be used, for example, for thermal protection of the energy storage by the upper level control so that when the RMS current exceeds some level, the current is limited or the converter is stopped.	-
	0.0…30000.0 A	Current RMS.	1 = 1 A
102.11	Modulation index %	Shows the modulation index, ie, how much of the time the IGBTs are in conducting state.	-
	-100.00…100.00%	Modulation index.	1% = 10
102.12	Power	Shows the converter output power to the energy storage. When the power is positive, the energy storage is charged.	-
	-30000.0… 30000.0 kW	Power to the energy storage.	1 = 1 kW
102.13	Power %	Shows the power in percent of the nominal value (101.64).	-
	-1000.00… 1000.00%	Power in percent of the nominal value.	1% = 10

103 Input references		Values of references received from various sources. All parameters in this group are read-only unless otherwise noted.	
103.01	Panel reference 1	Reference 1 given from the control panel.	-
	-100000.00 … 100000.00	Control panel reference.	1 = 10
103.05	FB A reference 1	Scaled fieldbus A reference 1.	-
	-100000.00 … 100000.00	Fieldbus A reference 1.	1 = 10
103.06	FB A reference 2	Scaled fieldbus A reference 2.	-
	-100000.00 … 100000.00	Fieldbus A reference 2.	1 = 10
103.11	DDCS controller ref 1	Reference 1 received from the external (DDCS) controller. See also section DDCS communication on page 48.	-
	-30000.00 … 30000.00	Scaled reference 1 received from external controller.	1 = 10
103.12	DDCS controller ref 2	Reference 2 received from the external (DDCS) controller. See also section DDCS communication on page 48.	-
	-30000.00 … 30000.00	Scaled reference 2 received from external controller.	1 = 10

No.	Name/Value	Description	Def/FbEq16
104 Warnings and faults		Information on warnings and faults that occurred last. For explanations of individual warning and fault codes, see chapter Fault tracing. All parameters in this group are read-only unless otherwise noted.	
104.01	Tripping fault	Code of the 1st active fault (the fault that caused the current trip).	-
	0000h...FFFFh	1st active fault.	1 = 1
104.02	Active fault 2	Code of the 2nd active fault.	-
	0000h...FFFFh	2nd active fault.	1 = 1
104.03	Active fault 3	Code of the 3rd active fault.	-
	0000h...FFFFh	3rd active fault.	1 = 1
104.04	Active fault 4	Code of the 4th active fault.	-
	0000h...FFFFh	4th active fault.	1 = 1
104.05	Active fault 5	Code of the 5th active fault.	-
	0000h...FFFFh	5th active fault.	1 = 1
104.06	Active warning 1	Code of the 1st active warning.	-
	0000h...FFFFh	1st active warning.	1 = 1
104.07	Active warning 2	Code of the 2nd active warning.	-
	0000h...FFFFh	2nd active warning.	1 = 1
104.08	Active warning 3	Code of the 3rd active warning.	-
	0000h...FFFFh	3rd active warning.	1 = 1
104.09	Active warning 4	Code of the 4th active warning.	-
	0000h...FFFFh	4th active warning.	1 = 1
104.10	Active warning 5	Code of the 5th active warning.	-
	0000h...FFFFh	5th active warning.	1 = 1
104.11	Latest fault	Code of the 1st stored fault.	-
	0000h...FFFFh	1st stored fault.	1 = 1
104.12	2nd latest fault	Code of the 2nd stored fault.	-
	0000h...FFFFh	2nd stored fault.	1 = 1
104.13	3rd latest fault	Code of the 3rd stored fault.	-
	0000h...FFFFh	3rd stored fault.	1 = 1
104.14	4th latest fault	Code of the 4th stored fault.	-
	0000h...FFFFh	4th stored fault.	1 = 1
104.15	5th latest fault	Code of the 5th stored fault.	-
	0000h...FFFFh	5th stored fault.	1 = 1
104.16	Latest warning	Code of the 1st stored warning.	-
	0000h...FFFFh	1st stored warning.	1 = 1
104.17	2nd latest warning	Code of the 2nd stored warning.	-
	0000h...FFFFh	2nd stored warning.	1 = 1
104.18	3rd latest warning	Code of the 3rd stored warning.	-
	0000h...FFFFh	3rd stored warning.	1 = 1

No.	Name/Value	Description	Def/FbEq16
104.19	4th latest warning	Code of the 4th stored warning.	-
	0000h...FFFFh	4th stored warning.	1 = 1
104.20	5th latest warning	Code of the 5th stored warning.	-
	0000h...FFFFh	5th stored warning.	1 = 1
104.25	Faulted modules	Indicates which parallel-connected modules have faulted. The bits of this word are cleared when all faults have been reset. This parameter is read-only.	-

Bit	Name	Description
0	Module 1	1 = Module 1 faulted.
1	Module 2	1 = Module 2 faulted.

	0000h...FFFFh	Faulted modules.	1 = 1

105 Diagnostics		Various run-time-type counters and measurements related to DC/DC converter unit maintenance. All parameters in this group are read-only unless otherwise noted.	
105.01	On-time counter	On-time counter. The counter runs when the DC/DC converter unit is powered.	-
	0 … 65535 d	On-time counter.	1 = 1 d
105.02	Run-time counter	DC/DC converter run-time counter. The counter runs when the DC/DC converter unit is running.	-
	0 … 65535 d	DC/DC converter run-time counter.	1 = 1 d
105.09	Time from power-up	500-microsecond ticks elapsed since the last boot of the control unit.	-
	0...4294967295	500-microsecond ticks since last boot.	1 = 1
105.11	Converter temperature %	Converter semiconductor temperature in percent of the fault limit.	-
	-40.0 … 160.0%	Converter temperature in percent.	1 = 1%
105.18	Control board humidity	Displays the actual humidity value on the surface of the control board.	-
	0...100%	Humidity on the surface of the control board in percent.	1 = 1%

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td colspan="2">106 Control and status words</td><td>Control and status words.</td><td></td></tr>
<tr><td>106.01</td><td>Main control word</td><td>The main control word of the DC/DC converter unit. This parameter shows the control signals used by the control program (such as digital inputs, the fieldbus interfaces, etc.).
This parameter is read-only.
The bit assignments are shown in the table below. For detailed bit descriptions, see page 215.
<table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>ON/OFF</td></tr><tr><td>1</td><td>Off2 control</td></tr><tr><td>2</td><td>Off3 control</td></tr><tr><td>3</td><td>Start</td></tr><tr><td>4</td><td>-</td></tr><tr><td>5</td><td>-</td></tr><tr><td>6</td><td>-</td></tr><tr><td>7</td><td>Reset</td></tr><tr><td>8</td><td>-</td></tr><tr><td>9</td><td>-</td></tr><tr><td>10</td><td>Remote cmd</td></tr><tr><td>11</td><td>Ext ctrl loc</td></tr><tr><td>12</td><td>User bit 0</td></tr><tr><td>13</td><td>User bit 1</td></tr><tr><td>14</td><td>User bit 2</td></tr><tr><td>15</td><td>User bit 3</td></tr></table></td><td>-</td></tr>
<tr><td></td><td>0000h…FFFFh</td><td>Main control word.</td><td>1 = 1</td></tr>
<tr><td>106.03</td><td>FBA A transparent control word</td><td>The unaltered control word received from the PLC through fieldbus adapter A.
This parameter is read-only.</td><td>-</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>Control word received through fieldbus adapter A.</td><td>-</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>106.11</td><td>Main status word</td><td>Main status word of the DC/DC converter unit.
Reflects the status of the DC/DC converter unit irrespective of control source eg. a fieldbus system, control panel (keypad), PC tool, standard I/O, application program or sequence programming, and irrespective of actual control profile which is used to control the DC/DC converter unit.
This parameter is read-only.
The bit assignments are shown in the table below. For detailed bit descriptions, see page 216.
<table>
<tr><th>Bit</th><th>Name</th></tr>
<tr><td>0</td><td>Ready to switch ON</td></tr>
<tr><td>1</td><td>Ready run</td></tr>
<tr><td>2</td><td>Ready ref</td></tr>
<tr><td>3</td><td>Tripped</td></tr>
<tr><td>4</td><td>-</td></tr>
<tr><td>5</td><td>-</td></tr>
<tr><td>6</td><td>-</td></tr>
<tr><td>7</td><td>Warning</td></tr>
<tr><td>8</td><td>Operating</td></tr>
<tr><td>9</td><td>Remote</td></tr>
<tr><td>10</td><td>Ready for load</td></tr>
<tr><td>11</td><td>User bit 0</td></tr>
<tr><td>12</td><td>User bit 1</td></tr>
<tr><td>13</td><td>User bit 2</td></tr>
<tr><td>14</td><td>Charging</td></tr>
<tr><td>15</td><td>User bit 3</td></tr>
</table></td><td>-</td></tr>
<tr><td></td><td>0000h…FFFFh</td><td>Main status word.</td><td>1 = 1</td></tr>
<tr><td>106.16</td><td>Status word 1</td><td>Status word 1 of the DC/DC converter unit.
This parameter is read-only.
<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>0</td><td>Enabled</td><td>1 = Run enable and start enable signals are present</td></tr>
<tr><td>1</td><td>Inhibited</td><td>1 = Start inhibited</td></tr>
<tr><td>2</td><td>Reserved</td><td></td></tr>
<tr><td>3</td><td>Reserved</td><td></td></tr>
<tr><td>4</td><td>Reserved</td><td></td></tr>
<tr><td>5</td><td>Started</td><td>1 = DC/DC converter has been started</td></tr>
<tr><td>6</td><td>Reserved</td><td></td></tr>
<tr><td>7</td><td>Reserved</td><td></td></tr>
<tr><td>8</td><td>Local control</td><td>1 = DC/DC converter is in local control</td></tr>
<tr><td>9</td><td>Network control</td><td>1 = DC/DC converter is in network control</td></tr>
<tr><td>10</td><td>Ext1 active</td><td>1 = Control location Ext1 active</td></tr>
<tr><td>11</td><td>Ext2 active</td><td>1 = Control location Ext2 active</td></tr>
<tr><td>12</td><td>Charging</td><td>1 = Charging relay is closed</td></tr>
<tr><td>13…15</td><td>Reserved</td><td></td></tr>
</table></td><td>-</td></tr>
<tr><td></td><td>0000h…FFFFh</td><td>Status word 1.</td><td>1 = 1</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>106.18</td><td>Start inhibit status word</td><td>Start inhibit status word.

<table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>Not ready run</td></tr><tr><td>1</td><td>Ctrl location changed</td></tr><tr><td>2</td><td>SSW inhibit</td></tr><tr><td>3</td><td>Fault</td></tr><tr><td>4</td><td>Lost start enable</td></tr><tr><td>5</td><td>Lost run enable</td></tr><tr><td>6</td><td>Reserved</td></tr><tr><td>7</td><td>Reserved</td></tr><tr><td>8</td><td>Reserved</td></tr><tr><td>9</td><td>Charging overload</td></tr><tr><td>10</td><td>Reserved</td></tr><tr><td>11</td><td>Reserved</td></tr><tr><td>12</td><td>Em Off2</td></tr><tr><td>13</td><td>Em Off3</td></tr><tr><td>14</td><td>Auto reset inhibit</td></tr><tr><td>15</td><td>Reserved</td></tr></table></td><td>-</td></tr>
<tr><td></td><td>0000h…FFFFh</td><td>Start inhibit status word.</td><td>1 = 1</td></tr>
<tr><td>106.30</td><td>MSW bit 11 sel</td><td>Selects a binary source whose status is transmitted as bit 11 of 106.11 Main status word.</td><td>Ext ctrl loc</td></tr>
<tr><td></td><td>False</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>True</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>Ext ctrl loc</td><td>Bit 11 of 106.01 Main control word</td><td>2</td></tr>
<tr><td></td><td>Other [bit]</td><td>A specific bit in another parameter.</td><td>-</td></tr>
<tr><td>106.31</td><td>MSW bit 12 sel</td><td>Selects a binary source whose status is transmitted as bit 12 of 106.11 Main status word.</td><td>False</td></tr>
<tr><td></td><td>False</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>True</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>Other [bit]</td><td>A specific bit in another parameter.</td><td>-</td></tr>
<tr><td>106.32</td><td>MSW bit 13 sel</td><td>Selects a binary source whose status is transmitted as bit 13 of 106.11 Main status word.</td><td>False</td></tr>
<tr><td></td><td>False</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>True</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>Other [bit]</td><td>A specific bit in another parameter.</td><td>-</td></tr>
<tr><td>106.33</td><td>MSW bit 15 sel</td><td>Selects a binary source whose status is transmitted as bit 15 of 106.11 Main status word.</td><td>False</td></tr>
<tr><td></td><td>False</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>True</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>Other [bit]</td><td>A specific bit in another parameter.</td><td>-</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
106.50	User status word1	User status word 1.	

Bit	Name	Description
0	User status bit 0	See 106.60 User status word 1 bit 0 sel.
1	User status bit 1	See 106.61 User status word 1 bit 1 sel.
2	User status bit 2	See 106.62 User status word 1 bit 2 sel.
3	User status bit 3	See 106.63 User status word 1 bit 3 sel.
4	User status bit 4	See 106.64 User status word 1 bit 4 sel.
5	User status bit 5	See 106.65 User status word 1 bit 5 sel.
6	User status bit 6	See 106.66 User status word 1 bit 6 sel.
7	User status bit 7	See 106.67 User status word 1 bit 7 sel.
8	User status bit 8	See 106.68 User status word 1 bit 8 sel.
9	User status bit 9	See 106.69 User status word 1 bit 9 sel.
10	User status bit 10	See 106.70 User status word 1 bit 10 sel.
11	User status bit 11	See 106.71 User status word 1 bit 11 sel.
12	User status bit 12	See 106.72 User status word 1 bit 12 sel.
13	User status bit 13	See 106.73 User status word 1 bit 13 sel.
14	User status bit 14	See 106.74 User status word 1 bit 14 sel.
15	User status bit 15	See 106.75 User status word 1 bit 15 sel.

	0000h...FFFFh	User-defined status word.	1 = 1
106.60	User status word 1 bit 0 sel	Selects a binary source whose status is transmitted as bit 0 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.61	User status word 1 bit 1 sel	Selects a binary source whose status is transmitted as bit 1 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.62	User status word 1 bit 2 sel	Selects a binary source whose status is transmitted as bit 2 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.63	User status word 1 bit 3 sel	Selects a binary source whose status is transmitted as bit 3 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.64	User status word 1 bit 4 sel	Selects a binary source whose status is transmitted as bit 4 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.65	User status word 1 bit 5 sel	Selects a binary source whose status is transmitted as bit 5 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-

No.	Name/Value	Description	Def/FbEq16
106.66	User status word 1 bit 6 sel	Selects a binary source whose status is transmitted as bit 6 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.67	User status word 1 bit 7 sel	Selects a binary source whose status is transmitted as bit 7 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.68	User status word 1 bit 8 sel	Selects a binary source whose status is transmitted as bit 8 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.69	User status word 1 bit 9 sel	Selects a binary source whose status is transmitted as bit 9 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.70	User status word 1 bit 10 sel	Selects a binary source whose status is transmitted as bit 10 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.71	User status word 1 bit 11 sel	Selects a binary source whose status is transmitted as bit 11 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.72	User status word 1 bit 12 sel	Selects a binary source whose status is transmitted as bit 12 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.73	User status word 1 bit 13 sel	Selects a binary source whose status is transmitted as bit 13 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.74	User status word 1 bit 14 sel	Selects a binary source whose status is transmitted as bit 14 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-
106.75	User status word 1 bit 15 sel	Selects a binary source whose status is transmitted as bit 15 of 106.50 User status word1.	False
	False	0.	0
	True	1.	1
	Other [bit]	A specific bit in another parameter.	-

No.	Name/Value	Description	Def/FbEq16
107 System info		Hardware and firmware information. All parameters in this group are read-only.	
107.03	Drive rating id	Type of the DC/DC converter unit.	-
	-	Type of the DC/DC converter unit.	1 = 1
107.04	Firmware name	Firmware identification.	-
	-	Firmware identification.	-
107.05	Firmware version	Version number of the firmware.	-
	-	Version number of the firmware.	-
107.06	Loading package name	Name of the firmware loading package.	-
	-	Name of the firmware loading package.	-
107.07	Loading package version	Version number of the firmware loading package.	-
	-	Version number of the firmware loading package.	-
107.08	Bootloader version	Version number of the firmware bootloader.	-
107.11	Cpu usage	Microprocessor load in percent.	-
	0 … 100%	Microprocessor load.	1 = 1%
107.13	PU logic version number	The version number of the power unit FPGA logic.	-
	-	The version number of the power unit FPGA logic.	-
107.14	FPGA logic version name	Version name of the FPGA logic of the control unit.	-
107.15	FPGA logic version number	Version number of the FPGA logic of the control unit.	-
107.30	Adaptive program status	Shows the status of the adaptive program. See section Adaptive programming (page 34).	-

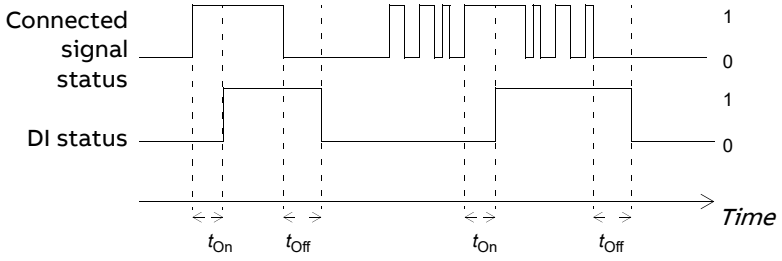
Bit	Name	Description
0	Initialized	1 = Adaptive program initialized
1	Editing	1 = Adaptive program is being edited
2	Edit done	1 = Editing of adaptive program finished
3	Running	1 = Adaptive program running
4…13	Reserved	
14	State changing	Reserved
15	Faulted	1 = Error in adaptive program

	0000h…FFFFh	Adaptive program status.	1 = 1
107.60	Device DNA bits [95..64]	Defines device DNA bits 95…64 for a control token. Control token is valid only in a single device, and it requires specific permission granted for the device. See section Control tokens on page 14.	-
	0000h…FFFFh	Device DNA bits 95…64.	1 = 1
107.61	Device DNA bits [63..32]	Defines device DNA bits 63…32 for a control token. Control token is valid only in a single device, and it requires specific permission granted for the device. See section Control tokens on page 14.	-
	0000h…FFFFh	Device DNA bits 63…32.	1 = 1
107.62	Device DNA bits [31..0]	Defines device DNA bits 31…0 for a control token. Control token is valid only in a single device, and it requires specific permission granted for the device. See section Control tokens on page 14.	-
	0000h…FFFFh	Device DNA bits 31…0.	1 = 1

No.	Name/Value	Description	Def/FbEq16
107.63	Remove all Control Tokens	Removes all active control tokens from the device. Enabling any bit of this parameter activates the removal. Control tokens are removed after a control unit reboot. See section Control tokens on page 14.	-
	0000h...FFFFh	Removal of all active control tokens.	1 = 1
107.64	Active control tokens 1	Defines active control tokens on the device. See section Control tokens on page 14.	-
	0000h...FFFFh	Active control tokens.	1 = 1
110 Standard DI, RO		Status and configuration of digital inputs and relay outputs.	
110.01	DI status	Status of digital inputs DIIL and DI6...DI1. Bits 0...5 reflect the status of DI1...DI6; bit 15 reflects the status of the DIIL input.	-
	0000h...FFFFh	Status of digital inputs.	1 = 1
110.02	DI delayed status	Status of digital inputs DIIL and DI6...DI1 after any activation/deactivation delays. Bits 0...5 reflect the delayed status of DI1...DI6; bit 15 reflects the delayed status of the DIIL input.	-
	0000h...FFFFh	Delayed status of digital inputs.	1 = 1
110.03	DI force selection	Defines how the true readings of the digital inputs can be overridden for eg. testing purposes. A bit in parameter 110.04 DI force data is provided for each digital input, and its value is applied whenever the corresponding bit in this parameter is 1.	0000h

Bit	Value
0	1 = Force DI1 to value of bit 0 of parameter 110.04 DI force data.
1	1 = Force DI2 to value of bit 1 of parameter 110.04 DI force data.
2	1 = Force DI3 to value of bit 2 of parameter 110.04 DI force data.
3	1 = Force DI4 to value of bit 3 of parameter 110.04 DI force data.
4	1 = Force DI5 to value of bit 4 of parameter 110.04 DI force data.
5	1 = Force DI6 to value of bit 5 of parameter 110.04 DI force data.
6...14	Reserved
15	1 = Force DIL to value of bit 15 of parameter 110.04 DI force data.

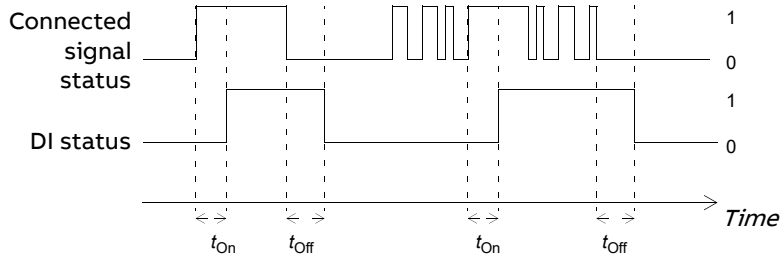
	0000h...FFFFh	Status of digital inputs.	1 = 1
110.04	DI force data	Defines and contains the values of digital inputs that are used instead of the true readings if selected in parameter 110.03 DI force selection. Bit 0 is the forced value for DI1.	0000h
	0000h...FFFFh	Forced values of digital inputs.	1 = 1
110.05	DI1 ON delay	Defines the activation delay for digital input DI1.	0.00 s



t_{On} 110.05 DI1 ON delay

t_{Off} 110.06 DI1 OFF delay

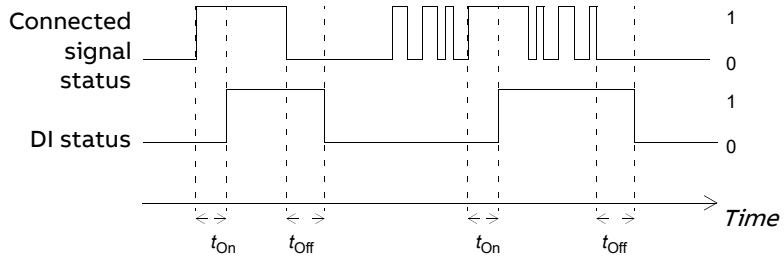
No.	Name/Value	Description	Def/FbEq16
	0.0 … 3000.0 s	Activation delay for DI1.	10 = 1 s
110.06	DI1 OFF delay	Defines the deactivation delay for digital input DI1. See parameter 110.05 DI1 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI1.	10 = 1 s
110.07	DI2 ON delay	Defines the activation delay for digital input DI2.	0.00 s



t_{On} 110.07 DI2 ON delay

t_{Off} 110.08 DI2 OFF delay

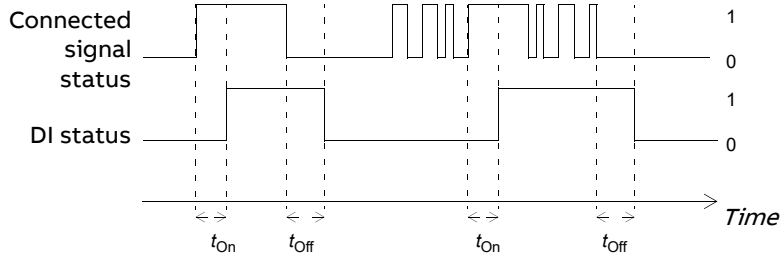
	0.0 … 3000.0 s	Activation delay for DI2.	10 = 1 s
110.08	DI2 OFF delay	Defines the deactivation delay for digital input DI2. See parameter 110.07 DI2 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI2.	10 = 1 s
110.09	DI3 ON delay	Defines the activation delay for digital input DI3.	0.30 s



t_{On} 110.09 DI3 ON delay

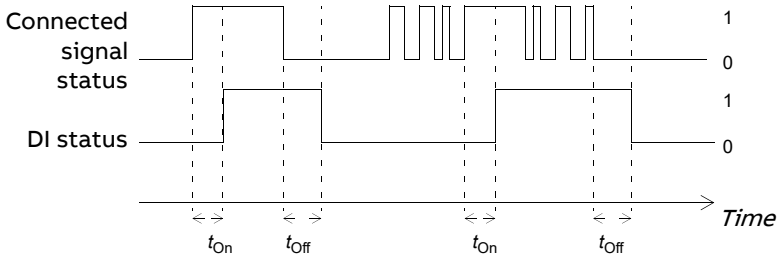
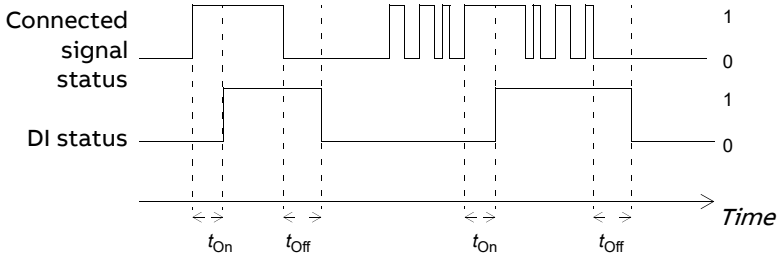
t_{Off} 110.10 DI3 OFF delay

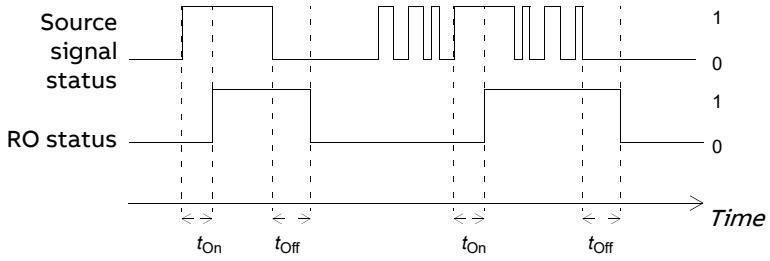
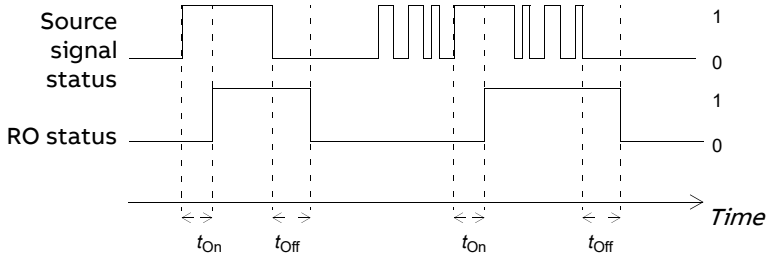
	0.0 … 3000.0 s	Activation delay for DI3.	10 = 1 s
110.10	DI3 OFF delay	Defines the deactivation delay for digital input DI3. See parameter 110.09 DI3 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI3.	10 = 1 s
110.11	DI4 ON delay	Defines the activation delay for digital input DI4.	0.00 s

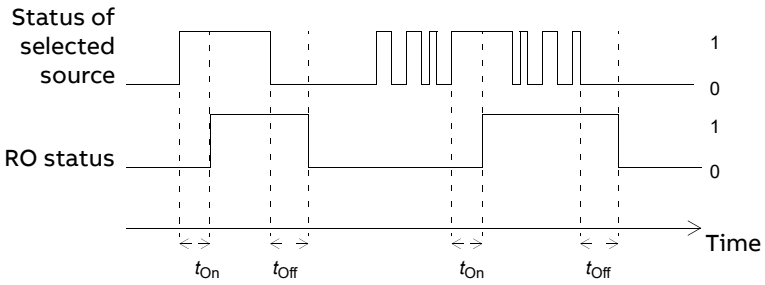


t_{On} 110.11 DI4 ON delay

t_{Off} 110.12 DI4 OFF delay

No.	Name/Value	Description	Def/FbEq16
	0.0 … 3000.0 s	Activation delay for DI4.	10 = 1 s
110.12	DI4 OFF delay	Defines the deactivation delay for digital input DI4. See parameter 110.11 DI4 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI4.	10 = 1 s
110.13	DI5 ON delay	Defines the activation delay for digital input DI5.	0.00 s
		 t_{On} 110.13 DI5 ON delay t_{Off} 110.14 DI4 OFF delay	
	0.0 … 3000.0 s	Activation delay for DI5.	10 = 1 s
110.14	DI5 OFF delay	Defines the deactivation delay for digital input DI5. See parameter 110.13 DI5 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI5.	10 = 1 s
110.15	DI6 ON delay	Defines the activation delay for digital input DI6.	0.00 s
		 t_{On} 110.15 DI6 ON delay t_{Off} 110.16 DI6 OFF delay	
	0.0 … 3000.0 s	Activation delay for DI6.	10 = 1 s
110.16	DI6 OFF delay	Defines the deactivation delay for digital input DI6. See parameter 110.15 DI6 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DI6.	10 = 1 s
110.21	RO status	Shows the status of relay outputs RO8…RO1. **Example:** 00000001 = RO1 is energized, RO2…RO8 are de-energized.	-
	0000h…FFFFh	Status of relay outputs.	1 = 1
110.24	RO1 source	Selects a DC/DC converter unit signal to be connected to relay output RO1. **Note:** For the cabinet-installed DC/DC converter units, ACS880-1607, check the delivery-specific use from the delivery-specific circuit diagrams. Do not change the setting if relay output is in use and connected already.	Ready run
	Not energized	Relay output is not energized.	0
	Energized	Relay output is energized.	1
	Ready	Bit 0 of 106.11 Main status word (see page 61). Relay is energized when the DC/DC converter unit is ready.	2

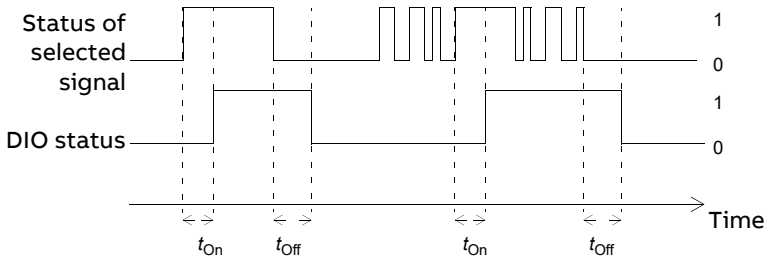
No.	Name/Value	Description	Def/FbEq16
	Started	Bit 4 of 106.16 Status word 1 (see page 61). Relay is energized when the DC/DC converter unit is started.	3
	Ready run	Bit 1 of 106.11 Main status word (see page 61). Relay is energized when the DC/DC converter is ready.	4
	Warning	Bit 7 of 106.11 Main status word (see page 61). Relay is energized when a warning is active.	5
	Fault	Bit 3 of 106.11 Main status word (see page 61). Relay is energized when a fault is active.	6
	Fault (-1)	Inverted bit 3 of 106.11 Main status word (see page 61). Relay is de-energized when a fault is active.	9
	Other [bit]	A specific bit in another parameter.	-
110.25	RO1 ON delay	Defines the activation delay for relay output RO1.	0.0 s
		 t_{On} 110.25 RO1 ON delay t_{Off} 110.26 RO1 OFF delay	
	0.0 … 3000.0 s	Activation delay for RO1.	10 = 1 s
110.26	RO1 OFF delay	Defines the deactivation delay for relay output RO1. See parameter 110.25 RO1 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO1.	10 = 1 s
110.27	RO2 source	Selects a DC/DC converter unit signal to be connected to relay output RO2. For the available selections, see parameter 110.24 RO1 source. **Note:** For the cabinet-installed DC/DC converter units, ACS880-1607, check the delivery-specific use from the delivery-specific circuit diagrams. Do not change the setting if relay output is in use and connected already.	Fault (-1)
110.28	RO2 ON delay	Defines the activation delay for relay output RO2.	0.0 s
		 t_{On} 110.28 RO2 ON delay t_{Off} 110.29 RO2 OFF delay	
	0.0 … 3000.0 s	Activation delay for RO2.	10 = 1 s
110.29	RO2 OFF delay	Defines the deactivation delay for relay output RO2. See parameter 110.28 RO2 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO2.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
110.30	RO3 source	Selects a DC/DC converter unit signal to be connected to relay output RO3. For the available selections, see parameter 110.24 RO1 source. **Note:** For the cabinet-installed DC/DC converter units, ACS880-1607, check the delivery-specific use from the delivery-specific circuit diagrams. Do not change the setting if relay output is in use and connected already.	Ready run
110.31	RO3 ON delay	Defines the activation delay for relay output RO3.	0.0 s
		 t_{On} 110.31 RO3 ON delay t_{Off} 110.32 RO3 OFF delay	
	0.0 … 3000.0 s	Activation delay for RO3.	10 = 1 s
110.32	RO3 OFF delay	Defines the deactivation delay for relay output RO3. See parameter 110.31 RO3 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO3.	10 = 1 s
110.51	DI filter time	Defines a filtering time for parameter 110.01 DI status. Note that this parameter has no effect on forced DI values defined by parameters 110.03 and 110.04.	10.0 ms
	0.3 … 100.0 ms	Filtering time for 110.01.	10 = 1 ms
110.99	RO/DIO control word	Storage parameter for controlling the relay outputs and digital input/outputs. To control the relay outputs (RO) and the digital input/outputs (DIO), send a control word with the bit assignments shown below as Modbus I/O data. Set the target selection parameter of that particular data. In the source selection parameter of the desired output, select the appropriate bit of this word.	0000h

Bit	Name	Description
0	RO1	Source bits for relay outputs RO1…RO3 (see parameters 110.24, 110.27 and 110.30).
1	RO2	
2	RO3	
3…7	Reserved	
8	DIO1	Source bits for digital input/outputs DIO1…DIO3 (see parameters 111.06 and 111.06).
9	DIO2	
10…15	Reserved	

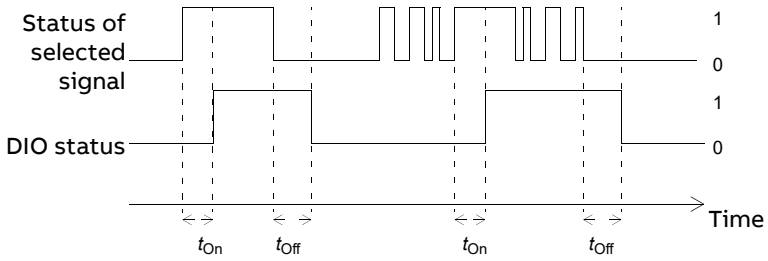
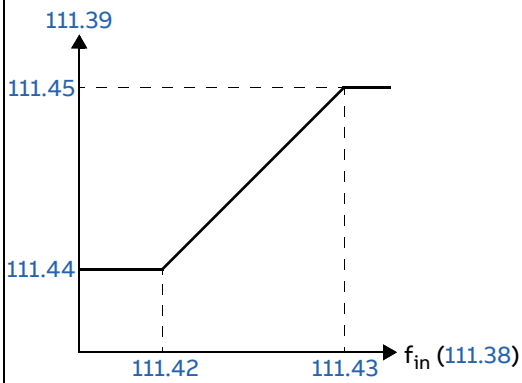
	0000h…FFFFh	RO/DIO control word.	1 = 1
111 Standard DIO, FI, FO		Configuration of digital input/outputs and frequency inputs/outputs.	
111.01	DIO status	Status of digital input/outputs DIO8…DIO1. **Example:** 0000001001 = DIO1 and DIO4 are on, the remainder are off.	-

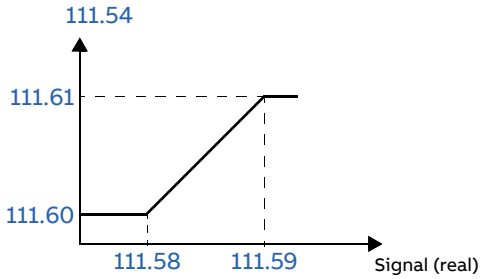
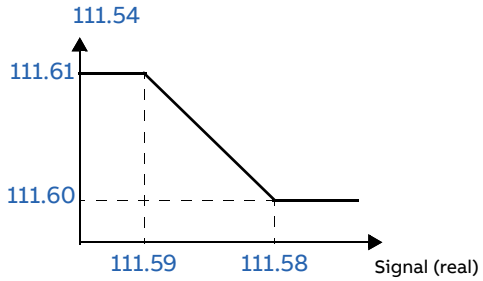
No.	Name/Value	Description	Def/FbEq16
	0000h…FFFFh	Status of digital input/outputs.	1 = 1
111.02	DIO delayed status	Status of digital input/outputs DIO8…DIO1 after activation/deactivation delays. Bit 0 reflects the delayed status of DIO1.	-
	0000h…FFFFh	Delayed status of digital input/outputs.	1 = 1
111.05	DIO1 function	Selects whether DIO1 is used as a digital output or input, or a frequency input.	Output
	Output	DIO1 is used as a digital output.	0
	Input	DIO1 is used as a digital input.	1
	Frequency	DIO1 is used as a frequency input.	2
111.06	DIO1 output source	Selects a signal to be connected to digital input/output DIO1 when parameter 111.05 DIO1 function is set to Output.	Not energized
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready	Bit 0 of 106.11 Main status word (see page 61). Output is energized when the DC/DC converter unit is ready.	2
	Started	Bit 4 of 106.16 Status word 1 (see page 61). Output is energized when the DC/DC converter unit is started.	3
	Running	Bit 1 of 106.11 Main status word (see page 61). Output is energized when the DC/DC converter unit is running.	4
	Warning	Bit 7 of 106.11 Main status word (see page 61). Output is energized when a warning is active.	5
	Fault	Bit 3 of 106.11 Main status word (see page 61). Output is energized when a fault is active.	6
	MCB	Bit 13 of 106.16 Status word 1 (see page 61). The relay is energized when the closing command for the main circuit breaker is given.	7
	Charging	Bit 12 of 106.16 Status word 1 (see page 61). Relay is energized when external charging is charging the drive.	8
	Fault (-1)	Inverted bit 3 of 106.11 Main status word.	9
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
111.07	DIO1 ON delay	Defines the activation delay for digital input/output DIO1 when parameter 111.05 DIO1 function is set to Output.	0.00 s
	0.0 … 3000.0 s	Activation delay for DIO1 when set as an output.	10 = 1 s
111.08	DIO1 OFF delay	Defines the deactivation delay for digital input/output DIO1 when parameter 111.05 DIO1 function is set to Output. See parameter 111.07 DIO1 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DIO1 when set as an output.	10 = 1 s



t_{On} 111.07 DIO1 ON delay

t_{Off} 111.08 DIO1 OFF delay

No.	Name/Value	Description	Def/FbEq16
111.09	DIO2 function	Selects whether DIO2 is used as a digital output or input.	Output
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
111.10	DIO2 output source	Selects a DC/DC converter unit signal to be connected to digital input/output DIO2 when parameter 111.09 DIO2 function is set to Output. For the available selections, see parameter 111.06 DIO1 output source.	Not energized
111.11	DIO2 ON delay	Defines the activation delay for digital input/output DIO2 when parameter 111.09 DIO2 function is set to Output.  t_{On} 111.11 DIO2 ON delay t_{Off} 111.12 DIO2 OFF delay	0.00 s
	0.0 … 30000.0 s	Activation delay for DIO2 when set as an output.	10 = 1 s
111.12	DIO2 OFF delay	Defines the deactivation delay for digital input/output DIO2 when parameter 111.09 DIO2 function is set to Output. See parameter 111.11 DIO2 ON delay.	0.00 s
	0.0 … 3000.0 s	Deactivation delay for DIO2 when set as an output.	10 = 1 s
111.38	Freq in 1 actual value	Value of frequency input 1 before scaling. See parameter 111.42 Freq in 1 min.	-
	0 … 16000 Hz	Unscaled value of frequency input 1.	1 = 1 Hz
111.39	Freq in 1 scaled	Value of frequency input 1 after scaling. See parameter 111.42 Freq in 1 min.	-
	-32768.000 … 32767.000	Scaled value of frequency input 1.	1 = 1
111.42	Freq in 1 min	Defines the minimum input frequency for frequency input 1 (DIO1 when it is used as a frequency input). The incoming frequency signal (111.38 Freq in 1 actual value) is scaled into an internal signal (111.39 Freq in 1 scaled) by parameters 111.42…111.45 as follows: 	0 Hz
	0 … 16000 Hz	Minimum frequency of frequency input 1.	1 = 1 Hz

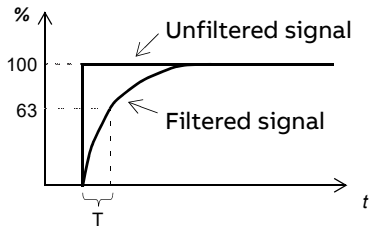
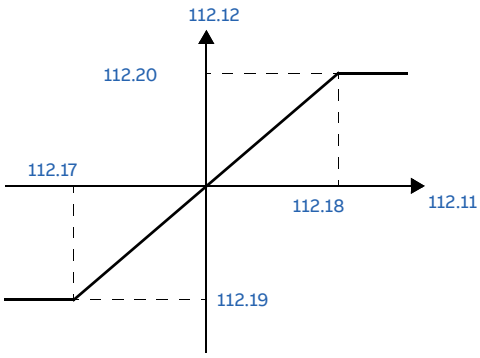
No.	Name/Value	Description	Def/FbEq16
111.43	Freq in 1 max	Defines the maximum input frequency for frequency input 1 (DIO1 when it is used as a frequency input). See parameter 111.42 Freq in 1 min.	16000 Hz
	0 … 16000 Hz	Maximum frequency for frequency input 1.	1 = 1 Hz
111.44	Freq in 1 at scaled min	Defines the value that corresponds to the minimum input frequency defined by parameter 111.42 Freq in 1 min. See diagram at parameter 111.42 Freq in 1 min.	0.000
	-32768.000 … 32767.000	Value corresponding to minimum of frequency input 1.	1 = 1
111.45	Freq in 1 at scaled max	Defines the value that corresponds to the maximum input frequency defined by parameter 111.43 Freq in 1 max. See diagram at parameter 111.42 Freq in 1 min.	0.000
	-32768.000 … 32767.000	Value corresponding to maximum of frequency input 1.	1 = 1
111.54	Freq out 1 actual value	Value of frequency output 1 before scaling. See parameter 111.58 Freq out 1 src min.	-
	0 … 16000 Hz	Unscaled value of frequency output 1.	1 = 1 Hz
111.58	Freq out 1 src min	Defines the real value of the signal that corresponds to the minimum value of frequency output 1 (defined by parameter 111.60 Freq out 1 at src min.  	0.000
	-32768.000 … 32767.000	Real signal value corresponding to minimum value of frequency output 1.	1 = 1
111.59	Freq out 1 src max	Defines the real value of the signal that corresponds to the maximum value of frequency output 1 (defined by parameter 111.61 Freq out 1 at src max). See parameter 111.58 Freq out 1 src min.	1500.000
	-32768.000 … 32767.000	Real signal value corresponding to maximum value of frequency output 1.	1 = 1
111.60	Freq out 1 at src min	Defines the minimum value of frequency output 1. See diagrams at parameter 111.58 Freq out 1 src min.	0 Hz
	0 … 16000 Hz	Minimum value of frequency output 1.	1 = 1 Hz
111.61	Freq out 1 at src max	Defines the maximum value of frequency output 1. See diagrams at parameter 111.58 Freq out 1 src min.	16000 Hz
	0 … 16000 Hz	Maximum value of frequency output 1.	1 = 1 Hz

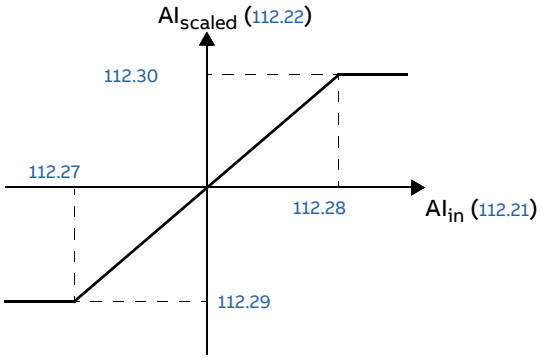
No.	Name/Value	Description	Def/FbEq16
111.81	DIO filter time	Defines a filtering time for parameter 111.01 DIO status. The filtering time will only affect the DIOs that are in input mode.	10.0 ms
	0.3 … 100.0 ms	Filtering time for 111.01.	10 = 1 ms

112 Standard AI		Configuration of analog inputs.	
112.03	AI supervision function	Selects how the DC/DC converter reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input. The inputs and the limits to be observed are selected by parameter 112.04 AI supervision selection.	No action
	No action	No action taken.	0
	Fault	DC/DC converter trips on 8E06 AI supervision.	1
	Warning	DC/DC converter generates an AE67 AI supervision warning.	2
112.04	AI supervision selection	Specifies the analog input limits to be supervised. See parameter 112.03 AI supervision function.	0000b

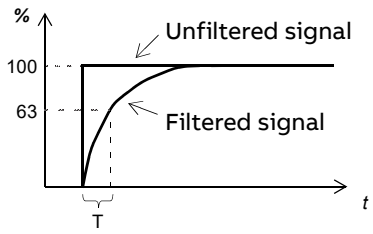
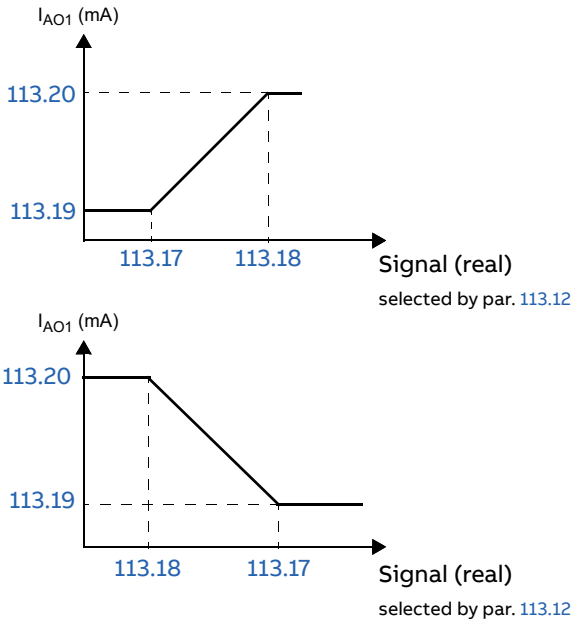
Bit	Name	Description
0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.
1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.
2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.
3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.
4…15	Reserved	

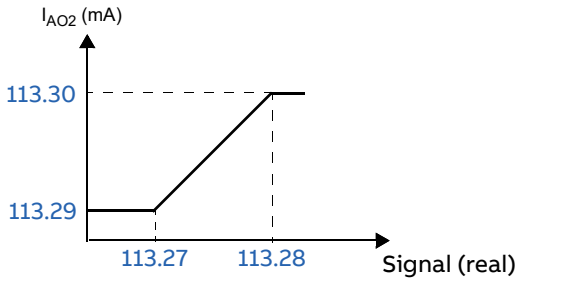
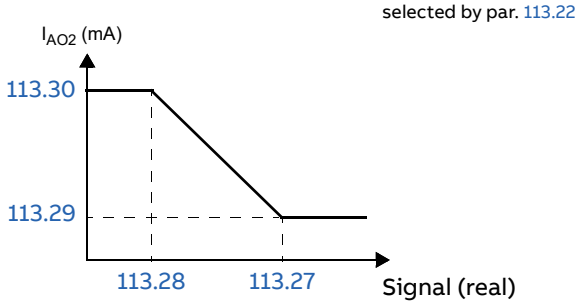
	0000b…1111b	Activation of analog input supervision.	1 = 1
112.11	AI1 actual value	Value of analog input AI1 in mA or V (depending on whether the input is set to current or voltage by switch AI1).	-
	-22.000 … 22.000 mA or V	Value of analog input AI1.	1000 = 1 mA or V
112.12	AI1 scaled value	Value of analog input AI1 after scaling. See parameters 112.19 AI1 scaled at AI1 min and 112.20 AI1 scaled at AI1 max.	-
	-32768.000 … 32767.000	Scaled value of analog input AI1.	1 = 1
112.15	AI1 unit selection	Selects the unit for readings and settings related to analog input 1.	V
	mA	Milliamperes.	10
	V	Volts.	2

No.	Name/Value	Description	Def/FbEq16
112.16	AI1 filter time	Defines the filter time constant for analog input AI1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.	0.000 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
112.17	AI1 min	Defines the minimum value for analog input AI1. See the drawing at parameter 112.19 AI1 scaled at AI1 min.	0.0 mA
	-22.000… 22.000 mA or V	Minimum value of AI1.	1000 = 1 mA or V
112.18	AI1 max	Defines the maximum value for analog input AI1. See the drawing at parameter 112.19 AI1 scaled at AI1 min.	20.000 mA
	-22.000… 22.000 mA or V	Maximum value of AI1.	1000 = 1 mA or V
112.19	AI1 scaled at AI1 min	Defines the real value of parameter 112.12 AI1 scaled value that that corresponds to the minimum analog input AI1 value defined by parameter 112.17 AI1 min. 	0.000
	-32768.000 …32768.000	Real value corresponding to minimum AI1 value.	1 = 1
112.20	AI1 scaled at AI1 max	Defines the real value of parameter 112.12 AI1 scaled value that corresponds to the maximum analog input AI1 value defined by parameter 112.18 AI1 max. See the drawing at parameter 112.19 AI1 scaled at AI1 min.	1920.000
	-32768.000 … 32767.000	Real value corresponding to maximum AI1 value.	1 = 1
112.21	AI2 actual value	Value of analog input AI2 in mA or V (depending on whether the input is set to current or voltage by switch AI2).	-

No.	Name/Value	Description	Def/FbEq16
	-22.000… 22.000 mA or V	Value of analog input AI2.	1000 = 1 mA or V
112.22	AI2 scaled value	Value of analog input AI2 after scaling. See parameters 112.29 AI2 scaled at AI2 min and 112.30 AI2 scaled at AI2 max.	-
	-32768.000 … 32767.000	Scaled value of analog input AI2.	1 = 1
112.25	AI2 unit selection	Selects the unit for readings and settings related to analog input 2.	mA
	mA	Milliamperes.	10
	V	Volts.	2
112.26	AI2 filter time	Defines the filter time constant for analog input AI2. See parameter 112.16 AI1 filter time.	0.000 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
112.27	AI2 min	Defines the minimum value for analog input AI2.	0.0 mA
	-22.000… 22.000 mA or V	Minimum value of AI2.	1000 = 1 mA or V
112.28	AI2 max	Defines the maximum value for analog input AI2.	20.000 mA
	-22.000… 22.000 mA or V	Maximum value of AI2.	1000 = 1 mA or V
112.29	AI2 scaled at AI2 min	Defines the real value of parameter 112.22 AI2 scaled value that corresponds to the minimum analog input AI2 value defined by parameter 112.27 AI2 min. 	0.000
	-32768.000 …32768.000	Real value corresponding to minimum AI2 value.	1 = 1
112.30	AI2 scaled at AI2 max	Defines the real value of parameter 112.22 AI2 scaled value that corresponds to the maximum analog input AI2 value defined by parameter 112.28 AI2 max. See the drawing at parameter 112.29 AI2 scaled at AI2 min.	1920.000
	-32768.000 … 32767.000	Real value corresponding to maximum AI2 value.	1 = 1

113 Standard AO		Configuration of analog outputs.	
113.11	AO1 actual value	Value of AO1 in mA.	-
	0.000 … 22.000 mA	Value of AO1.	1000 = 1 mA
113.12	AO1 source	Selects a signal to be connected to analog output AO1.	Zero
	Zero	None.	0
	DC voltage	101.01 DC voltage	1
	AO1 data storage	113.91 AO1 data storage (page 79).	37
	AO2 data storage	113.92 AO2 data storage (page 79).	38
	Other	The value is taken from another parameter.	-

No.	Name/Value	Description	Def/FbEq16
113.16	AO1 filter time	Defines the filtering time constant for analog output AO1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output t = time T = filter time constant	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
113.17	AO1 source min	Defines the real value of the signal (selected by parameter 113.12 AO1 source) that corresponds to the minimum AO1 output value (defined by parameter 113.19 AO1 out at AO1 src min). 	0.0
	-32768.0 … 32767.0	Real signal value corresponding to minimum AO1 output value.	1 = 1
113.18	AO1 source max	Defines the real value of the signal (selected by parameter 113.12 AO1 source) that corresponds to the maximum AO1 output value (defined by parameter 113.20 AO1 out at AO1 src max). See parameter 113.17 AO1 source min.	100.0
	-32768.0 … 32767.0	Real signal value corresponding to maximum AO1 output value.	1 = 1
113.19	AO1 out at AO1 src min	Defines the minimum output value for analog output AO1. See also drawing at parameter 113.17 AO1 source min.	4.000 mA

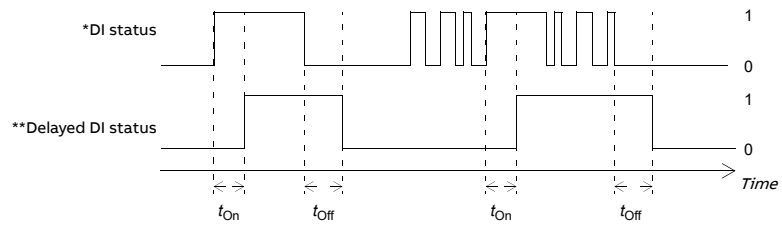
No.	Name/Value	Description	Def/FbEq16
	0.000 … 22.000 mA	Minimum AO1 output value.	1000 = 1 mA
113.20	AO1 out at AO1 src max	Defines the maximum output value for analog output AO1. See also drawing at parameter 113.17 AO1 source min.	20.000 mA
	0.000 … 22.000 mA	Maximum AO1 output value.	1000 = 1 mA
113.21	AO2 actual value	Value of AO2 in mA.	-
	0.000 … 22.000 mA	Value of AO2.	1000 = 1 mA
113.22	AO2 source	Selects a signal to be connected to analog output AO2. For the selections, see parameter 113.12 AO1 source.	Zero
113.26	AO2 filter time	Defines the filtering time constant for analog output AO2. See parameter 113.16 AO1 filter time.	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
113.27	AO2 source min	Defines the real value of the signal (selected by parameter 113.22 AO2 source) that corresponds to the minimum AO2 output value (defined by parameter 113.29 AO2 out at AO2 src min).  	0.0
	-32768.0 … 32767.0	Real signal value corresponding to minimum AO2 output value.	1 = 1
113.28	AO2 source max	Defines the real value of the signal (selected by parameter 113.22 AO2 source) that corresponds to the maximum AO2 output value (defined by parameter 113.30 AO2 out at AO2 src max). See parameter 113.27 AO2 source min.	100.0
	-32768.0 … 32767.0	Real signal value corresponding to maximum AO2 output value.	1 = 1
113.29	AO2 out at AO2 src min	Defines the minimum output value for analog output AO2. See also drawing at parameter 113.27 AO2 source min.	4.000 mA
	0.000 … 22.000 mA	Minimum AO2 output value.	1000 = 1 mA
113.30	AO2 out at AO2 src max	Defines the maximum output value for analog output AO2. See also drawing at parameter 113.27 AO2 source min.	20.000 mA
	0.000 … 22.000 mA	Maximum AO2 output value.	1000 = 1 mA

No.	Name/Value	Description	Def/FbEq16
113.91	AO1 data storage	Storage parameter for controlling analog output AO1 eg. through fieldbus. In 113.12 AO1 source, select AO1 data storage. Then set this parameter as the target of the incoming value data.	0.00
	-327.68 … 327.67	Storage parameter for AO1.	100 = 1
113.92	AO2 data storage	Storage parameter for controlling analog output AO2 eg. through fieldbus. In 113.22 AO2 source, select AO2 data storage. Then set this parameter as the target of the incoming value data.	0.00
	-327.68 … 327.67	Storage parameter for AO2.	100 = 1

114 Extension I/O module 1		Configuration of I/O extension module 1. See also section Programmable I/O extensions (page 35). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
114.01	Module 1 type	Activates (and specifies the type of) I/O extension module 1.	None
	None	Inactive.	0
	FIO-01	FIO-01.	1
	FIO-11	FIO-11.	2
	FDIO-01	FDIO-01.	3
	FAIO-01	FAIO-01.	4
114.02	Module 1 location	Specifies the node number (1…3) on the control unit into which the I/O extension module is installed. (Node 1 = slot 1, node 2 = slot 2, node 3 = slot 3) Alternatively, specifies the node ID of the slot on an FEA-03 extension adapter.	Slot 1
	Slot 1	Slot 1.	1
	Slot 2	Slot 2.	2
	Slot 3	Slot 3.	3
	4…254	Node ID of the slot on the FEA-03 extension adapter.	1 = 1
114.03	Module 1 status	Displays the status of I/O extension module 1.	No option
	No option	No module detected in the specified slot.	0
	No communication	A module has been detected but cannot be communicated with.	1
	Unknown	The module type is unknown.	2
	FIO-01	An FIO-01 module has been detected and is active.	3
	FIO-11	An FIO-11 module has been detected and is active.	4
	FAIO-01	An FAIO-01 module has been detected and is active.	24

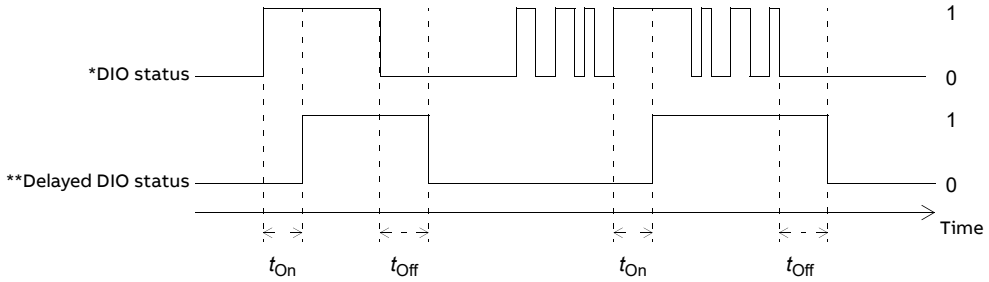
No.	Name/Value	Description	Def/FbEq16
114.05	DI status	(Visible when 114.01 Module 1 type = FDIO-01) Displays the status of the digital inputs on the extension module. The activation/deactivation delays (if any are specified) are ignored. A filtering time (for input mode) can be defined by parameter 114.08 DI filter time. Bit 0 indicates the status of DI1. **Note:** The number of active bits in this parameter depends on the number of digital input/outputs on the extension module. **Example:** 0101b = DI1 and DI3 are on, remainder are off. This parameter is read-only.	-
	0000b…1111b	Status of digital inputs.	1 = 1
114.05	DIO status	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Displays the electrical status of the digital input/outputs on the extension module. The activation/deactivation delays (if any are specified) are ignored. Bit 0 indicates the status of DIO1. **Note:** The number of active bits in this parameter depends on the number of digital input/outputs on the extension module. **Example:** 00001001 = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	-
	0000h…FFFFh	Status of digital input/outputs.	1 = 1
114.06	DI delayed status	(Visible when 114.01 Module 1 type = FDIO-01) Displays the delayed status of the digital inputs on the extension module. The word is updated only after activation/deactivation delays (if any are specified). Bit 0 indicates the status of DI1. **Note:** The number of active bits in this parameter depends on the number of digital inputs on the extension module. **Example:** 0101b = DI1 and DI3 are on, remainder are off. This parameter is read-only.	-
	0000b…1111b	Delayed status of digital inputs.	1 = 1
114.06	DIO delayed status	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Displays the status of the digital input/outputs on the extension module. This word is updated only after activation/deactivation delays (if any are specified). Bit 0 indicates the status of DIO1. **Note:** The number of active bits in this parameter depends on the number of digital input/outputs on the extension module. **Example:** 0000001001 = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	-
	0000h…FFFFh	Delayed status of digital input/outputs.	1 = 1
114.08	DI filter time	(Visible when 114.01 Module 1 type = FDIO-01) Defines a filtering time for parameter 114.05 DI status.	10.0 ms
	0.8 … 100.0 ms	Filtering time for 114.05.	10 = 1 ms
114.09	DIO1 configuration	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO1 of the extension module is used as a digital input or output.	Input

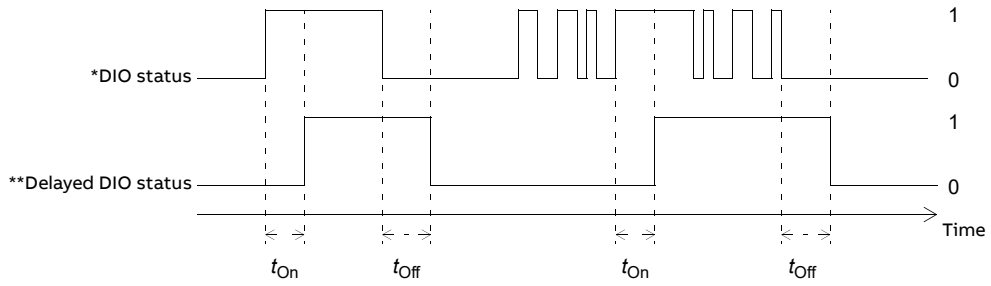
No.	Name/Value	Description	Def/FbEq16
	Input	DIO1 is used as a digital input.	0
	Output	DIO1 is used as a digital output.	1
114.10	DIO1 filter gain	(Visible when 114.01 Module 1 type = FIO-11) Determines a filtering time for DIO1 when it is used as an input.	7.5 us
	7.5 us	7.5 µs.	0
	195 us	195 µs.	1
	780 us	780 µs.	2
	4.680 ms	4.680 ms.	3
114.11	DIO1 output source	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Selects a signal to be connected to digital input/output DIO1 of the extension module when parameter 114.09 DIO1 configuration is set to Output.	Not energized
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready run	Ready run. Bit 1 of 106.11 Main status word.	2
	Enabled	Bit 0 of 106.16 Status word 1. Output is energized when the DC/DC converter is enabled.	3
	Started	Bit 5 of 106.16 Status word 1. Relay is energized when the DC/DC converter is started.	4
	Running	Bit 1 of 106.11 Main status word (see page 61). Output is energized when the DC/DC converter unit is running.	5
	Ready ref	Bit 2 of 106.11 Main status word. Output is energized when DC/DC converter operation is enabled.	6
	Warning	Bit 7 of 106.11 Main status word. Output is energized when a warning is active.	7
	Fault	Bit 3 of 106.11 Main status word. Output is energized when a fault is active.	8
	Fault (-1)	Inverted bit 3 of 106.11 Main status word.	9
	MCB	Bit 13 of 106.16 Status word 1 (see page 61). Relay controls the main circuit breaker. The relay is energized when the closing command for the main circuit breaker is given.	10
	Charging	Bit 12 of 106.16 Status word 1. Output is energized when the external charging has charged the DC/DC converter.	11
	Other [bit]	A specific bit in another parameter.	-
114.12	DI1 ON delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the activation delay for digital input DI1.	0.00 s



t_{On} = 114.12 DI1 ON delay
t_{Off} = 114.13 DI1 OFF delay
*Electrical status of DI or status of selected source (in output mode). Indicated by 114.05 DI status.
**Indicated by 114.06 DI delayed status.

	0.00 … 3000.00 s	Activation delay for DI1.	10 = 1 s

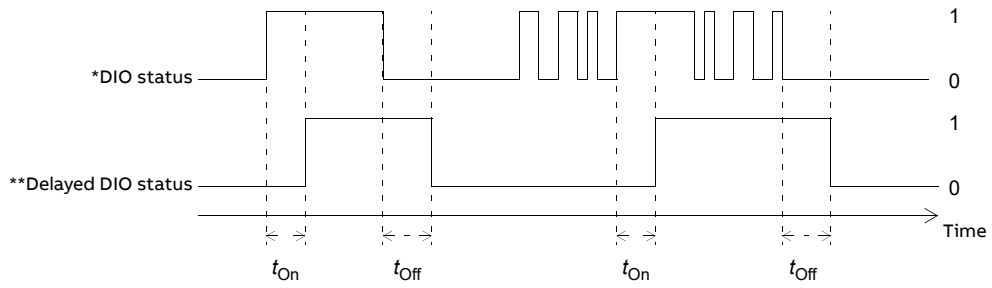
No.	Name/Value	Description	Def/FbEq16
114.12	DIO1 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for digital input/output DIO1.	0.0 s
		 tOn = 114.12 DIO1 ON delay tOff = 114.13 DIO1 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 114.05 DIO status. **Indicated by 114.06 DIO delayed status.	
	0.0 … 3000.0 s	Activation delay for DIO1.	10 = 1 s
114.13	DI1 OFF delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI1. See parameter 114.12 DI1 ON delay.	0.00 s
	0.00 … 3000.00 s	Deactivation delay for DI1.	10 = 1 s
114.13	DIO1 OFF delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for digital input/output DIO1. See parameter 114.12 DIO1 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DIO1.	10 = 1 s
114.14	DIO2 configuration	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Selects whether DIO2 of the extension module is used as a digital input or output.	Input
	Input	DIO2 is used as a digital input.	0
	Output	DIO2 is used as a digital output.	1
114.15	DIO2 filter gain	(Visible when 114.01 Module 1 type = FIO-11) Determines a filtering time for DIO2 when it is used as an input.	7.5 us
	7.5 us	7.5 microseconds.	0
	195 us	195 microseconds.	1
	780 us	780 microseconds.	2
	4.680 ms	4.680 milliseconds.	3
114.16	DIO2 output source	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Selects a signal to be connected to digital input/output DIO2 when parameter 114.14 DIO2 configuration is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized
114.17	DI2 ON delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the activation delay for digital input DI2. See parameter 114.12 DI1 ON delay.	0.00 s
	0.00 … 3000.00 s	Activation delay for DI2.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
114.17	DIO2 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for digital input/output DIO2.	0.0 s
		 t_{On} = 114.17 DIO2 ON delay t_{Off} = 114.18 DIO2 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 114.05 DIO status. **Indicated by 114.06 DIO delayed status.	
	0.0 … 3000.0 s	Activation delay for DIO2.	10 = 1 s
114.18	DI2 OFF delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI2. See parameter 114.12 DI1 ON delay.	0.00 s
	0.00 … 3000.00 s	Deactivation delay for DI2.	10 = 1 s
114.18	DIO2 OFF delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the deactivation delay for digital input/output DIO2. See parameter 114.17 DIO2 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DIO2.	10 = 1 s
114.19	DIO3 configuration	(Visible when 114.01 Module 1 type = FIO-01) Selects whether DIO3 of the extension module is used as a digital input or output.	Input
	Input	DIO3 is used as a digital input.	0
	Output	DIO3 is used as a digital output.	1
114.19	AI supervision function	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Selects how the DC/DC converter reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input. The inputs and the limits to be observed are selected by parameter 114.20 AI supervision selection.	No action
	No action	No action taken.	0
	Fault	DC/DC converter trips on 8E06 AI supervision.	1
	Warning	DC/DC converter generates an AE67 AI supervision warning.	2

No.	Name/Value	Description	Def/FbEq16
114.20	AI supervision selection	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Specifies the analog input limits to be supervised. See parameter 114.19 AI supervision function.	0000h

Bit	Name	Description
0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.
1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.
2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.
3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.
4	AI3 < MIN	1 = Minimum limit supervision of AI3 active.
5	AI3 > MAX	1 = Maximum limit supervision of AI3 active.
6...15	Reserved	

	0000h...FFFFh	Activation of analog input supervision.	1 = 1
114.21	DIO3 output source	(Visible when 114.01 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO3 when parameter 114.19 DIO3 configuration is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized
114.22	DI3 ON delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the activation delay for digital input DI3. See parameter 114.12 DI1 ON delay.	0.00 s
	0.00 ... 3000.00 s	Activation delay for DI3.	10 = 1 s
114.22	DIO3 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for digital input/output DIO3.	0.0 s



tOn = 114.22 DIO3 ON delay

tOff = 114.23 DIO3 OFF delay

*Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 114.05 DIO status.

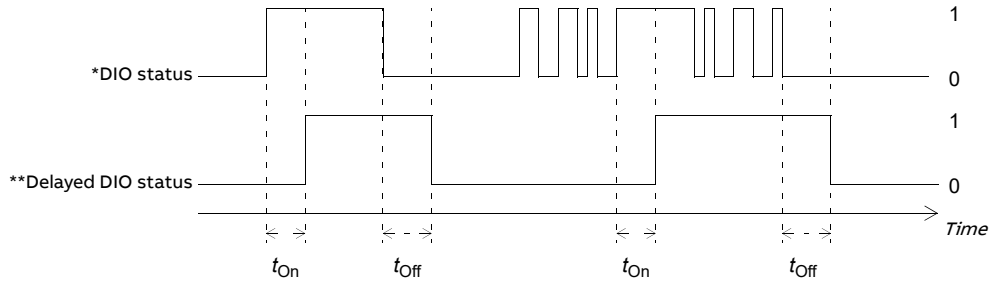
**Indicated by 114.06 DIO delayed status.

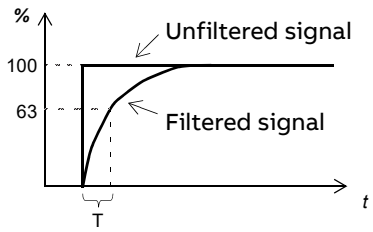
	0.0 ... 3000.0 s	Activation delay for DIO3.	10 = 1 s

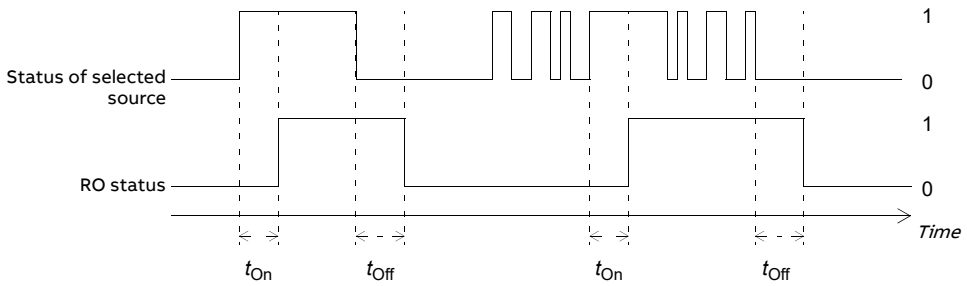
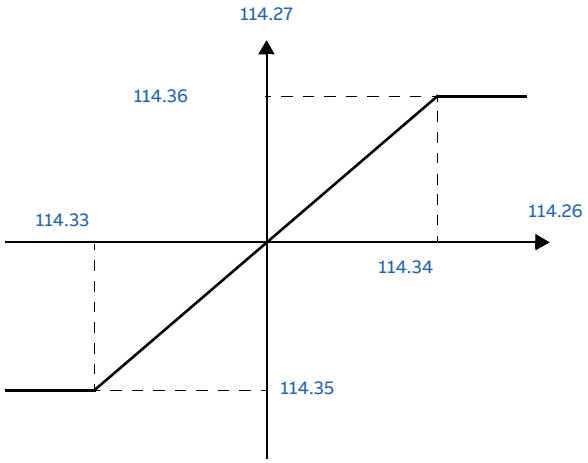
No.	Name/Value	Description	Def/FbEq16
114.22	AI force sel	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) The true readings of the analog inputs can be overridden for, eg. testing purposes. A forced value parameter is provided for each analog input, and its value is applied whenever the corresponding bit in this parameter is 1.	00000000h

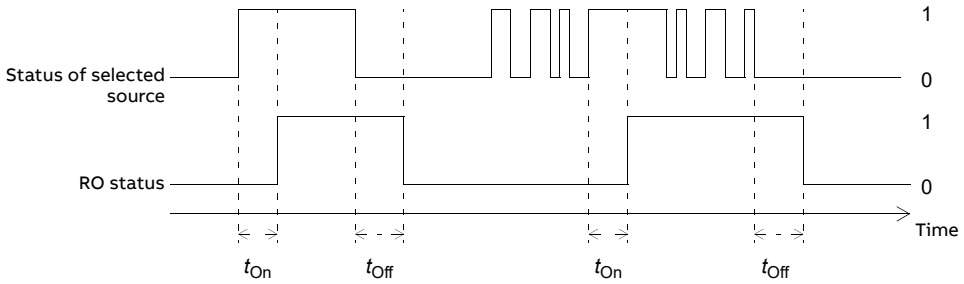
Bit	Value
0	1 = Force AI1 to value of parameter 114.28 AI1 force data.
1	1 = Force AI2 to value of parameter 114.43 AI2 force data.
2	1 = Force AI3 to value of parameter 114.58 AI3 force data.
3…31	Reserved.

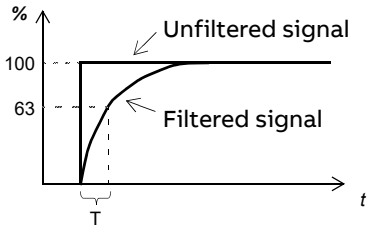
	00000000h … FFFFFFFFh	Forced values selector for analog inputs.	1 = 1
114.23	DI3 OFF delay	(Visible when 114.01 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI3. See parameter 114.12 DI1 ON delay.	0.00 s
	0.00 … 3000.00 s	Deactivation delay for DI3.	10 = 1 s
114.23	DIO3 OFF delay	(Visible when 114.01 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO3. See parameter 114.22 DIO3 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DIO3.	10 = 1 s
114.24	DIO4 configuration	(Visible when 114.01 Module 1 type = FIO-01) Selects whether DIO4 of the extension module is used as a digital input or output.	Input
	Input	DIO4 is used as a digital input.	0
	Output	DIO4 is used as a digital output.	1
114.26	DIO4 output source	(Visible when 114.01 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO4 when parameter 114.24 DIO4 configuration is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized
114.26	AI1 actual value	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of analog input AI1 in mA or V (depending on whether the input is set to current or voltage). This parameter is read-only.	-
	-22.000… 22.000 mA or V	Value of analog input AI1.	1000 = 1 mA or V

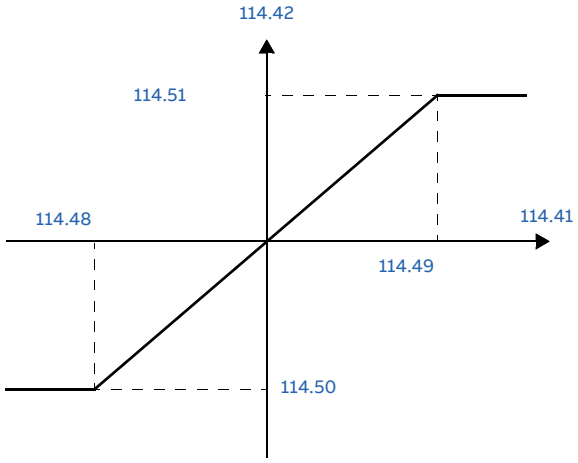
No.	Name/Value	Description	Def/FbEq16
114.27	DIO4 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FIO-11) Defines the activation delay for digital input/output DIO4.	0.0 s
		 tOn = 114.27 DIO4 ON delay tOff = 114.28 DIO4 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 114.05 DIO status. **Indicated by 114.06 DIO delayed status.	
	0.0 … 3000.0 s	Activation delay for DIO4.	10 = 1 s
114.27	AI1 scaled value	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of analog input AI1 after scaling. See parameter 114.35 AI1 scaled at AI1 min. This parameter is read-only.	-
	-32768.000 … 32767.000	Scaled value of analog input AI1.	1 = 1
114.28	DIO4 OFF delay	(Visible when 114.01 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO4. See parameter 114.27 DIO4 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DIO4.	10 = 1 s
114.28	AI1 force data	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the true reading of the input. See parameter 114.22 AI force sel.	-
	-22.000… 22.000 mA or V	Forced value of analog input AI1.	1000 = 1 mA or V
114.29	AI1 HW switch pos	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Shows the position of the hardware current/voltage selector on the I/O extension module. **Note:** The setting of the current/voltage selector must match the unit selection made in parameter 114.30 AI1 unit selection. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	-
	V	Volts.	2
	mA	Milliamperes.	10
114.30	AI1 unit selection	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Selects the unit for readings and settings related to analog input AI1. **Note:** This setting must match the corresponding hardware setting on the I/O extension module (see the manual of the I/O extension module). The hardware setting is shown by parameter 114.29 AI1 HW switch pos. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	mA
	V	Volts.	2

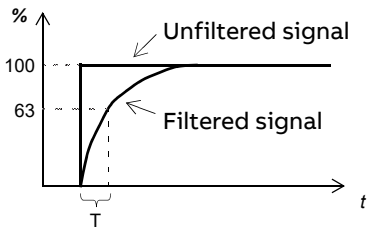
No.	Name/Value	Description	Def/FbEq16
	mA	Milliamperes.	10
114.31	RO status	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Status of relay outputs on the I/O extension module. **Example:** 00000001b = RO1 is energized, RO2 is de-energized.	-
	0000h…FFFFh	Status of relay outputs.	1 = 1
114.31	AI1 filter gain	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Selects a hardware filtering time for AI1. See also parameter 114.32 AI1 filter time.	No filtering
	No filtering	No filtering.	0
	125 us	125 microseconds.	1
	250 us	250 microseconds.	2
	500 us	500 microseconds.	3
	1 ms	1 millisecond.	4
	2 ms	2 milliseconds.	5
	4 ms	4 milliseconds.	6
	7.9375 ms	7.9375 milliseconds.	7
114.32	AI1 filter time	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for analog input AI1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.31 AI1 filter gain.	0.040 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
114.33	AI1 min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum value for analog input AI1. See also parameter 114.21 DIO3 output source.	0.000 mA or V
	-22.000… 22.000 mA or V	Minimum value of AI1.	1000 = 1 mA or V
114.34	RO1 source	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Selects a signal to be connected to relay output RO1. For the available selections, see parameter 114.11 DIO1 output source.	Not energized
114.34	AI1 max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum value for analog input AI1. See also parameter 114.21 DIO3 output source.	10.000 mA or V
	-22.000… 22.000 mA or V	Maximum value of AI1.	1000 = 1 mA or V

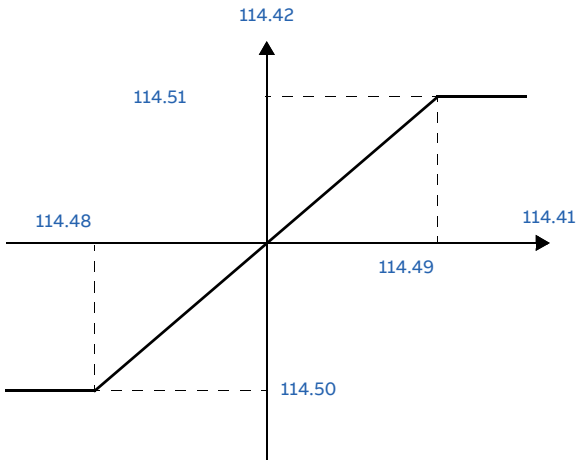
No.	Name/Value	Description	Def/FbEq16
114.35	RO1 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Defines the activation delay for relay output RO1.  tOn = 114.35 RO1 ON delay tOff = 114.36 RO1 OFF delay	0.0 s
	0.0 … 3000.0 s	Activation delay for RO1.	10 = 1 s
114.35	AI1 scaled at AI1 min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value that corresponds to the minimum analog input AI1 value defined by parameter 114.33 AI1 min.  	0.000
	-32768.000 … 32767.000	Real value corresponding to minimum AI1 value.	1 = 1
114.36	RO1 OFF delay	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Defines the deactivation delay for relay output RO1. See parameter 114.35 RO1 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO1.	10 = 1 s
114.36	AI1 scaled at AI1 max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value that corresponds to the maximum analog input AI1 value defined by parameter 114.34 AI1 max. See the drawing at parameter 114.35 AI1 scaled at AI1 min.	1500.0
	-32768.000 … 32767.000	Real value corresponding to maximum AI1 value.	1 = 1
114.37	RO2 source	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Selects a signal to be connected to relay output RO2. For the available selections, see parameter 114.11 DIO1 output source.	Not energized

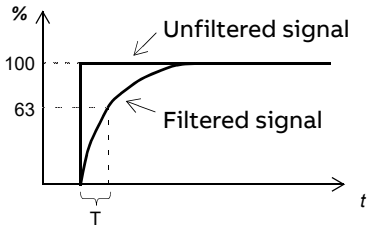
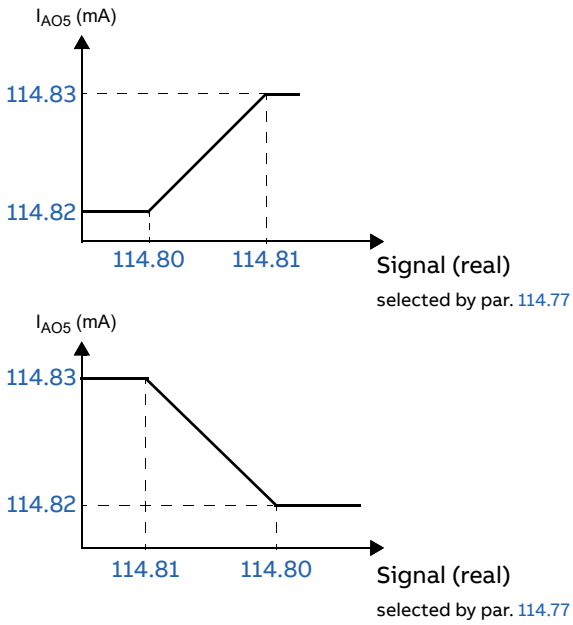
No.	Name/Value	Description	Def/FbEq16
114.38	RO2 ON delay	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Defines the activation delay for relay output RO2.	0.0 s
		 tOn = 114.38 RO2 ON delay tOff = 114.39 RO2 OFF delay	
	0.0 … 3000.0 s	Activation delay for RO2.	10 = 1 s
114.39	RO2 OFF delay	(Visible when 114.01 Module 1 type = FIO-01 or FDIO-01) Defines the deactivation delay for relay output RO1. See parameter 114.35 RO1 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO2.	10 = 1 s
114.41	AI2 actual value	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of analog input AI2 in mA or V (depending on whether the input is set to current or voltage). This parameter is read-only.	-
	-22.000… 22.000 mA or V	Value of analog input AI2.	1000 = 1 mA or V
114.42	AI2 scaled value	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Displays the value of analog input AI2 after scaling. See parameter 114.50 AI2 scaled at AI2 min. This parameter is read-only.	-
	-32768.000 … 32767.000	Scaled value of analog input AI2.	1 = 1
114.43	AI2 force data	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the true reading of the input. See parameter 114.22 AI force sel.	0.000 mA
	-22.000… 22.000 mA or V	Forced value of analog input AI2.	1000 = 1 mA or V
114.44	AI2 HW switch pos	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Shows the position of the hardware current/voltage selector on the I/O extension module. **Note:** The setting of the current/voltage selector must match the unit selection made in parameter 114.45 AI2 unit selection. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	-
	V	Volts.	2
	mA	Milliamperes.	10

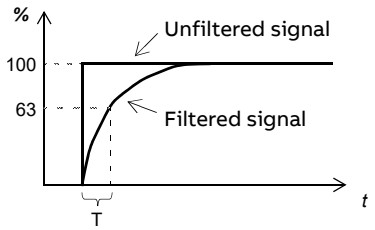
No.	Name/Value	Description	Def/FbEq16
114.45	AI2 unit selection	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Selects the unit for readings and settings related to analog input AI2. **Note:** This setting must match the corresponding hardware setting on the I/O extension module (see the manual of the I/O extension module). The hardware setting is shown by parameter 114.44 AI2 HW switch pos. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	mA
	V	Volts.	2
	mA	Milliamperes.	10
114.46	AI2 filter gain	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Selects a hardware filtering time for AI2. See also parameter 114.47 AI2 filter time.	No filtering
	No filtering	No filtering.	0
	125 us	125 microseconds.	1
	250 us	250 microseconds.	2
	500 us	500 microseconds.	3
	1 ms	1 millisecond.	4
	2 ms	2 milliseconds.	5
	4 ms	4 milliseconds.	6
	7.9375 ms	7.9375 milliseconds.	7
114.47	AI2 filter time	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the filter time constant for analog input AI2.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.46 AI2 filter gain.	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
114.48	AI2 min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum value for analog input AI2. See also parameter 114.21 DIO3 output source.	0.000 mA or V
	-22.000… 22.000 mA or V	Minimum value of AI2.	1000 = 1 mA or V
114.49	AI2 max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum value for analog input AI2. See also parameter 114.21 DIO3 output source.	10.000 mA or V
	-22.000… 22.000 mA or V	Maximum value of AI2.	1000 = 1 mA or V

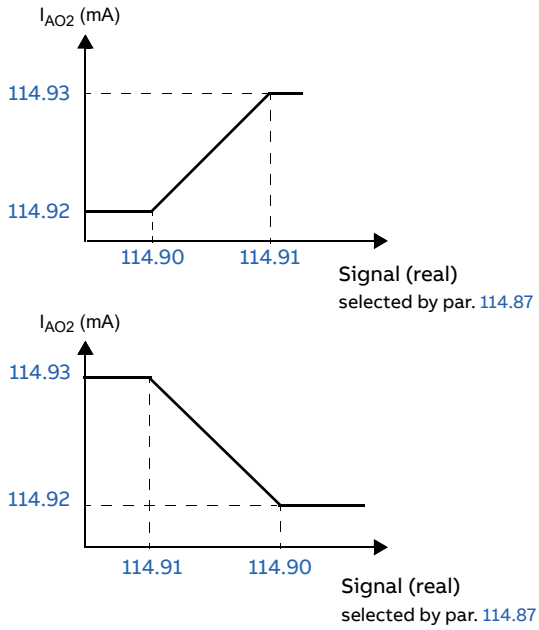
No.	Name/Value	Description	Def/FbEq16
114.50	AI2 scaled at AI2 min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 14.48 AI2 min.  	0.000
	-32768.000 … 32767.000	Real value corresponding to minimum AI2 value.	1 = 1
114.51	AI2 scaled at AI2 max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value that corresponds to the maximum analog input AI2 value defined by parameter 114.49 AI2 max. See the drawing at parameter 114.50 AI2 scaled at AI2 min.	1500.0
	-32768.000 … 32767.000	Real value corresponding to maximum AI2 value.	1 = 1
114.56	AI3 actual value	(Visible when 114.01 Module 1 type = FIO-11) Displays the value of analog input AI3 in mA or V (depending on whether the input is set to current or voltage). This parameter is read-only.	-
	-22.000… 22.000 mA or V	Value of analog input AI3.	1000 = 1 mA or V
114.57	AI3 scaled value	(Visible when 114.01 Module 1 type = FIO-11) Displays the value of analog input AI3 after scaling. See parameter 114.65 AI3 scaled at AI3 min. This parameter is read-only.	-
	-32768.000 … 32767.000	Scaled value of analog input AI3.	1 = 1
114.58	AI3 force data	(Visible when 114.01 Module 1 type = FIO-11) Forced value that can be used instead of the true reading of the input. See parameter 114.22 AI force sel.	0.000 mA
	-22.000… 22.000 mA or V	Forced value of analog input AI3.	1000 = 1 mA or V
114.59	AI3 HW switch pos	(Visible when 114.01 Module 1 type = FIO-11) Shows the position of the hardware current/voltage selector on the I/O extension module. **Note:** The setting of the current/voltage selector must match the unit selection made in parameter 114.60 AI3 unit selection. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	-
	V	Volts.	2

No.	Name/Value	Description	Def/FbEq16
	mA	Milliamperes.	10
114.60	AI3 unit selection	(Visible when 114.01 Module 1 type = FIO-11) Selects the unit for readings and settings related to analog input AI3. **Note:** This setting must match the corresponding hardware setting on the I/O extension module (see the manual of the I/O extension module). The hardware setting is shown by parameter 114.59 AI3 HW switch pos. I/O module reboot either by cycling the power or through parameter 196.08 Control board boot is required to validate any changes in the jumper settings.	mA
	V	Volts.	2
	mA	Milliamperes.	10
114.61	AI3 filter gain	(Visible when 114.01 Module 1 type = FIO-11) Selects a hardware filtering time for AI3. See also parameter 114.62 AI3 filter time.	No filtering
	No filtering	No filtering.	0
	125 us	125 microseconds.	1
	250 us	250 microseconds.	2
	500 us	500 microseconds.	3
	1 ms	1 millisecond.	4
	2 ms	2 milliseconds.	5
	4 ms	4 milliseconds.	6
	7.9375 ms	7.9375 milliseconds.	7
114.62	AI3 filter time	(Visible when 114.01 Module 1 type = FIO-11) Defines the filter time constant for analog input AI3.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.61 AI3 filter gain.	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
114.63	AI3 min	(Visible when 114.01 Module 1 type = FIO-11) Defines the minimum value for analog input AI3. See also parameter 114.21 DIO3 output source.	0.000 mA or V
	-22.000… 22.000 mA or V	Minimum value of AI3.	1000 = 1 mA or V
114.64	AI3 max	(Visible when 114.01 Module 1 type = FIO-11) Defines the maximum value for analog input AI3. See also parameter 114.21 DIO3 output source.	10.000 mA or V

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>-22.000…
22.000 mA or V</td><td>Maximum value of AI3.</td><td>1000 = 1 mA or V</td></tr>
<tr><td>114.65</td><td>AI3 scaled at AI3 min</td><td>(Visible when 114.01 Module 1 type = FIO-11)
Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 114.48 AI2 min.
 
</td><td>0.000</td></tr>
<tr><td></td><td>-32768.000 … 32767.000</td><td>Real value corresponding to minimum AI3 value.</td><td>1 = 1</td></tr>
<tr><td>114.66</td><td>AI3 scaled at AI3 max</td><td>(Visible when 114.01 Module 1 type = FIO-11)
Defines the real value that corresponds to the maximum analog input AI3 value defined by parameter 114.64 AI3 max. See the drawing at parameter 114.65 AI3 scaled at AI3 min.</td><td>1500.0</td></tr>
<tr><td></td><td>-32768.000 … 32767.000</td><td>Real value corresponding to maximum AI3 value.</td><td>1 = 1</td></tr>
<tr><td>114.71</td><td>AO force selection</td><td>(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01)
The value of the analog output can be overridden for eg. testing purposes. A forced value parameter (114.78 AO1 force data) is provided for the analog output, and its value is applied whenever the corresponding bit in this parameter is 1.
<table><tr><th>Bit</th><th>Value</th></tr><tr><td>0</td><td>1 = Force AO1 to value of parameter 114.78 AO1 force data.</td></tr><tr><td>1…31</td><td>Reserved.</td></tr></table></td><td>00000000h</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>Forced values selector for analog outputs.</td><td>1 = 1</td></tr>
<tr><td>114.76</td><td>AO1 actual value</td><td>(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01)
Displays the value of AO1 in mA.
This parameter is read-only.</td><td>-</td></tr>
<tr><td></td><td>0.000 … 22.000 mA</td><td>Value of AO1.</td><td>1000 = 1 mA</td></tr>
<tr><td>114.77</td><td>AO1 source</td><td>(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01)
Selects a signal to be connected to analog output AO1. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor.</td><td>Zero</td></tr>
<tr><td></td><td>Zero</td><td>None.</td><td>0</td></tr>
<tr><td></td><td>Other</td><td>The value is taken from another parameter.</td><td>-</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
114.78	AO1 force data	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Forced value that can be used instead of the selected output signal. See parameter 114.71 AO force selection.	0.000 mA
	0.000 … 22.000 mA	Forced value of analog output AO1.	1000 = 1 mA
114.79	AO1 filter time	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the filtering time constant for analog output AO1.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
114.80	AO1 source min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value of the signal (selected by parameter 114.77 AO1 source) that corresponds to the minimum AO1 output value (defined by parameter 114.82 AO1 out at AO1 src min) 	0.0
	-32768.0 … 32767.0	Real signal value corresponding to minimum AO1 output value.	1 = 1

No.	Name/Value	Description	Def/FbEq16
114.81	AO1 source max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the real value of the signal (selected by parameter 114.77 AO1 source) that corresponds to the maximum AO1 output value (defined by parameter 114.83 AO1 out at AO1 src max). See parameter 114.80 AO1 source min.	1500.0
	-32768.0 … 32767.0	Real signal value corresponding to maximum AO1 output value.	1 = 1
114.82	AO1 out at AO1 src min	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the minimum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	0.000 mA
	0.000 … 22.000 mA	Minimum AO1 output value.	1000 = 1 mA
114.83	AO1 out at AO1 src max	(Visible when 114.01 Module 1 type = FIO-11 or FAIO-01) Defines the maximum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	20.000 mA
	0.000 … 22.000 mA	Maximum AO1 output value.	1000 = 1 mA
114.86	AO2 actual value	(Visible when 114.01 Module 1 type = FAIO-01) Displays the value of AO2 in mA. This parameter is read-only.	-
	0.000 … 22.000 mA	Value of AO2.	1000 = 1 mA
114.87	AO2 source	(Visible when 114.01 Module 1 type = FAIO-01) Selects a signal to be connected to analog output AO2. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. For the selections, see parameter 114.77 AO1 source.	Zero
114.88	AO2 force data	(Visible when 114.01 Module 1 type = FAIO-01) Forced value that can be used instead of the selected output signal. See parameter 114.71 AO force selection.	0.000 mA
	0.000 … 22.000 mA	Forced value of analog output AO2.	1000 = 1 mA
114.89	AO2 filter time	(Visible when 114.01 Module 1 type = FAIO-01) Defines the filtering time constant for analog output AO2.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s

No.	Name/Value	Description	Def/FbEq16
114.90	AO2 source min	(Visible when 114.01 Module 1 type = FAIO-01) Defines the real value of the signal (selected by parameter 114.87 AO2 source) that corresponds to the minimum AO2 output value (defined by parameter 114.92 AO2 out at AO2 src min). 	0.0
	-32768.0 … 32767.0	Real signal value corresponding to minimum AO2 output value.	1 = 1
114.91	AO2 source max	(Visible when 114.01 Module 1 type = FAIO-01) Defines the real value of the signal (selected by parameter 114.87 AO2 source) that corresponds to the maximum AO2 output value (defined by parameter 114.93 AO2 out at AO2 src max). See parameter 114.90 AO2 source min.	100.0
	-32768.0 … 32767.0	Real signal value corresponding to maximum AO2 output value.	1 = 1
114.92	AO2 out at AO2 src min	(Visible when 114.01 Module 1 type = FAIO-01) Defines the minimum output value for analog output AO2. See also drawing at parameter 114.90 AO2 source min.	0.000 mA
	0.000 … 22.000 mA	Minimum AO2 output value.	1000 = 1 mA
114.93	AO2 out at AO2 src max	(Visible when 114.01 Module 1 type = FAIO-01) Defines the maximum output value for analog output AO2. See also drawing at parameter 114.90 AO2 source min.	10.000 mA
	0.000 … 22.000 mA	Maximum AO2 output value.	1000 = 1 mA
115 Extension I/O module 2		Configuration of I/O extension module 2. See also section Programmable I/O extensions (page 35). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
115.01	Module 2 type	See parameter 114.01 Module 1 type.	None
115.02	Module 2 location	See parameter 114.02 Module 1 location.	Slot 1

No.	Name/Value	Description	Def/FbEq16
115.03	Module 2 status	See parameter 114.03 Module 1 status.	No option
115.05	DI status	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.05 DI status.	-
115.05	DIO status	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.05 DIO status.	-
115.06	DI delayed status	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.06 DI delayed status.	-
115.06	DIO delayed status	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.06 DIO delayed status.	-
115.08	DI filter time	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.08 DI filter time.	10.0 ms
115.09	DIO1 configuration	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.09 DIO1 configuration.	Input
115.10	DIO1 filter gain	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.10 DIO1 filter gain.	7.5 us
115.11	DIO1 output source	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.11 DIO1 output source.	Not energized
115.12	DI1 ON delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.12 DI1 ON delay.	0.00 s
115.12	DIO1 ON delay	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.12 DIO1 ON delay.	0.0 s
115.13	DI1 OFF delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.13 DI1 OFF delay.	0.00 s
115.13	DIO1 OFF delay	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.13 DIO1 OFF delay.	0.0 s
115.14	DIO2 configuration	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.14 DIO2 configuration.	Input
115.15	DIO2 filter gain	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.15 DIO2 filter gain.	7.5 us
115.16	DIO2 output source	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.16 DIO2 output source.	Not energized
115.17	DI2 ON delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.17 DI2 ON delay.	0.00 s
115.17	DIO2 ON delay	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.17 DIO2 ON delay.	0.0 s
115.18	DI2 OFF delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.18 DI2 OFF delay.	0.00 s
115.18	DIO2 OFF delay	(Visible when 115.01 Module 2 type = FIO-01 or FIO-11) See parameter 114.18 DIO2 OFF delay.	0.0 s
115.19	DIO3 configuration	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.19 DIO3 configuration.	Input
115.19	AI supervision function	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.19 AI supervision function.	No action
115.20	AI supervision selection	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.20 AI supervision selection.	0000h
115.21	DIO3 output source	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.21 DIO3 output source.	Not energized
115.22	DI3 ON delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.22 DI3 ON delay.	0.00 s
115.22	DIO3 ON delay	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.22 DIO3 ON delay.	0.0 s

No.	Name/Value	Description	Def/FbEq16
115.22	AI force sel	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.22 AI force sel.	00000000h
115.23	DI3 OFF delay	(Visible when 115.01 Module 2 type = FDIO-01) See parameter 114.23 DI3 OFF delay.	0.00 s
115.23	DIO3 OFF delay	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.23 DIO3 OFF delay.	0.0 s
115.24	DIO4 configuration	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.24 DIO4 configuration.	Input
115.26	DIO4 output source	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.26 DIO4 output source.	Not energized
115.26	AI1 actual value	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.26 AI1 actual value.	-
115.27	DIO4 ON delay	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.27 DIO4 ON delay.	0.0 s
115.27	AI1 scaled value	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.27 AI1 scaled value.	-
115.28	DIO4 OFF delay	(Visible when 115.01 Module 2 type = FIO-01) See parameter 114.28 DIO4 OFF delay.	0.0 s
115.28	AI1 force data	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.28 AI1 force data.	
115.29	AI1 HW switch pos	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.29 AI1 HW switch pos.	-
115.30	AI1 unit selection	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.30 AI1 unit selection.	mA
115.31	RO status	(Visible when 115.01 Module 2 type = FIO-01 or FAIO-01) See parameter 114.31 RO status.	-
115.31	AI1 filter gain	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.31 AI1 filter gain.	No filtering
115.32	AI1 filter time	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.32 AI1 filter time.	0.040 s
115.33	AI1 min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.33 AI1 min.	0.000 mA or V
115.34	RO1 source	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.34 RO1 source.	Not energized
115.34	AI1 max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.34 AI1 max.	10.000 mA or V
115.35	RO1 ON delay	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.35 RO1 ON delay.	0.0 s
115.35	AI1 scaled at AI1 min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.35 AI1 scaled at AI1 min.	0.000
115.36	RO1 OFF delay	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.36 RO1 OFF delay.	0.0 s
115.36	AI1 scaled at AI1 max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.36 AI1 scaled at AI1 max.	1500.0
115.37	RO2 source	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.37 RO2 source.	Not energized
115.38	RO2 ON delay	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.38 RO2 ON delay.	0.0 s
115.39	RO2 OFF delay	(Visible when 115.01 Module 2 type = FIO-01 or FDIO-01) See parameter 114.39 RO2 OFF delay.	0.0 s
115.41	AI2 actual value	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.41 AI2 actual value.	-

No.	Name/Value	Description	Def/FbEq16
115.42	AI2 scaled value	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.42 AI2 scaled value.	-
115.43	AI2 force data	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.43 AI2 force data.	0.000 mA
115.44	AI2 HW switch pos	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.44 AI2 HW switch pos.	-
115.45	AI2 unit selection	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.45 AI2 unit selection.	mA
115.46	AI2 filter gain	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.46 AI2 filter gain.	No filtering
115.47	AI2 filter time	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.47 AI2 filter time.	0.100 s
115.48	AI2 min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.48 AI2 min.	0.000 mA or V
115.49	AI2 max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.49 AI2 max.	10.000 mA or V
115.50	AI2 scaled at AI2 min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.50 AI2 scaled at AI2 min.	0.000
115.51	AI2 scaled at AI2 max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.51 AI2 scaled at AI2 max.	1500.0
115.56	AI3 actual value	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.56 AI3 actual value.	-
115.57	AI3 scaled value	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.57 AI3 scaled value.	-
115.58	AI3 force data	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.58 AI3 force data.	0.000 mA
115.59	AI3 HW switch pos	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.59 AI3 HW switch pos.	-
115.60	AI3 unit selection	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.60 AI3 unit selection.	mA
115.61	AI3 filter gain	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.61 AI3 filter gain.	No filtering
115.62	AI3 filter gain	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.62 AI3 filter time.	0.100 s
115.63	AI3 min	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.63 AI3 min.	0.000 mA or V
115.64	AI3 max	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.64 AI3 max.	10.000 mA or V
115.65	AI3 scaled at AI3 min	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.65 AI3 scaled at AI3 min.	0.000
115.66	AI3 scaled at AI3 max	(Visible when 115.01 Module 2 type = FIO-11) See parameter 114.66 AI3 scaled at AI3 max.	1500.0
115.71	AO force selection	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.71 AO force selection.	00000000h
115.76	AO1 actual value	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.76 AO1 actual value.	-
115.77	AO1 source	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.77 AO1 source.	Zero
115.78	AO1 force data	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.78 AO1 force data.	0.000 mA
115.79	AO1 filter time	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.79 AO1 filter time.	0.100 s

No.	Name/Value	Description	Def/FbEq16
115.80	AO1 source min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.80 AO1 source min.	0.0
115.81	AO1 source max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.81 AO1 source max.	1500.0
115.82	AO1 out at AO1 src min	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA
115.83	AO1 out at AO1 src max	(Visible when 115.01 Module 2 type = FIO-11 or FAIO-01) See parameter 114.83 AO1 out at AO1 src max.	20.000 mA
115.86	AO2 actual value	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.86 AO2 actual value.	-
115.87	AO2 source	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.87 AO2 source.	Zero
115.88	AO2 force data	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.88 AO2 force data.	0.000 mA
115.89	AO2 filter time	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.89 AO2 filter time.	0.100 s
115.90	AO2 source min	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.90 AO2 source min.	0.0
115.91	AO2 source max	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.91 AO2 source max.	100.0
115.92	AO2 out at AO2 src min	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.92 AO2 out at AO2 src min.	0.000 mA
115.93	AO2 out at AO2 src max	(Visible when 115.01 Module 2 type = FAIO-01) See parameter 114.93 AO2 out at AO2 src max.	10.000 mA
116 Extension I/O module 3		Configuration of I/O extension module 3. See also section Programmable I/O extensions (page 35). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
116.01	Module 3 type	See parameter 114.01 Module 1 type.	None
116.02	Module 3 location	See parameter 114.02 Module 1 location.	Slot 1
116.03	Module 3 status	See parameter 114.03 Module 1 status.	No option
116.05	DI status	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.05 DI status.	-
116.05	DIO status	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.05 DIO status.	-
116.06	DI delayed status	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.06 DI delayed status.	-
116.06	DIO delayed status	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.06 DIO delayed status.	-
116.08	DI filter time	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.08 DI filter time.	10.0 ms
116.09	DIO1 configuration	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.09 DIO1 configuration.	Input
116.10	DIO1 filter gain	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.10 DIO1 filter gain.	7.5 us
116.11	DIO1 output source	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.11 DIO1 output source.	Not energized
116.12	DI1 ON delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.12 DI1 ON delay.	0.00 s
116.12	DIO1 ON delay	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.12 DIO1 ON delay.	0.0 s

No.	Name/Value	Description	Def/FbEq16
116.13	DI1 OFF delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.13 DI1 OFF delay.	0.00 s
116.13	DIO1 OFF delay	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.13 DIO1 OFF delay.	0.0 s
116.14	DIO2 configuration	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.14 DIO2 configuration.	Input
116.15	DIO2 filter gain	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.15 DIO2 filter gain.	7.5 us
116.16	DIO2 output source	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.16 DIO2 output source.	Not energized
116.17	DI2 ON delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.17 DI2 ON delay.	0.00 s
116.17	DIO2 ON delay	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.17 DIO2 ON delay.	0.0 s
116.18	DI2 OFF delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.18 DI2 OFF delay.	0.00 s
116.18	DIO2 OFF delay	(Visible when 116.01 Module 3 type = FIO-01 or FIO-11) See parameter 114.18 DIO2 OFF delay.	0.0 s
116.19	DIO3 configuration	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.19 DIO3 configuration.	Input
116.19	AI supervision function	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.19 AI supervision function.	No action
116.20	AI supervision selection	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.20 AI supervision selection.	0000h
116.21	DIO3 output source	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.21 DIO3 output source.	Not energized
116.22	DI3 ON delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.22 DI3 ON delay.	0.00 s
116.22	DIO3 ON delay	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.22 DIO3 ON delay.	0.0 s
116.22	AI force sel	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.22 AI force sel.	00000000h
116.23	DI3 OFF delay	(Visible when 116.01 Module 3 type = FDIO-01) See parameter 114.23 DI3 OFF delay.	0.00 s
116.23	DIO3 OFF delay	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.23 DIO3 OFF delay.	0.0 s
116.24	DIO4 configuration	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.24 DIO4 configuration.	Input
116.26	DIO4 output source	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.26 DIO4 output source.	Not energized
116.26	AI1 actual value	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.26 AI1 actual value.	-
116.27	DIO4 ON delay	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.27 DIO4 ON delay.	0.0 s
116.27	AI1 scaled value	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.27 AI1 scaled value.	-
116.28	DIO4 OFF delay	(Visible when 116.01 Module 3 type = FIO-01) See parameter 114.28 DIO4 OFF delay.	0.0 s
116.28	AI1 force data	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.28 AI1 force data.	-
116.29	AI1 HW switch pos	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.29 AI1 HW switch pos.	-

No.	Name/Value	Description	Def/FbEq16
116.30	AI1 unit selection	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.30 AI1 unit selection.	mA
116.31	RO status	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.31 RO status.	-
116.31	AI1 filter gain	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.31 AI1 filter gain.	No filtering
116.32	AI1 filter time	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.32 AI1 filter time.	0.040 s
116.33	AI1 min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.33 AI1 min.	0.000 mA or V
116.34	RO1 source	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.34 RO1 source.	Not energized
116.34	AI1 max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.34 AI1 max.	10.000 mA or V
116.35	RO1 ON delay	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.35 RO1 ON delay.	0.0 s
116.35	AI1 scaled at AI1 min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.35 AI1 scaled at AI1 min.	0.000
116.36	RO1 OFF delay	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.36 RO1 OFF delay.	0.0 s
116.36	AI1 scaled at AI1 max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.36 AI1 scaled at AI1 max.	1500.0
116.37	RO2 source	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.37 RO2 source.	Not energized
116.38	RO2 ON delay	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.38 RO2 ON delay.	0.0 s
116.39	RO2 OFF delay	(Visible when 116.01 Module 3 type = FIO-01 or FDIO-01) See parameter 114.39 RO2 OFF delay.	0.0 s
116.41	AI2 actual value	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.41 AI2 actual value.	-
116.42	AI2 scaled value	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.42 AI2 scaled value.	-
116.43	AI2 force data	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.43 AI2 force data.	0.000 mA
116.44	AI2 HW switch pos	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.44 AI2 HW switch pos.	-
116.45	AI2 unit selection	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.45 AI2 unit selection.	mA
116.46	AI2 filter gain	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.46 AI2 filter gain.	No filtering
116.47	AI2 filter time	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.47 AI2 filter time.	0.100 s
116.48	AI2 min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.48 AI2 min.	0.000 mA or V
116.49	AI2 max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.49 AI2 max.	10.000 mA or V
116.50	AI2 scaled at AI2 min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.50 AI2 scaled at AI2 min.	0.000
116.51	AI2 scaled at AI2 max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.51 AI2 scaled at AI2 max.	1500.0
116.56	AI3 actual value	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.56 AI3 actual value.	-

No.	Name/Value	Description	Def/FbEq16
116.57	AI3 scaled value	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.57 AI3 scaled value.	-
116.58	AI3 force data	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.58 AI3 force data.	0.000 mA
116.59	AI3 HW switch pos	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.59 AI3 HW switch pos.	-
116.60	AI3 unit selection	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.60 AI3 unit selection.	mA
116.61	AI3 filter gain	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.61 AI3 filter gain.	No filtering
116.62	AI3 filter time	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.62 AI3 filter time.	0.100 s
116.63	AI3 min	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.63 AI3 min.	0.000 mA or V
116.64	AI3 max	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.64 AI3 max.	10.000 mA or V
116.65	AI3 scaled at AI3 min	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.65 AI3 scaled at AI3 min.	0.000
116.66	AI3 scaled at AI3 max	(Visible when 116.01 Module 3 type = FIO-11) See parameter 114.66 AI3 scaled at AI3 max.	1500.0
116.71	AO force selection	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.71 AO force selection.	00000000h
116.76	AO1 actual value	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.76 AO1 actual value.	-
116.77	AO1 source	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.77 AO1 source.	Zero
116.78	AO1 force data	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.78 AO1 force data.	0.000 mA
116.79	AO1 filter time	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.79 AO1 filter time.	0.100 s
116.80	AO1 source min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.80 AO1 source min.	0.0
116.81	AO1 source max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.81 AO1 source max.	1500.0
116.82	AO1 out at AO1 src min	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA
116.83	AO1 out at AO1 src max	(Visible when 116.01 Module 3 type = FIO-11 or FAIO-01) See parameter 114.83 AO1 out at AO1 src max.	20.000 mA
116.86	AO2 actual value	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.86 AO2 actual value.	-
116.87	AO2 source	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.87 AO2 source.	Zero
116.88	AO2 force data	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.88 AO2 force data.	0.000 mA
116.89	AO2 filter time	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.89 AO2 filter time.	0.100 s
116.90	AO2 source min	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.90 AO2 source min.	0.0
116.91	AO2 source max	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.91 AO2 source max.	100.0
116.92	AO2 out at AO2 src min	(Visible when 116.01 Module 3 type = FAIO-01) See parameter 114.92 AO2 out at AO2 src min.	0.000 mA

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>116.93</td><td>AO2 out at AO2 src max</td><td>(Visible when 116.01 Module 3 type = FAIO-01)
See parameter 114.93 AO2 out at AO2 src max.</td><td>10.000 mA</td></tr>
<tr><td colspan="2">119 Operation mode</td><td>Selection of external control location sources.
See section Control locations for start/stop on page 30.</td><td></td></tr>
<tr><td>119.17</td><td>Local control disable</td><td>Enables/disables (or selects a source that enables/disables) local control.
⚠ WARNING! Before disabling local control, ensure that the control panel is not needed for stopping the DC/DC converter unit.</td><td>No</td></tr>
<tr><td></td><td>No</td><td>Local control enabled.</td><td>0</td></tr>
<tr><td></td><td>Yes</td><td>Local control disabled.</td><td>1</td></tr>
<tr><td colspan="2">120 Start/stop</td><td>Start/stop, run/enable and start enable signal source selection.
See section Run enable, Start/stop and Start enable control on page 36.</td><td></td></tr>
<tr><td>120.01</td><td>Ext1 commands</td><td>Selects the source of start and stop commands for external control location 1 (EXT1).
Note: This parameter cannot be changed while the converter is running.</td><td>In1 Start</td></tr>
<tr><td></td><td>Not sel</td><td>No start or stop command sources selected.</td><td>0</td></tr>
<tr><td></td><td>In1 Start</td><td>The source of the start and stop commands is selected by parameter 120.03 Ext1 in1 source. The state transitions of the source bit are interpreted as follows:
<table><tr><th>State of source (120.03)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>Start</td></tr><tr><td>1 -> 0</td><td>Stop</td></tr></table></td><td>1</td></tr>
<tr><td></td><td>In1P Start; In2 Stop</td><td>The sources of the start and stop commands are selected by parameters 120.03 Ext1 in1 source and 120.04 Ext1 in2 source. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (120.03)</th><th>State of source 2 (120.04)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>1 -> 0</td><td>Stop</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table></td><td>4</td></tr>
<tr><td></td><td>Keypad</td><td>The start and stop commands are taken from the control panel (or PC connected to the control panel).</td><td>11</td></tr>
<tr><td></td><td>Fieldbus A</td><td>The start and stop commands are taken from fieldbus adapter A.</td><td>12</td></tr>
<tr><td></td><td>DDCS controller</td><td>The start and stop commands are taken from an external (DDCS) controller.</td><td>16</td></tr>
<tr><td>120.02</td><td>Ext1 start trigger type</td><td>Defines whether the start signal for external control location EXT1 is edge-triggered or level-triggered.
Note: In case the settings of parameters 120.01 and 120.02 are in conflict, the setting of parameter 120.01 takes preference.</td><td>Level</td></tr>
<tr><td></td><td>Edge</td><td>The start signal is edge-triggered.</td><td>0</td></tr>
<tr><td></td><td>Level</td><td>The start signal is level-triggered.</td><td>1</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
120.03	Ext1 in1 source	Selects source 1 for external control location EXT1 if the selection of parameter 120.01 points to this parameter. See parameter 120.01 Ext1 commands. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	On
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	2
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	7
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	10
	DIO2	Digital input /output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	11
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
120.04	Ext1 in2 source	Selects source 2 for external control location EXT1. See parameter 120.01 Ext1 commands. For the available selections, see parameter 120.03 Ext1 in1 source.	DI2
120.12	Run enable 1 source	Selects the source of the run enable signal. If the run enable signal is switched off, the DC/DC converter unit will not start, or stops if running. 1 = Run enable. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program. **Note:** This parameter cannot be changed while the converter is running.	On
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	2
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	6

No.	Name/Value	Description	Def/FbEq16
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	7
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	11
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
120.19	Enable start command	Selects the source for the start enable signal. 1 = Start enable. With the signal switched off, the converter will not start. (Switching the signal off while the converter is running will not stop it.) **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	On
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	2
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	7
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	11
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-

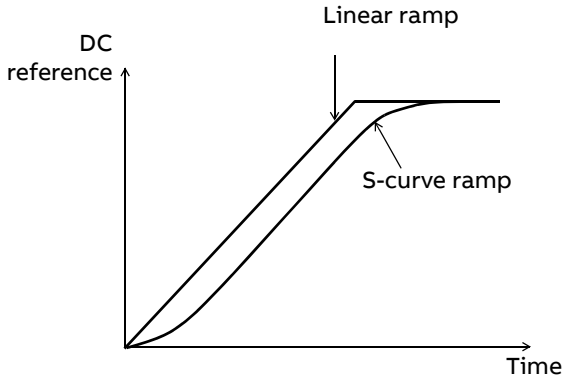
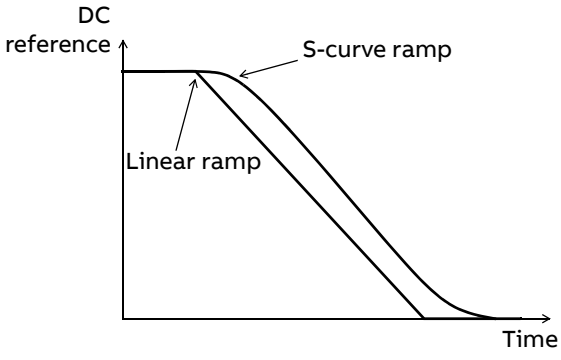
121 Start/stop mode		Emergency stop mode and signal source selection.	
121.04	Emergency stop mode	Selects the way the DC/DC converter unit is stopped when an emergency stop command is received. The source of the emergency stop signal is selected with parameter 121.05 Emergency stop source.	Stop and warning
	Stop and warning	Stop DC/DC converter and show emergency stop warning.	0
	Warning	Show emergency stop warning but do not stop DC/DC converter.	1
	Fault	Stop DC/DC converter and create an emergency stop fault.	2
121.05	Emergency stop source	Selects the source of the emergency stop signal. 0 = Emergency stop active 1 = Normal operation **Note:** This parameter cannot be changed while the DC/DC converter is running.	Inactive (true)
	Active (false)	0.	0

No.	Name/Value	Description	Def/FbEq16
	Inactive (true)	1.	1
	DIIL	DIIL input (110.02 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (110.02 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (110.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (110.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (110.02 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (110.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (110.02 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.02 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (111.02 DIO delayed status, bit 1).	12
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-

122 Power reference		Settings and signals for the power reference chain. See section Reference chains on page 41, and the diagram Power reference chain on page 225.	
122.01	User Power ref	Defines the active power reference value for selection User ref of the parameter 122.02 Power ref sel. The unit is selected with parameter 122.06 Power ref type. See the diagram Power reference chain (page 225).	-
	-	The active power reference value.	1 = 1
122.02	Power ref sel	Selects the source for active power reference. See the diagram Power reference chain (page 225).	FB A ref1
	User ref	122.01 User Power ref.	0
	FB A ref1	Fieldbus adapter A reference 1.	4
	FB A ref2	Fieldbus adapter A reference 2.	5
	DDCS ctrl ref1	103.11 DDCS controller ref 1 (see page 57).	10
	DDCS ctrl ref2	103.12 DDCS controller ref 2 (see page 57).	11
	Other	Source selection (see Terms and abbreviations on page 51).	-
122.03	Power ref 1	Shows the unscaled power reference value selected by 122.02 Power ref sel. See the diagram Power reference chain (page 225).	0.00 kW
	-	The unscaled power reference value.	1 = 1
122.04	Power ref scale	Defines the scaling factor for 122.03 Power ref 1. See the diagram Power reference chain (page 225).	1.00
	-1000.00 …1000.00	The scaling factor.	1 = 1
122.05	Power ref 2	Shows the scaled power reference value: the value selected by parameter 122.02 Power ref sel and multiplied by parameter 122.04 Power ref scale. See the diagram Power reference chain (page 225).	0.00 kW
	-	The scaled power reference value.	1 = 1
122.06	Power ref type	Selects the active power reference type for the scaled reference value (parameter 122.05 Power ref 2). See the diagram Power reference chain (page 225).	Ipow ref [A]
	Ipow ref [A]	Active current reference in Amperes.	0
	Ipow ref [%]	Active current reference in percent of the nominal current (101.63).	1
	Pow ref kW	Active power reference in kW.	2
	Pow ref %	Active power reference in percent of the nominal power (101.64).	3

No.	Name/Value	Description	Def/FbEq16
122.07	Ipower ref %	Shows the active current reference in percent of the nominal current of the converter. **Note:** If the selection of power reference type (122.06) is other than Ipow ref [%], the control program converts the reference to Ipow ref [%] before it writes the reference to this parameter. The control chain diagram shows the conversion factors. See the diagram Power reference chain (page 225).	-
	-1000.0 …1000.0 %	Active current reference in percent.	1 = 1%
122.14	Ipower ref ramp up	Defines the active current reference ramp up time (time from zero to nominal) in ms. See the diagram Power reference chain (page 225).	1.000 ms
	0.000… 100000.000 ms	Active current reference ramp up time.	1 = 1 ms
122.15	Ipower ref ramp down	Defines the active current reference ramp down time (time from nominal to zero) in ms. See the diagram Power reference chain (page 225).	1.000 ms
	0.000… 100000.000 ms	Active current reference ramp down time.	1 = 1 ms
122.16	Ipower ref out %	Shows the output value of power reference chain. See the diagram Power reference chain (page 225).	0.0%
	-200.0…200.0%	Output value of power reference chain.	1 = 1%

123 DC voltage reference		Settings and signals for the DC voltage reference chain. See section Reference chains on page 41, and the diagram DC voltage reference chain on page 222.	
123.01	User DC voltage ref	Defines the DC voltage reference value for selection User ref of the parameter 123.02 DC voltage ref selection. See the diagram DC voltage reference chain (page 222).	-
	0.00 … 2000.00 V	DC voltage reference value.	0 = 1 V
123.02	DC voltage ref selection	Selects the source for DC voltage reference. See the diagram DC voltage reference chain (page 222).	FB A ref1
	User ref	123.01 User DC voltage ref.	0
	FB A ref1	Fieldbus adapter A reference 1.	4
	FB A ref2	Fieldbus adapter A reference 2.	5
	DDCS ctrl ref1	103.11 DDCS controller ref 1 (see page 57).	10
	DDCS ctrl ref2	103.12 DDCS controller ref 2 (see page 57).	11
	Other	Source selection (see Terms and abbreviations on page 51).	-
123.03	DC voltage ref 1	Shows the unscaled DC voltage reference value selected by 123.02 DC voltage ref selection. See the diagram DC voltage reference chain (page 222).	-
	0.00 … 2000.00 V	Value of the DC voltage reference.	1 = 1 V
123.05	DC voltage ref 2	Shows the scaled DC reference value. See the diagram DC voltage reference chain (page 222).	-
	0.00 … 2000.00 V	Limitation of DC voltage reference.	1 = 1 V
123.06	DC voltage ref max	Defines the maximum limit for DC voltage reference in Volts. See the diagram DC voltage reference chain (page 222).	1200 V
	0 … 2000 V	Maximum DC voltage reference.	1 = 1 V
123.07	DC voltage ref min	Defines the minimum limit for DC voltage reference in Volts. See the diagram DC voltage reference chain (page 222).	0 V
	0 …1100 V	Minimum DC voltage reference.	1 = 1 V

No.	Name/Value	Description	Def/FbEq16
123.08	DC voltage ref lim	Shows the output value of DC voltage reference limitation. See the diagram DC voltage reference chain (page 222).	-
	0.00 … 2000.00 V	Output value of DC voltage reference limitation.	1 = 1 V
123.09	DC voltage ref ramp up	Defines the DC voltage reference ramp up time (time from zero to nominal DC level) in ms. See the diagram DC voltage reference chain (page 222).	1000 ms
	0…10000 ms	DC voltage reference ramp up time.	1 = 1 ms
123.10	DC voltage ref ramp down	Defines the DC voltage reference ramp down time (time from nominal DC level to zero) in ms. See the diagram DC voltage reference chain (page 222).	1000 ms
	0…10000 ms	DC voltage reference ramp down time.	1 = 1 ms
123.11	DC voltage ref out	Shows the output value of DC voltage reference ramping in Volts for the controller. If the reference can not be met, an actual value is used in the signal instead of ramped value. See the diagram DC voltage reference chain (page 222).	-
	0.00 … 2000.00 V	Output value of DC voltage reference ramping.	1 = 1 V
123.12	DC voltage ref scale	Defines the DC voltage reference scaling factor. See the diagram DC voltage reference chain (page 222).	1.00
	-100.00…100.00	DC voltage reference scaling factor.	1 = 100
123.15	DC voltage ref shape time	Defines the shape of the ramp. 0.0 s: Linear ramp. Suitable for steady acceleration or deceleration and for slow ramps. 0.1…1000.0 s: S-curve ramp. S-curve ramps are ideal for lifting applications. The S-curve consists of symmetrical curves at both ends of the ramp and a linear part in between. **Acceleration:**  **Deceleration:**  	0.0 ms
	0.0…10000.0 ms	Shape of the ramp.	1 = 1 ms

No.	Name/Value	Description	Def/FbEq16
128 DC voltage controller		Settings and signals for the DC voltage controller. See the diagrams in chapter Control chain and converter logic diagrams (page 221).	
128.01	DC voltage control select	Selects the voltage used for voltage error calculation if the converter voltage controller controls the converter DC bus voltage or the energy storage DC voltage. See the diagram DC voltage controller on page 223.	DC bus voltage
	DC bus voltage	DC bus voltage.	0
	ES voltage	Energy storage voltage.	1
128.02	Voltage error filtered	Displays the filtered voltage error between reference and actual measured value. See the diagram DC voltage controller on page 223. This parameter is read-only.	0.0 V
	-1500.00… 1500.00 V	The voltage error.	1 V = 10
128.03	DC voltage error filtering time	Defines the time constant of the voltage error low pass filter.	0 ms
	0…100000 ms	Time constant.	1 = 1 ms
128.04	DC voltage window control	Enables/disables the voltage window control. The window control is used for voltage control of the DC bus voltage or the energy storage voltage. If the window control is activated and the actual voltage (102.01) is inside the window, the voltage error for the voltage controller is set to zero (P part of the voltage controller) and the integral part is multiplied with parameter 128.07. See parameter 128.07 DC voltage window coef.	No
	No	DC voltage window control disabled.	0
	Yes	DC voltage window control enabled.	1
128.05	DC voltage window high	Defines the upper boundary of the window control.	0.00 V
	0.00…1000.00 V	Upper boundary of the window control.	1 V = 10
128.06	DC voltage window low	Defines the lower boundary of the window control.	0.00 V
	-1000.00…0.00 V	Lower boundary of the window control.	1 V = 10
128.07	DC voltage window coef	Defines a coefficient for handling the part I of the voltage controller during window control. Example: If the window control is activated and the actual voltage (102.01) is inside the window, the value of this parameter is 0.3. The integral part is decreased 70% during 1 ms.	1.000
	0.000…1.000	Coefficient.	1 = 100
128.08	DC voltage ctrl proportional gain	Defines the proportional gain of the voltage controller.	0.50
	0.00…1000.00%	Proportional gain of the voltage controller.	1 = 100
128.09	DC voltage ctrl integration time	Defines the integration time for the voltage controller.	20 ms
	0…1000 ms	Integration time.	1 = 1 ms
128.10	DC voltage control droop	Enables/disables drooping. Drooping is used when there are voltage-controlled, parallel-connected DC/DC converter units. The drooping function stabilizes the load sharing between the units.	No
	No	Drooping disabled.	0
	Yes	Drooping enabled.	1

No.	Name/Value	Description	Def/FbEq16
128.11	DC voltage drooping rate	Defines the droop rate in percent of the rated DC bus voltage. Drooping decreases the voltage reference slightly as the output current increases. Actual voltage decrease at a certain operating point depends on the droop rate setting and the actual current ([current reference] / [voltage controller output]). At 100% voltage controller output, drooping is at its nominal level, ie, equal to the value of this parameter. Drooping effect decreases linearly to zero along with the decreasing current. In practice, the correct droop rate must be found out case by case.	5.0%
	0.0…100.0%	Droop rate ([current reference] / [voltage controller output]).	1% = 10
128.12	DC voltage control cur ref %	Displays the voltage controller output that is transferred to current controller. This parameter is read-only.	0.00%
	-1000.00… 1000.00%	Voltage controller output.	1% = 10

129 Current controller		Settings and signals of the current controller. See the diagrams in chapter Control chain and converter logic diagrams (page 221).	
129.01	Current reference used %	Shows the current reference selected by parameter 197.13 Control mode (from the power reference chain or the DC voltage reference chain) in percent of the nominal current (101.63). See the diagram on page 226.	0.00%
	-1000.00… 1000.00%	Current reference.	1% = 10
129.03	Current max lim %	Defines the maximum current limit in percent of the nominal current (101.63).	0.00%
	-1000.00… 1000.00%	Maximum current limit.	1% = 10
129.04	Current min lim %	Defines the minimum current limit in percent of the nominal current (101.63). If the current reference absolute value is below this limit, the modulation index is set to zero.	0.00%
	-1000.00… 1000.00%	Minimum current limit.	1% = 10
129.14	Current reference stop limit	Defines the current reference stop limit. If the current reference absolute value is below this limit, the modulation index is set to zero.	0.00%
	0.00…100.00%	Current reference stop limit.	1% = 10

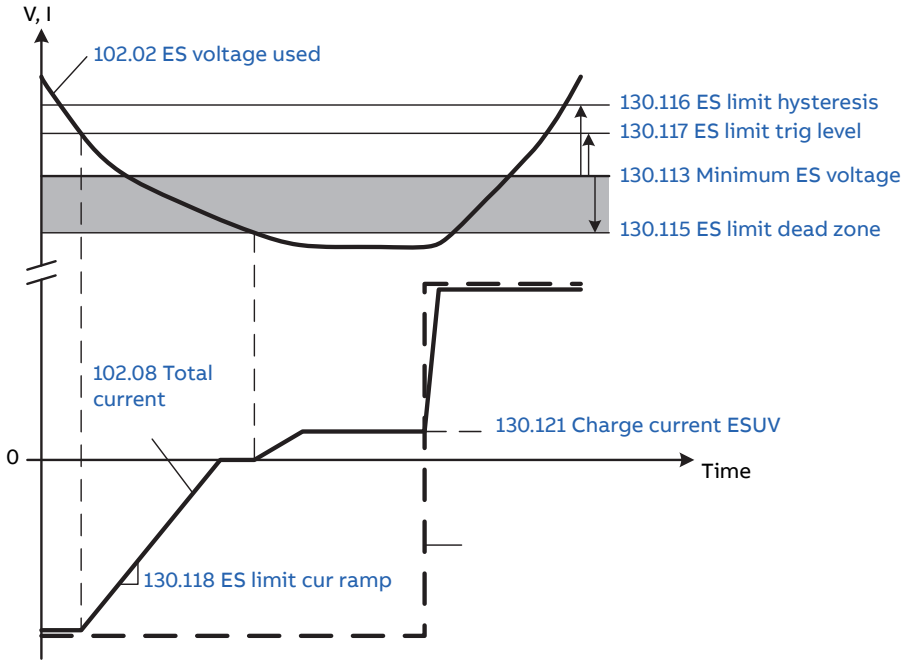
No.	Name/Value	Description	Def/FbEq16
130 Limits		Converter operation limits. **WARNING!** Check and set all the limits in this group carefully before starting the DC/DC converter for the first time.	
130.101	DDC limit word 1	Displays the limit word 1. This parameter is read-only.	-

Bit	Name	Description
0	DC under voltage	1 = Current is limited by the low DC bus voltage (see parameter 130.111 Minimum DC bus voltage).
1	DC over voltage	1 = Current is limited by the high DC bus voltage (see parameter 130.112 Maximum DC bus voltage).
2	ES under voltage	1 = Current is limited by the low energy storage voltage (see parameter 130.113 Minimum ES voltage).
3	ES over voltage	1 = Current is limited by the high energy storage voltage (see parameter 130.114 Maximum ES voltage).
4	Min user current	1 = Current is limited by parameter 130.110 Max discharge current.
5	Max user current	1 = Current is limited by parameter 130.109 Max charge current.
6	Thermal current	1 = Current is limited by the main circuit thermal limit calculation.
7	SOA current	1 = Current is limited by the safe operating area (squared current integrator).
8	Thermal IGBT	1 = Current is limited by the maximum thermal semiconductor current calculation.
9	Thermal Tj limit	1 = Current is limited by the maximum semiconductor junction temperature.
10	Thermal dTjc	1 = Current is limited by the maximum semiconductor junction-to-case temperature difference.
11	Power limit	1 = Current is limited by the power limit.
12	Max pulse width	1 = Current control is limiting the duty cycle to its maximum.
13	-	Reserved.
14	-	Reserved.
15	-	Reserved.

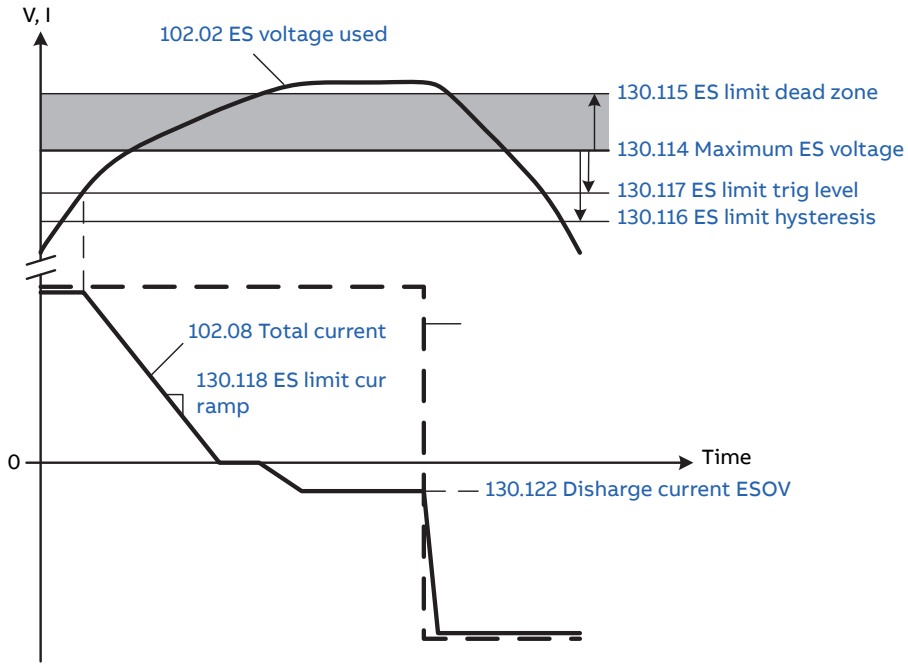
	0000h…FFFFh	DDC limit word 1.	1 = 1
130.103	Minimum current available	Shows the minimum current (energy storage discharging current) that is theoretically available after all limitation blocks. The value changes according to the actual DC bus and energy storage voltage levels and temperature. Current is positive when the DC/DC converter charges the energy storage. Current is negative when the DC/DC converter discharges the energy storage.	0 A
	-30000…30000 A	Minimum current available.	1 = 1 A
130.104	Maximum current available	Shows the maximum current (energy storage charging current) that is theoretically available after all limitation blocks. The value changes according to the actual DC bus and energy storage voltage levels and temperature. Current is positive when the DC/DC converter charges the energy storage. Current is negative when the DC/DC converter discharges the energy storage.	-
	-30000…30000 A	Maximum current available.	1 = 1 A

No.	Name/Value	Description	Def/FbEq16
130.109	Max charge current	Defines the maximum energy storage charging current of the DC/DC converter. This value is always positive or zero. Positive value means that DC/DC converter charges the energy storage. Zero means that it does not charge the energy storage (but it may still be discharging).	30000 A
	0…30000 A	Maximum charging current.	1 = 1 A
130.110	Max discharge current	Defines the maximum energy storage discharging current. This value is negative or zero. Negative value means that the energy storage is discharged. **WARNING!** If more power is taken from the common DC bus than the DC/DC converter and other regenerative devices in the bus are allowed or able to convey to it, the DC bus voltage can drop to the energy storage voltage level. Then current starts flowing uncontrolled from the energy storage to the common DC bus via the freewheeling diodes inside the DC/DC converter. In this situation the limit defined here may be crossed. However, crossing the limit does not stop the DC/DC converter operation, ie, cause a fault trip. Use parameter 131.25 User current fault limit to set the current trip limit to protect the energy storage and/or the chokes.	-30000 A
	-30000…0 A	Maximum discharging current.	1 = 1 A
130.111	Minimum DC bus voltage	Defines the minimum DC bus voltage. When the DC bus voltage drops under this limit, the DC/DC converter discharges the energy storage to keep the DC bus voltage above the limit unless some current limit or energy storage low voltage limit prevents this. **Note:** This value must be smaller than or equal to the value of parameter 130.112 Maximum DC bus voltage, otherwise warning AE86 Parameters not set appears and the converter cannot be started.	0 V
	0.00…1500.00 V	Minimum DC bus voltage.	1 V = 10
130.112	Maximum DC bus voltage	Defines the maximum DC bus voltage. When the DC bus voltage rises above this limit, the DC/DC converter charges the energy storage to keep the DC bus voltage under the limit unless some current limit or energy storage high voltage limit prevents this. 0 = Default maximum limit in use **Note:** Unless user changes this parameter to a non-zero value, the firmware calculates the value internally as 1.56 times the upper range of parameter 195.01 Supply voltage. This value must be bigger than or equal to the value of parameter 130.111 Minimum DC bus voltage, otherwise warning AE86 Parameters not set appears and the converter cannot be started. **WARNING!** This value should be set higher than the normal DC bus voltage level, otherwise the DC/DC converter may continuously charge the energy storage.	0 V
	0.00…1500.00 V	Maximum DC bus voltage.	1 V = 10

No.	Name/Value	Description	Def/FbEq16
130.113	Minimum ES voltage	Defines the minimum energy storage voltage. When the energy storage voltage drops under this limit (+ trig level), the current is ramped to zero. When the energy storage voltage drops under this limit – the dead zone, the energy storage will be charged to increase the voltage. Maximum charging current limit is defined with parameter 130.121 Charge current ESUV. **Note:** This value must be smaller than the value of parameter 130.114 Maximum ES voltage, otherwise warning AE86 Parameters not set appears and the converter cannot be started.	0 V
	-100.00…1500.00 V	Minimum energy storage voltage.	1 V = 10



No.	Name/Value	Description	Def/FbEq16
130.114	Maximum ES voltage	Defines the maximum energy storage voltage. When the energy storage voltage rises above this limit (- trig level), the current is ramped to zero. When the energy storage voltage increases over the maximum limit + the dead zone, the energy storage will be discharged to reduce its voltage. Maximum current limit for discharging is defined with parameter 130.122 Disharge current ESOV. **Note:** You must set a non-zero value to this parameter, otherwise warning AE86 Parameters not set appears and the converter cannot be started. This value must also be higher than the value of parameter 130.113 Minimum ES voltage.	0 V
	0.00…1500.00 V	Maximum energy storage voltage.	1 V = 10
130.115	ES limit dead zone	Defines voltage zones right below parameter 130.113 Minimum ES voltage and right above parameter 130.114 Maximum ES voltage so that when the energy storage voltage is in either zone, the current reference is ramped to zero. Thus no power will oscillate between the DC bus and the energy storage during the energy storage voltage limitation despite of the ripple in the energy storage voltage estimation or measurement.	10.00 V
	0.00…1500.00 V	Energy storage limit dead zone.	1 V = 10



No.	Name/Value	Description	Def/FbEq16
130.116	ES limit hysteresis	Defines the voltage hysteresis to parameters 130.113 Minimum ES voltage and 130.114 Maximum ES voltage that moves the internal limit upwards when the actual energy storage voltage is below the minimum limit (+ trig level), or downwards when the actual energy storage voltage is above the maximum limit (- trig level). Thus the current consumption is ramped down when reaching either limit, and no power will oscillate between the DC bus and the energy storage during the energy storage voltage limitation despite of the ripple in the energy storage voltage estimation or measurement. **Note:** This value should always be bigger than parameter 130.117 ES limit trig level.	7.00 V
	0.00…1500.00 V	Energy storage limit hysteresis.	1 V = 10
130.117	ES limit trig level	Defines the energy storage voltage trig level. Trig level can be added to the maximum and minimum energy storage voltage levels. When the actual energy storage voltage goes below the minimum energy storage voltage + the trig level, or above the maximum energy storage voltage - the trig level, the current is ramped down to zero. (Ramping is stopped if the voltage returns to normal level.) **Note:** This value should always be smaller than parameter 130.116 ES limit hysteresis.	4.00 V
	0.00…1500.00 V	Energy storage voltage trig level.	1 V = 10
130.118	ES limit cur ramp	Defines the sum current ramp-down time when the energy storage voltage reaches the upper or lower energy storage limit dead zone (+/- trig level). Ramp time is in percent of the converter-rated current per millisecond.	1.00 %/ms
	0.00…100.00 %/ms	Energy storage limit current ramp-down slope in %/ms.	1 = 1 %/ms
130.119	Minimum current	Defines the minimum current of the DC/DC converter. This value must be negative or zero. Negative current means that the energy storage is discharged. **WARNING!** If more power is taken from the common DC bus than the DC/DC converter and other regenerative devices in the bus are allowed or able to produce, the DC bus voltage can drop to the energy storage voltage level and the current flows uncontrolled from the energy storage to the common DC bus via the freewheeling diodes inside the DC/DC converter. However, crossing the limit does not stop the DC/DC converter operation, ie, cause a fault trip. Use parameter 131.25 User current fault limit to set the current trip limit to protect the energy storage and/or the chokes. **Note:** This value must be smaller than the value of parameter 130.120 Maximum current, otherwise warning AE86 Parameters not set appears and the converter cannot be started.	0.0 A
	-30000.0…0.0 A	Minimum current.	1 = 1 A

No.	Name/Value	Description	Def/FbEq16
130.120	Maximum current	Defines the maximum current of the DC/DC converter. This value must be positive or zero. Positive current means that the energy storage is charged. **Note:** You must set a non-zero value to this parameter, otherwise warning AE86 Parameters not set appears and the converter cannot be started. This value must also be higher than the value of parameter 130.119 Minimum current.	0.0 A
	0.0…30000.0 A	Maximum current.	1 = 1 A
130.121	Charge current ESUV	Defines the charging current that is used to charge the energy storage in an energy storage undervoltage limitation state (energy storage voltage is below [130.113 Minimum ES voltage] - [130.115 ES limit dead zone]). Super capacitor can be automatically charged to a minimum value after a power-up when this parameter is used as a current reference. **Note:** This value should be set to a non-zero value only with a super capacitor but not with a battery to prevent battery overcharging in case of a faulty energy storage voltage measurement or an incorrect parameterization.	0.0 A
	0.0…30000.0 A	Maximum current (charging) during the energy storage undervoltage limitation.	1 = 1 A
130.122	Disharge current ESOV	Defines the discharging current that is used to discharge the energy storage in an energy storage overvoltage limitation state (energy storage voltage is above [130.114 Maximum ES voltage] + [130.115 ES limit dead zone]).	0.0 A
	-30000.0…0.0 A	Minimum current (discharging) during the energy storage overvoltage limitation.	1 = 1 A
130.126	Power charging lim	Defines the maximum output power. This value must be positive or zero. Positive power means that the energy storage is charged. **Note:** This value must be smaller than the value of parameter 130.127 Power discharging lim, otherwise warning AE86 Parameters not set appears and the converter cannot be started.	0.0 kW
	0.0…30000.0 kW	Maximum output power (charging power).	1 = 1 kW
130.127	Power discharging lim	Defines the minimum output power. This value must be negative or zero. Negative power means that the energy storage is discharged. **Note:** You must set a non-zero value to this parameter, otherwise warning AE86 Parameters not set appears and the converter cannot be started. This value must also be higher than the value of parameter 130.126 Power charging lim.	0.0 kW
	-30000.0…0.0 kW	Minimum output power (discharging power).	1 = 1 kW

No.	Name/Value	Description	Def/FbEq16
130.130	DC voltage bus lim coef	Defines how sharply the current drops when the DC bus voltage reaches the maximum or the minimum limit. Current limit changes proportionally to the difference between the actual DC bus voltage and the limit. Scale is a per unit scale where the maximum measurable DC bus voltage difference creates a rated current limit multiplied by this coefficient. **Example:** Maximum measurable DC bus voltage is 1250 V, parameter 130.130 DC voltage bus lim coef is set to 40.00, parameter 130.112 Maximum DC bus voltage is set to 750 V, and 101.01 DC voltage is 740 V. Then the minimum available current (discharging current) in a p.u. scale is $i_{min,avail}$ = (740 - 750)/1250 x 40.00 = -0.32 = -32% and if the rated current is 600 A, the minimum available current in S.I. units is -0.32 x 600 A = -192 A.	40.00
	0.00…10000.00	DC bus voltage limitation coefficient.	1 = 1
130.131	ES volt lim coef	Defines how sharply the current drops when the energy storage voltage reaches the maximum or the minimum limit. Scale is a per unit scale where the energy storage voltage difference as high as the maximum measurable DC bus voltage creates a rated current limit multiplied by this coefficient. See parameter 130.130 DC voltage bus lim coef for a calculation example.	40.00
	0.00…10000.00	Energy storage voltage limitation coefficient	1 = 1

131 Fault functions		Settings that define the behavior of the DC/DC converter unit upon fault situations.	
131.01	External event 1 source	Defines the source of external event 1. See also parameter 131.02 External event 1 type. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	Inactive (true)
	Active (false)	0	0
	Inactive (true)	1	1
	DIIL	Digital input DIIL (as indicated by 110.02 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	3
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	8
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	12
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-

No.	Name/Value	Description	Def/FbEq16
131.02	External event 1 type	Selects the type of external event 1.	Fault
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Pure event	The event is only logged with a time stamp. No fault or warning is generated.	2
	Warning/Fault	If the DC/DC converter unit is running, the external event generates a fault. Otherwise, the event generates a warning.	3
131.03	External event 2 source	Defines the source of external event 2. See also parameter 131.04 External event 2 type. For the selections, see parameter 131.01 External event 1 source.	Inactive (true)
131.04	External event 2 type	Selects the type of external event 2.	Fault
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Pure event	The event is only logged with a time stamp. No fault or warning is generated.	2
	Warning/Fault	If the DC/DC converter unit is running, the external event generates a fault. Otherwise, the event generates a warning.	3
131.05	External event 3 source	Defines the source of external event 3. See also parameter 131.06 External event 3 type. For the selections, see parameter 131.01 External event 1 source.	Inactive (true)
131.06	External event 3 type	Selects the type of external event 3.	Fault
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Pure event	The event is only logged with a time stamp. No fault or warning is generated.	2
	Warning/Fault	If the DC/DC converter unit is running, the external event generates a fault. Otherwise, the event generates a warning.	3
131.07	External event 4 source	Defines the source of external event 4. See also parameter 131.08 External event 4 type. For the selections, see parameter 131.01 External event 1 source.	Inactive (true)
131.08	External event 4 type	Selects the type of external event 4.	Fault
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Pure event	The event is only logged with a time stamp. No fault or warning is generated.	2
	Warning/Fault	If the DC/DC converter unit is running, the external event generates a fault. Otherwise, the event generates a warning.	3
131.09	External event 5 source	Defines the source of external event 5. See also parameter 131.10 External event 5 type. For the selections, see parameter 131.01 External event 1 source.	Inactive (true)
131.10	External event 5 type	Selects the type of external event 5.	Fault

No.	Name/Value	Description	Def/FbEq16
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Pure event	The event is only logged with a time stamp. No fault or warning is generated.	2
	Warning/Fault	If the DC/DC converter unit is running, the external event generates a fault. Otherwise, the event generates a warning.	3
131.11	Fault reset selection	Selects the source of an external fault reset signal. The signal resets the DC/DC converter unit after a fault trip if the cause of the fault no longer exists. 0 -> 1 = Reset **Note:** A fault reset from the fieldbus interface is always observed regardless of this parameter. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	DI6
	Off	0	0
	On	1	1
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	2
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	7
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	11
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-

No.	Name/Value	Description	Def/FbEq16
131.12	Autoreset selection	Selects faults that are automatically reset. The parameter is a 16-bit word with each bit corresponding to a fault type. Whenever a bit is set to 1, the corresponding fault is automatically reset. **Note:** The autoreset function is available in external control only. **WARNING!** The DC/DC converter unit starts automatically after the autoreset if Start, Run enable and Start enable signals are on and the control program detects no fault. Before you activate the function, make sure that no dangerous situations can occur. The function resets the DC/DC converter unit automatically and continues operation after a fault. If you select an external source for the start command and it is on, the DC/DC converter unit will start immediately after fault reset. The bits of the binary number correspond to the following faults:	0000h

Bit	Fault
0	Reserved
1	Overvoltage (3E04 DC link overvoltage)
2	Undervoltage
3…9	Reserved
10	User fault (selected by parameter 131.13 User selectable fault)
11	External fault 1 (from source selected by parameter 131.01 External event 1 source)
12	External fault 2 (from source selected by parameter 131.03 External event 2 source)
13	External fault 3 (from source selected by parameter 131.05 External event 3 source)
14	External fault 4 (from source selected by parameter 131.07 External event 4 source)
15	External fault 5 (from source selected by parameter 131.09 External event 5 source)

	0000h…FFFFh	Automatic reset configuration word.	1 = 1
131.13	User selectable fault	Defines the fault that can be automatically reset using parameter 131.12 Autoreset selection, bit 10. The faults are listed in chapter Fault tracing.	0
	0…65535	Fault code. See chapter Fault tracing.	-
131.14	Number of trials	Defines the number of automatic fault resets the DC/DC converter unit performs within the time defined by parameter 131.15 Total trials time.	0
	0…5	Number of automatic resets.	-
131.15	Total trials time	Defines the time for the automatic reset function. See parameter 131.14 Number of trials.	30.0 s
	1.0 … 600.0 s	Time for automatic resets.	10 = 1 s
131.16	Delay time	Defines the time that the DC/DC converter unit will wait after a fault before attempting an automatic reset. See parameter 131.12 Autoreset selection.	0.0 s
	0.0 … 120.0 s	Autoreset delay.	10 = 1 s
131.21	Supply phase loss	Selects how the DC/DC converter reacts when a supply phase loss is detected.	Fault
	No	No action taken.	0
	Fault	The DC/DC converter trips on fault 3E0B Output phase loss.	1

No.	Name/Value	Description	Def/FbEq16
131.22	ES under voltage level	Defines the fault level for the energy storage undervoltage. To be able to use this supervision, you must select either a measurement of energy storage voltage (parameter 197.14 ES voltage source) or the voltage must be estimated based on a model.	-10.0 V
	-100.0…2000.0 V	Energy storage undervoltage trip level.	1 V = 10
131.23	ES over voltage level	Defines the fault level for the energy storage overvoltage. To be able to use this supervision, you must select either a measurement of energy storage voltage (parameter 197.14 ES voltage source) or the voltage must be estimated based on a model.	0.0 V
	0.0…2000.0 V	Energy storage overvoltage trip level.	1 V = 10
131.24	ES voltage difference	Defines the fault level for the difference between the estimated and measured energy storage voltages. Missing or faulted energy storage voltage measurement can lead to overcharging of the energy storage and damage it. **Note:** The fault 3E11 ES voltage difference is generated only when the estimated voltage is greater than the measured voltage, not when it is smaller.	0.0 V
	0.0…2000.0 V	Energy storage voltage difference.	1 V = 10
131.25	User current fault limit	Defines a current fault limit to protect the energy storage and/or the chokes. If you set the value to zero, you disable the supervision. Internal DC/DC converter safety trip limit is always valid despite the value of this parameter. **WARNING!** The current limit defined with parameter 130.119 Minimum current does not protect the converter in a situation where more power is taken from the common DC bus than the DC/DC converter and other regenerative devices are allowed or able to produce. In this situation the DC bus voltage can drop to the energy storage voltage level and the current flows uncontrolled from the energy storage to the common DC bus via the freewheeling diodes inside the DC/DC converter. Use this parameter to protect the energy storage and the chokes from an excessive discharging current.	150%
	0.00…600.00%	User current trip limit. 100% corresponds to the nominal current (101.63).	1 % = 10
131.28	Ext earth leakage signal source	Defines the source of earth leakage event indication. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	Inactive (true)
	Active (false)	0 = Earth leakage fault	0
	Inactive (true)	1 = No earth leakage fault	1
	DIIL	Digital input DIIL (as indicated by 110.02 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	3
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	6

No.	Name/Value	Description	Def/FbEq16
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	8
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	12
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
131.29	Ext earth leakage action	Selects how the DC/DC converter reacts when an external earth leakage is detected.	Fault
	Warning	The DC/DC converter trips on a fault.	0
	Fault	The DC/DC converter generates a warning.	1
131.32	Aux circuit breaker fault source	Defines the source of auxiliary circuit breaker fault. **Note:** Digital inputs and digital input/outputs can be reserved for use in the control program.	Inactive (true)
	Active (false)	0 = Auxiliary circuit breaker fault	0
	Inactive (true)	1 = No auxiliary circuit breaker fault	1
	DIIL	Digital input DIIL (as indicated by 110.02 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (as indicated by 110.02 DI delayed status, bit 0). **Note:** DI1 is reserved for temperature fault in the control program. Do not select it for any other use.	3
	DI2	Digital input DI2 (as indicated by 110.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (as indicated by 110.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (as indicated by 110.02 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (as indicated by 110.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (as indicated by 110.02 DI delayed status bit 5).	8
	DIO1	Digital input/output DIO1 (as indicated by 111.02 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (as indicated by 111.02 DIO delayed status, bit 1).	12
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
131.33	Cabinet temperature fault source	Activates/inactivates the monitoring for the cabinet thermal switch, and defines the source for the monitored signal. If the monitoring detects an overtemperature, it trips the DC/DC converter unit to fault 4E06 Cabinet temperature fault. Status of the monitored signal and implication: 1 = Temperature is normal, no fault 0 = Overtemperature, fault trip	DI1
	Active (false)	Monitoring function is active.	0
	Inactive (true)	Monitoring function is inactive.	1
	DIIL	Monitoring function is active and it reads the status indication through DIIL (110.02 DI delayed status, bit 15).	2

No.	Name/Value	Description	Def/FbEq16
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.02 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.02 DI delayed status, bit 1).	4
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.02 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.02 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.02 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.02 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (111.02 DIO delayed status, bit 0).	11
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (111.02 DIO delayed status, bit 1).	12
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
131.34	Cabinet temperature supervision	Selects whether there is a delay in monitoring the parameter 131.33 Cabinet temperature fault source. If this parameter is set to Yes, the monitoring is started after the DC/DC converter has started. Otherwise there is no delay for the monitoring.	Yes
	No	There is no delay for the monitoring.	0
	Yes	Cabinet temperature monitoring is started after the DC/DC converter has started.	1
131.35	Main fan fault function	Air-cooled units only: Selects how the DC/DC converter unit reacts when a main cooling fan fault is detected.	Warning
	Fault	The DC/DC converter unit trips on fault 5E00 Fan.	0
	Warning	The DC/DC converter unit generates an AE73 Fan warning.	1
	No action	No action taken.	2
131.38	Fuse trip fault source	Activates/inactivates the monitoring for the fuse trip, and defines the source for the monitored signal.	Inactive (true)
	Active (false)	Monitoring function is active.	0
	Inactive (true)	Monitoring function is inactive.	1
	DIIL	Monitoring function is active and it reads the status indication through DIIL (110.02 DI delayed status, bit 15).	2
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.02 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.02 DI delayed status, bit 1).	4
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.02 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.02 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.02 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.02 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (110.02 DI delayed status, bit 0).	11

No.	Name/Value	Description	Def/FbEq16
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (110.02 DI delayed status, bit 1).	12
	Other	Source selection (see Terms and abbreviations on page 51).	-
131.39	Brake chopper fault source	Activates/inactivates the monitoring for the brake chopper, and defines the source for the monitored signal.	Inactive (true)
	Active (false)	Monitoring function is active.	0
	Inactive (true)	Monitoring function is inactive.	1
	DIIL	Monitoring function is active and it reads the status indication through DIIL (110.02 DI delayed status, bit 15).	2
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.02 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.02 DI delayed status, bit 1).	4
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.02 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.02 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.02 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.02 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (110.02 DI delayed status, bit 0).	11
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (110.02 DI delayed status, bit 1).	12
	Other	Source selection (see Terms and abbreviations on page 51).	-
131.40	Disable warning messages	Selects warnings to be suppressed. The parameter is a 16-bit word with each bit corresponding to a warning. Whenever a bit is set to 1, the corresponding warning is suppressed. The bits of this binary number correspond to the following warnings:	0000b

Bit	Name
0	Reserved.
1	Reserved.
2	Reserved.
3	Reserved.
4	CU (Control unit) battery
5…6	Reserved.
7	Default pass code
8…15	Reserved.

	0000h…FFFFh	Warning suppression word.	1 = 1
131.55	Ext I/O comm loss event	Selects how the unit reacts when the communication to an I/O extension module fails.	Fault
	No action	No action taken.	0
	Warning	The unit generates warning.	1
	Fault	The unit trips on fault.	2

No.	Name/Value	Description	Def/FbEq16
133 Generic timer & counter		Configuration of maintenance timers/counters. See also section Generic timers and counters (page 44).	
133.01	Counter status	Displays the maintenance timer/counter status word, indicating which maintenance timers/counters have exceeded their limits. This parameter is read-only.	-

Bit	Name	Description
0	On-time1	1 = On-time timer 1 has reached its preset limit.
1	On-time2	1 = On-time timer 2 has reached its preset limit.
2	Edge 1	1 = Signal edge counter 1 has reached its preset limit.
3	Edge 2	1 = Signal edge counter 2 has reached its preset limit.
4	Value 1	1 = Value counter 1 has reached its preset limit.
5	Value 2	1 = Value counter 2 has reached its preset limit.
6…15	Reserved	

	0000h…FFFFh	Maintenance time/counter status word.	1 = 1
133.10	On-time 1 actual	Reading of on-time timer 1. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-
	0 … 4294967295 s	Reading of on-time timer 1.	1 = 1 s
133.11	On-time 1 limit	Sets the warning limit for on-time timer 1.	0 s
	0 … 4294967295 s	Warning limit for on-time counter 1.	1 = 1 s
133.12	On-time 1 function	Configures on-time timer 1. This timer runs whenever the signal selected by parameter 133.13 On-time 1 source is on. After the limit set by 133.11 On-time 1 limit is reached, the warning specified by 133.14 On-time 1 warning select is given (if enabled by this parameter), and the timer resets. The current value of the timer is readable from parameter 133.10 On-time 1 actual. Bit 0 of 133.01 Counter status indicates that the time has exceeded the limit.	00b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2…15	Reserved

	0000h…FFFFh	On-time timer 1 configuration word.	1 = 1
133.13	On-time 1 source	Selects the signal to be monitored by on-time timer 1.	False
	False	Constant 0.	0
	True	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status (page 68).	2
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
133.14	On-time 1 warning select	Selects the warning message for on-time timer 1.	On-time 1
	On-time 1	Pre-selectable warning message for on-time timer 1.	0

No.	Name/Value	Description	Def/FbEq16
	Device clean	Pre-selectable warning message for on-time timer 1.	6
	Additional cooling fan	Pre-selectable warning message for on-time timer 1.	7
	Cabinet fan	Pre-selectable warning message for on-time timer 1.	8
	DC-capacitor	Pre-selectable warning message for on-time timer 1.	9
133.20	On-time 2 actual	Reading of on-time timer 2. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-
	0 … 4294967295 s	Reading of on-time timer 2.	1 = 1 s
133.21	On-time 2 limit	Sets the warning limit for on-time timer 2.	0 s
	0 … 4294967295 s	Warning limit for on-time counter 2.	1 = 1 s
133.22	On-time 2 function	Configures on-time timer 2. This timer runs whenever the signal selected by parameter 133.23 On-time 2 source is on. After the limit set by 133.21 On-time 2 limit is reached, the warning specified by 133.24 On-time 2 warning select is given (if enabled by this parameter), and the timer reset. The current value of the timer is readable from parameter 133.20 On-time 2 actual. Bit 1 of 133.01 Counter status indicates that the time has exceeded the limit.	00b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2…15	Reserved

	0000h…FFFFh	On-time timer 2 configuration word.	1 = 1
133.23	On-time 2 source	Selects the signal to be monitored by on-time timer 2.	False
	False	Constant 0.	0
	True	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status (page 68).	2
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
133.24	On-time 2 warning select	Selects the warning message for on-time timer 2.	On-time 2
	On-time 2	Pre-selectable warning message for on-time timer 2.	1
	Device clean	Pre-selectable warning message for on-time timer 2.	6
	Additional cool fan	Pre-selectable warning message for on-time timer 2.	7
	Cabinet fan	Pre-selectable warning message for on-time timer 2.	8
	DC-capacitor	Pre-selectable warning message for on-time timer 2.	9
133.30	Edge counter 1 actual	Reading of signal edge counter 1. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-
	0…4294967295	Reading of signal edge counter 1.	1 = 1
133.31	Edge counter 1 limit	Sets the warning limit for signal edge counter 1.	0
	0…4294967295	Warning limit for signal edge counter 1.	1 = 1

No.	Name/Value	Description	Def/FbEq16
133.32	Edge counter 1 func	Configures signal edge counter 1. This counter is incremented every time the signal selected by parameter 133.33 Edge counter 1 source switches on or off (or either, depending on the setting of this parameter). A divisor may be applied to the count (see 133.34 Edge counter 1 divider). After the limit set by 133.31 Edge counter 1 limit is reached, the warning specified by 133.35 Edge counter 1 warning selection is given (if enabled by this parameter), and the counter reset. The current value of the counter is readable from parameter 133.30 Edge counter 1 actual. Bit 2 of 133.01 Counter status indicates that the count has exceeded the limit.	0000b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2	Count rising edges 0 = Disable: Rising edges are not counted 1 = Enable: Rising edges are counted
3	Count falling edges 0 = Disable: Falling edges are not counted 1 = Enable: Falling edges are counted
4…15	Reserved

	0000h…FFFFh	Edge counter 1 configuration word.	1 = 1
133.33	Edge counter 1 source	Selects the signal to be monitored by signal edge counter 1.	False
	False	Constant 0.	0
	True	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status (page 68).	2
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
133.34	Edge counter 1 divider	Divisor for signal edge counter 1. Determines how many signal edges increment the counter by 1.	1
	1…4294967295	Divisor for signal edge counter 1.	1= 1
133.35	Edge counter 1 warning selection	Selects the warning message for signal edge counter 1.	Edge counter 1
	Edge counter 1	Pre-selectable warning message for signal edge counter 1.	2
	Main contactor	Pre-selectable warning message for signal edge counter 1.	11
	Output relay	Pre-selectable warning message for signal edge counter 1.	12
	Supply unit starts	Pre-selectable warning message for signal edge counter 1.	13
	Power ups	Pre-selectable warning message for signal edge counter 1.	14
	DC-charge	Pre-selectable warning message for signal edge counter 1.	15

No.	Name/Value	Description	Def/FbEq16
133.40	Edge counter 2 actual	Reading of signal edge counter 2. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-
	0…4294967295	Reading of signal edge counter 2.	1 = 1
133.41	Edge counter 2 limit	Sets the warning limit for signal edge counter 2.	0
	0…4294967295	Warning limit for signal edge counter 2.	1 = 1
133.42	Edge counter 2 function	Configures signal edge counter 2. This counter is incremented every time the signal selected by parameter 133.43 Edge counter 2 source switches on or off (or either, depending on the setting of this parameter). A divisor may be applied to the count (see 133.44 Edge counter 2 divider). After the limit set by 133.41 Edge counter 2 limit is reached, the warning specified by 133.45 Edge counter 2 warning selection is given (if enabled by this parameter), and the counter reset. The current value of the counter is readable from parameter 133.40 Edge counter 2 actual. Bit 3 of 133.01 Counter status indicates that the count has exceeded the limit.	0000b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2	Count rising edges 0 = Disable: Rising edges are not counted 1 = Enable: Rising edges are counted
3	Count falling edges 0 = Disable: Falling edges are not counted 1 = Enable: Falling edges are counted
4…15	Reserved

	0000h…FFFFh	Edge counter 2 configuration word.	1 = 1
133.43	Edge counter 2 source	Selects the signal to be monitored by signal edge counter 2.	False
	False	0.	0
	True	1.	1
	RO1	Bit 0 of 110.21 RO status (page 68).	2
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
133.44	Edge counter 2 divider	Divisor for signal edge counter 2. Determines how many signal edges increment the counter by 1.	1
	1…4294967295	Divisor for signal edge counter 2.	1 = 1
133.45	Edge counter 2 warning selection	Selects the warning message for signal edge counter 2.	Edge counter 2
	Edge counter 2	Pre-selectable warning message for signal edge counter 2.	3
	Main contactor	Pre-selectable warning message for signal edge counter 2.	11
	Output relay	Pre-selectable warning message for signal edge counter 2.	12

No.	Name/Value	Description	Def/FbEq16
	Supply unit starts	Pre-selectable warning message for signal edge counter 2.	13
	Power ups	Pre-selectable warning message for signal edge counter 2.	14
	DC-charge	Pre-selectable warning message for signal edge counter 2.	15
133.50	Value counter 1 actual	Reading of value counter 1. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-
	-2147483008 … 2147483008	Reading of value counter 1.	1 = 1
133.51	Value counter 1 limit	Sets the warning limit for value counter 1.	0
	-2147483008 … 2147483008	Warning limit for value counter 1.	1 = 1
133.52	Value counter 1 function	Configures value counter 1. The counter calculates its actual value (133.53) by integrating the monitored value (133.xx) with respect to time. A divisor may be applied to the count (see 133.54 Value counter 1 divider). When the actual value exceeds the limit set by parameter 133.51 Value counter 1 limit, the warning specified by 133.55 Value counter 1 warning select is given (if enabled by this parameter). The signal is sampled at 1-second intervals. Note that the scaled (see the "Def/FbEq16" column at the signal in question) value is used. The current value of the counter is readable from parameter 133.50 Value counter 1 actual. Bit 4 of 133.01 Counter status indicates that the count has exceeded the limit.	00b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2…15	Reserved

	0000h…FFFFh	Value counter 1 configuration word.	1 = 1
133.53	Value counter 1 source	Selects the signal to be monitored by value counter 1.	Not selected
	Not selected	None.	0
	Other	The value is taken from another parameter.	-
133.54	Value counter 1 divider	Divisor for value counter 1. The value of the monitored signal is divided by this value before integration.	1.000
	0.001 … 2147483.647	Divisor for value counter 1.	1 = 1
133.55	Value counter 1 warning select	Selects the warning message for value counter 1.	Value 1
	Value 1	Pre-selectable warning message for value counter 1.	4
133.60	Value counter 2 actual	Reading of value counter 2. Can be reset from the Drive composer PC tool, or from the control panel by keeping Reset depressed for over 3 seconds.	-

No.	Name/Value	Description	Def/FbEq16
	-2147483008 … 2147483008	Reading of value counter 2.	1 = 1
133.61	Value counter 2 limit	Sets the warning limit for value counter 2.	0
	-2147483008 … 2147483008	Warning limit for value counter 2.	1 = 1
133.62	Value counter 2 function	Configures value counter 2. he counter calculates its actual value (133.63) by integrating the monitored value (133.xx) with respect to time. A divisor may be applied to the count (see 133.64 Value counter 2 divider). When the actual value exceeds the limit set by parameter 133.61 Value counter 2 limit, the warning specified by 133.65 Value counter 2 warning selection is given (if enabled by this parameter). The signal is sampled at 1-second intervals. Note that the scaled (see the “FbEq” column at the signal in question) value is used. The current value of the counter is readable from parameter 133.60 Value counter 2 actual. Bit 5 of 133.01 Counter status indicates that the count has exceeded the limit.	00b

Bit	Function
0	Counter mode 0 = Loop: If warning is enabled by bit 1, it stays active only for 10 seconds 1 = Saturate: If warning is enabled by bit 1, it stays active until reset
1	Warning enable 0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached
2…15	Reserved

	0000h…FFFFh	Value counter 2 configuration word.	1 = 1
133.63	Value counter 2 source	Selects the signal to be monitored by value counter 2.	Not selected
	Not selected	None.	0
	Other	The value is taken from another parameter.	-
133.64	Value counter 2 divider	Divisor for value counter 2. The value of the monitored signal is divided by this value before integration.	1.000
	0.001 … 2147483.647	Divisor for value counter 1.	1 = 1
133.65	Value counter 2 warning selection	Selects the warning message for value counter 2.	Value 2
	Value 2	Pre-selectable warning message for value counter 2.	5

136 Load analyzer		Peak value and amplitude logger settings. See also section Load analyzer (page 45).	
136.01	PVL signal source	Selects the signal to be monitored by the peak value logger. The signal is filtered using the filtering time specified by parameter 136.02 PVL filter time. The peak value is stored, along with other pre-selected signals at the time, into parameters 136.10…136.15. The peak value logger can be reset using parameter 136.09 Reset loggers. The date and time of the last reset are stored into parameters 136.16 and 136.17 respectively.	
	Not selected	None (peak value logger disabled).	0

No.	Name/Value	Description	Def/FbEq16
	DC voltage	DC voltage, 101.01 DC voltage	1
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
136.02	PVL filter time	Peak value logger filtering time. See parameter 136.01 PVL signal source.	2.00 s
	0.00 … 120.00 s	Peak value logger filtering time.	100 = 1 s
136.06	AL2 signal source	Selects the signal to be monitored by amplitude logger 2. The signal is sampled at 200 ms intervals. The results are displayed by parameters 136.40…136.49. Each parameter represents an amplitude range, and shows what portion of the samples fall within that range. The signal value corresponding to 100% is defined by parameter 136.07 AL2 signal scaling. Amplitude logger 2 can be reset using parameter 136.09 Reset loggers. The date and time of the last reset are stored into parameters 136.50 and 136.51 respectively.	Ambient temperature
	Zero	None (peak value logger disabled).	0
	DC voltage	DC voltage, 101.01 DC voltage	1
	Ambient temperature	Ambient temperature, 101.70 Ambient temperature The amplitude range of 0…100% corresponds to 0…60 °C or 32…140 °F.	8
	Other [bit]	Source selection (see Terms and abbreviations on page 13).	-
136.07	AL2 signal scaling	Defines the signal value that corresponds to 100% amplitude.	100.00
	0.00 … 32767.00	Signal value corresponding to 100%.	1 = 1
136.09	Reset loggers	Resets the peak value logger and/or amplitude logger 2. (Amplitude logger 1 cannot be reset.)	Done
	Done	Reset completed or not requested (normal operation).	0
	All	Reset both the peak value logger and amplitude logger 2.	1
	PVL	Reset the peak value logger.	2
	AL2	Reset amplitude logger 2.	3
136.10	PVL peak value	Peak value recorded by the peak value logger.	0.00
	-32768.00 … 32767.00	Peak value.	1 = 1
136.11	PVL peak date	The date on which the peak value was recorded.	-
	-	Peak occurrence date.	-
136.12	PVL peak time	The time at which the peak value was recorded.	-
	-	Peak occurrence time.	-
136.13	PVL current at peak	Line current at the moment the peak value was recorded.	0.00 A
	-32768.00 … 32767.00 A	Line current at peak.	1 = 1 A
136.14	PVL DC voltage at peak	Voltage in the intermediate DC circuit at the moment the peak value was recorded.	0.00 V
	0.00 … 2000.00 V	DC voltage at peak.	10 = 1 V
136.15	PVL power at peak	Power at the moment the peak value was recorded. See parameter 101.12 Power.	0.00 kW
	0.00 … 30000.00 kW	Power at peak.	1 = 1 kW
136.16	PVL reset date	The date on which the peak value logger was last reset.	-
	-	Last reset date of the peak value logger.	-

No.	Name/Value	Description	Def/FbEq16
136.17	PVL reset time	The time at which the peak value logger was last reset.	-
	-	Last reset time of the peak value logger.	-
136.20	AL1 below 10%	Percentage of samples recorded by amplitude logger 1 that fall between 0 and 10%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 0 and 10%.	1 = 1%
136.21	AL1 10 to 20%	Percentage of samples recorded by amplitude logger 1 that fall between 10 and 20%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 10 and 20%.	1 = 1%
136.22	AL1 20 to 30%	Percentage of samples recorded by amplitude logger 1 that fall between 20 and 30%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 20 and 30%.	1 = 1%
136.23	AL1 30 to 40%	Percentage of samples recorded by amplitude logger 1 that fall between 30 and 40%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 30 and 40%.	1 = 1%
136.24	AL1 40 to 50%	Percentage of samples recorded by amplitude logger 1 that fall between 40 and 50%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 40 and 50%.	1 = 1%
136.25	AL1 50 to 60%	Percentage of samples recorded by amplitude logger 1 that fall between 50 and 60%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 50 and 60%.	1 = 1%
136.26	AL1 60 to 70%	Percentage of samples recorded by amplitude logger 1 that fall between 60 and 70%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 60 and 70%.	1 = 1%
136.27	AL1 70 to 80%	Percentage of samples recorded by amplitude logger 1 that fall between 70 and 80%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 70 and 80%.	1 = 1%
136.28	AL1 80 to 90%	Percentage of samples recorded by amplitude logger 1 that fall between 80 and 90%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples between 80 and 90%.	1 = 1%
136.29	AL1 over 90%	Percentage of samples recorded by amplitude logger 1 that exceed 90%.	0.00%
	0.00 … 100.00%	Amplitude logger 1 samples over 90%.	1 = 1%
136.40	AL2 below 10%	Percentage of samples recorded by amplitude logger 2 that fall between 0 and 10%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 0 and 10%.	1 = 1%
136.41	AL2 10 to 20%	Percentage of samples recorded by amplitude logger 2 that fall between 10 and 20%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 10 and 20%.	1 = 1%
136.42	AL2 20 to 30%	Percentage of samples recorded by amplitude logger 2 that fall between 20 and 30%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 20 and 30%.	1 = 1%
136.43	AL2 30 to 40%	Percentage of samples recorded by amplitude logger 2 that fall between 30 and 40%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 30 and 40%.	1 = 1%
136.44	AL2 40 to 50%	Percentage of samples recorded by amplitude logger 2 that fall between 40 and 50%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 40 and 50%.	1 = 1%
136.45	AL2 50 to 60%	Percentage of samples recorded by amplitude logger 2 that fall between 50 and 60%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 50 and 60%.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
136.46	AL2 60 to 70%	Percentage of samples recorded by amplitude logger 2 that fall between 60 and 70%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 60 and 70%.	1 = 1%
136.47	AL2 70 to 80%	Percentage of samples recorded by amplitude logger 2 that fall between 70 and 80%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 70 and 80%.	1 = 1%
136.48	AL2 80 to 90%	Percentage of samples recorded by amplitude logger 2 that fall between 80 and 90%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples between 80 and 90%.	1 = 1%
136.49	AL2 over 90%	Percentage of samples recorded by amplitude logger 2 that exceed 90%.	0.00%
	0.00 … 100.00%	Amplitude logger 2 samples over 90%.	1 = 1%
136.50	AL2 reset date	The date on which amplitude logger 2 was last reset.	-
	-	Last reset date of amplitude logger 2.	-
136.51	AL2 reset time	The time at which amplitude logger 2 was last reset.	-
	-	Last reset time of amplitude logger 2.	-

146 Monitoring settings		Scaling settings.	
146.01	Power scaling	Defines the power and also active current and percent reference depending on parameter 122.06 Power ref type, that corresponds to 10000 for fieldbus communication with ABB Drives communication profile. Also defines the 16-bit scaling of 101.12 Power, 122.03 Power ref 1 and 122.05 Power ref 2.	10000.0
	0.1…30000.0	Power, active current and percent reference.	1 = 1
146.04	DC voltage scaling	Defines the DC voltage that corresponds to 10000 for fieldbus communication with ABB Drives communication profile.	100.00 V
	0.10…30000.00 V	DC voltage.	1 = 1 V
146.11	Current RMS period	Defines the period of RMS calculation for signal 102.10 RMS current.	60 s
	1…100 s	Current RMS value calculation period.	1 = 1 s

147 Data storage		Parameters that can be written to and read from by using source and target settings of other parameters. Note that there are different storage parameters for different data types. See section Data storage (DDCS controller) parameters on page 49.	
147.01	Data storage 1 real32	Data storage parameter 1.	0.000
	-2147483.000 …2147483.000	32-bit data.	-
147.02	Data storage 2 real32	Data storage parameter 2.	0.000
	-2147483.000 …2147483.000	32-bit data.	-
147.03	Data storage 3 real32	Data storage parameter 3.	0.000
	-2147483.000 …2147483.000	32-bit data.	-
147.04	Data storage 4 real32	Data storage parameter 4.	0.000
	-2147483.000 …2147483.000	32-bit data.	-

No.	Name/Value	Description	Def/FbEq16
147.05	Data storage 5 real32	Data storage parameter 5.	0.000
	-2147483.000 ...2147483.000	32-bit data.	-
147.06	Data storage 6 real32	Data storage parameter 6.	0.000
	-2147483.000 ...2147483.000	32-bit data.	-
147.07	Data storage 7 real32	Data storage parameter 7.	0.000
	-2147483.000 ...2147483.000	32-bit data.	-
147.08	Data storage 8 real32	Data storage parameter 8.	0.000
	-2147483.000 ...2147483.000	32-bit data.	-
147.11	Data storage 1 int32	Data storage parameter 9.	0
	-2147483648... 2147483647	32-bit data.	-
147.12	Data storage 2 int32	Data storage parameter 10.	0
	-2147483648... 2147483647	32-bit data.	-
147.13	Data storage 3 int32	Data storage parameter 11.	0
	-2147483648... 2147483647	32-bit data.	-
147.14	Data storage 4 int32	Data storage parameter 12.	0
	-2147483648... 2147483647	32-bit data.	-
147.15	Data storage 5 int32	Data storage parameter 13.	0
	-2147483648... 2147483647	32-bit data.	-
147.16	Data storage 6 int32	Data storage parameter 14.	0
	-2147483648... 2147483647	32-bit data.	-
147.17	Data storage 7 int32	Data storage parameter 15.	0
	-2147483648... 2147483647	32-bit data.	-
147.18	Data storage 8 int32	Data storage parameter 16.	0
	-2147483648... 2147483647	32-bit data.	-
147.21	Data storage 1 int16	Data storage parameter 17.	0
	-32768...32767	16-bit data.	1 = 1
147.22	Data storage 2 int16	Data storage parameter 18.	0
	-32768...32767	16-bit data.	1 = 1

No.	Name/Value	Description	Def/FbEq16
147.23	Data storage 3 int16	Data storage parameter 19.	0
	-32768…32767	16-bit data.	1 = 1
147.24	Data storage 4 int16	Data storage parameter 20.	0
	-32768…32767	16-bit data.	1 = 1
147.25	Data storage 5 int16	Data storage parameter 21.	0
	-32768…32767	16-bit data.	1 = 1
147.26	Data storage 6 int16	Data storage parameter 22.	0
	-32768…32767	16-bit data.	1 = 1
147.27	Data storage 7 int16	Data storage parameter 23.	0
	-32768…32767	16-bit data.	1 = 1
147.28	Data storage 8 int16	Data storage parameter 24.	0
	-32768…32767	16-bit data.	1 = 1
149 Panel port communication		Communication settings for the control panel port on the DC/DC converter unit.	
149.01	Node ID number	Defines the node ID of the DC/DC converter unit. All devices connected to the same panel bus/link must have a dedicated node ID. **Note:** If you change the setting, new setting takes effect only after parameter 149.06 Refresh settings is switched to Done.	2
	1…32	Node ID.	1 = 1
149.03	Baud rate	Defines the transfer rate of the link. **Note:** If you change the setting, new setting takes effect only after parameter 149.06 Refresh settings is switched to Done.	921.6 kbps
	9.6 kbps	9.6 kbit/s.	0
	38.4 kbps	38.4 kbit/s.	1
	57.6 kbps	57.6 kbit/s.	2
	86.4 kbps	86.4 kbit/s.	3
	115.2 kbps	115.2 kbit/s.	4
	230.4 kbps	230.4 kbit/s.	5
	460.8 kbps	460.8 kbit/s.	6
	921.6 kbps	921.6 kbit/s.	7
149.04	Communication loss time	Sets a time-out for control panel (or PC tool) communication. If a communication break lasts longer than the time-out, the action specified by parameter 149.05 Communication loss action is taken.	10.0 s
	0.3 … 3000.0 s	Panel/PC tool communication time-out.	10 = 1 s
149.05	Communication loss action	Selects how the DC/DC converter unit reacts to a control panel (or PC tool) communication break. **Note:** If you change the setting, new setting takes effect only after parameter 149.06 Refresh settings is switched to Done.	Fault
	No action	Communication break does not cause any actions.	0
	Fault	DC/DC converter unit trips on a fault 7E01 Panel loss and the motor coasts to a stop.	1

No.	Name/Value	Description	Def/FbEq16
149.06	Refresh settings	Applies the settings of parameters 149.01…149.05. **Note:** Refreshing may cause a communication break, so reconnecting may be required.	Done
	Done	Refresh done or not requested.	0
	Refresh	Refresh parameters 149.01…149.05. The value reverts automatically to Done.	1

150 FBA		General settings for fieldbus communication configuration.	
150.01	FBA A enable	Enables/disables communication between the DC/DC converter unit and fieldbus adapter A, and specifies the slot the adapter is installed into.	Disable
	Disable	Communication between DC/DC converter unit and fieldbus adapter A disabled.	0
	Option slot 1	Communication between DC/DC converter unit and fieldbus adapter A enabled. The adapter is in slot 1.	1
	Option slot 2	Communication between DC/DC converter unit and fieldbus adapter A enabled. The adapter is in slot 2.	2
	Option slot 3	Communication between DC/DC converter unit and fieldbus adapter A enabled. The adapter is in slot 3.	3
150.02	FBA A comm loss func	Selects how the DC/DC converter unit reacts upon a fieldbus communication break. The time delay is defined by parameter 150.03 FBA A comm loss t out.	No action
	No action	Communication break detection disabled.	0
	Fault	Communication break detection active. Upon a communication break, the DC/DC converter unit trips on a communication fault.	1
	Fault always	The DC/DC converter unit trips on a communication fault even though no control is expected from the fieldbus.	4
	Warning	The DC/DC converter unit generates a communication warning even though no control is expected from the fieldbus.	5
150.03	FBA A comm loss t out	Defines the time delay before the action defined by parameter 150.02 FBA A comm loss func is taken. Time count starts when the communication link fails to update the message.	0.3 s
	0.3 … 6553.5 s	Time delay.	10 = 1 s
150.04	FBA A ref1 type	Selects the type of fieldbus A reference 1.	Active power
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	The scaling is defined with parameter 146.04 DC voltage scaling	3
	Active power	The scaling is defined with parameter 146.01 Power scaling.	4
150.05	FBA A ref2 type	Selects the type of fieldbus A reference 2. For the selections, see parameter 150.04 FBA A ref1 type.	Active power
150.07	FBA A actual 1 type	Selects the type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Transparent
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC voltage	The scaling is defined with parameter 146.04 DC voltage scaling	3

No.	Name/Value	Description	Def/FbEq16
	Active power	The scaling is defined with parameter 146.01 Power scaling.	4
150.08	FBA A actual 2 type	Selects the type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter A. For the selections, see parameter 150.07 FBA A actual 1 type.	Transparent
150.10	FBA A act1 transparent source	When parameter 150.07 FBA A actual 1 type is set to Transparent, this parameter selects the source of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Not selected
	Not selected	No source selected.	-
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
150.11	FBA A act2 transparent source	When parameter 150.08 FBA A actual 2 type is set to Transparent, this parameter selects the source of actual value 2 transmitted to the fieldbus network through fieldbus adapter A.	Not selected
	Not selected	No source selected.	-
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
150.12	FBA A debug mode	Enables the display of raw (unmodified) data received from and sent to fieldbus adapter A in parameters 150.13…150.18. Note that the changes made take effect only after reboot or setting the parameter 151.27 FBA A par refresh to Refresh. This functionality should only be used for debugging.	Disable
	Disable	Display of raw data from fieldbus adapter A disabled.	0
	Fast	Debug mode is enabled. Cyclical data update is as fast as possible which increases the CPU load on the DC/DC converter unit.	1
150.13	FBA A control word	Displays the control word received from fieldbus adapter A. For the commands assigned to each bit, see chapter Fieldbus control through a fieldbus adapter.	-
	00000000h … FFFFFFFFh	Control word received from fieldbus adapter A.	1 = 1
150.14	FBA A reference 1	Displays raw (unmodified) reference REF1 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 150.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 … 2147483647	Raw REF1 sent by master to fieldbus adapter A.	-
150.15	FBA A reference 2	Displays raw (unmodified) reference REF2 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 150.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 … 2147483647	Raw REF2 sent by master to fieldbus adapter A.	-
150.16	FBA A status word	Displays the status word sent to fieldbus adapter A. For the commands assigned to each bit, see chapter Fieldbus control through a fieldbus adapter.	-
	00000000h … FFFFFFFFh	Status word sent to fieldbus adapter A.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>150.17</td><td>FBA A actual value 1</td><td>Displays raw actual value ACT1 sent to fieldbus adapter A.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw ACT1 sent to fieldbus adapter A.</td><td>1 = 1</td></tr>
<tr><td>150.18</td><td>FBA A actual value 2</td><td>Displays raw actual value ACT2 sent to fieldbus adapter A.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw ACT2 sent to fieldbus adapter A.</td><td>1 = 1</td></tr>
<tr><td>150.21</td><td>FBA A timelevel sel</td><td>Selects the communication speed for the fieldbus adapter A.
In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting.
<table><tr><th>Selection</th><th>Cyclic*</th><th>Acyclic**</th></tr><tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></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>500 µs</td></tr></table>
*Cyclic data consists of fieldbus Control and Status words, Act1 and Act2.
**Acyclic data consists of the parameter data mapped to parameter groups 152 FBA A data in and 153 FBA A data out.</td><td>Normal</td></tr>
<tr><td></td><td>Normal</td><td>Normal speed.</td><td>0</td></tr>
<tr><td></td><td>Fast</td><td>Fast speed.</td><td>1</td></tr>
<tr><td></td><td>Very fast</td><td>Very fast speed.</td><td>2</td></tr>
<tr><td></td><td>Monitoring</td><td>Low speed. Optimized for PC tool communication and monitoring usage.</td><td>3</td></tr>
<tr><td>150.31</td><td>FBA B enable</td><td>Enables/disables communication between the DC/DC converter unit and fieldbus adapter B, and specifies the slot the adapter is installed into.</td><td>Disable</td></tr>
<tr><td></td><td>Disable</td><td>Communication between DC/DC converter unit and fieldbus adapter B disabled.</td><td>0</td></tr>
<tr><td></td><td>Option slot 1</td><td>Communication between DC/DC converter unit and fieldbus adapter B enabled. The adapter is in slot 1.</td><td>1</td></tr>
<tr><td></td><td>Option slot 2</td><td>Communication between DC/DC converter unit and fieldbus adapter B enabled. The adapter is in slot 2.</td><td>2</td></tr>
<tr><td></td><td>Option slot 3</td><td>Communication between DC/DC converter unit and fieldbus adapter B enabled. The adapter is in slot 3.</td><td>3</td></tr>
<tr><td>150.32</td><td>FBA B comm loss func</td><td>Selects how the DC/DC converter unit reacts upon a fieldbus communication break. The time delay is defined by parameter 150.33 FBA B comm loss timeout.</td><td>No action</td></tr>
<tr><td></td><td>No action</td><td>Communication break detection disabled.</td><td>0</td></tr>
<tr><td></td><td>Fault</td><td>Communication break detection active. Upon a communication break, the DC/DC converter unit trips on a communication fault.</td><td>1</td></tr>
<tr><td></td><td>Fault always</td><td>The DC/DC converter unit trips on a communication fault even though no control is expected from the fieldbus.</td><td>4</td></tr>
<tr><td></td><td>Warning</td><td>The DC/DC converter unit generates a communication warning even though no control is expected from the fieldbus.</td><td>5</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
150.33	FBA B comm loss timeout	Defines the time delay before the action defined by parameter 150.32 FBA B comm loss func is taken. Time count starts when the communication link fails to update the message.	0.3 s
	0.3 … 6553.5 s	Time delay.	10 = 1 s
150.34	FBA B ref1 type	Selects the type and scaling of reference 1 received from fieldbus adapter B. For the selections, see parameter 150.04 FBA A ref1 type.	Active power
150.35	FBA B ref2 type	Selects the type and scaling of reference 2 received from fieldbus adapter B. For the selections, see parameter 150.05 FBA A ref2 type.	Active power
150.37	FBA B actual 1 type	Selects the type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter B. For the selections, see parameter 150.07 FBA A actual 1 type.	Transparent
150.38	FBA B actual 2 type	Selects the type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter B. For the selections, see parameter 150.07 FBA A actual 1 type.	Transparent
150.40	FBA B act1 transparent source	When parameter 150.37 FBA B actual 1 type is set to Transparent, this parameter selects the source of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Not selected
	Not selected	No source selected.	-
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
150.41	FBA B act2 transparent source	When parameter 150.38 FBA B actual 2 type is set to Transparent, this parameter selects the source of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Not selected
	Not selected	No source selected.	-
	Other [bit]	Source selection (see Terms and abbreviations on page 51).	-
150.42	FBA B debug mode	Enables the display of raw (unmodified) data received from and sent to fieldbus adapter B in parameters 150.43…150.48. Note that the changes made take effect only after reboot or setting the parameter 154.27 FBA B par refresh to Refresh. This functionality should only be used for debugging.	Disable
	Disable	Display of raw data from fieldbus adapter B disabled.	0
	Fast	Debug mode is enabled. Cyclical data update is as fast as possible which increases the CPU load on the DC/DC converter unit.	1
150.43	FBA B control word	Displays the control word received from fieldbus adapter B. For the commands assigned to each bit, see chapter Fieldbus control through a fieldbus adapter.	-
	00000000h … FFFFFFFFh	Control word received from fieldbus adapter B.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>150.44</td><td>FBA B reference 1</td><td>Displays the raw (unmodified) reference REF1 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter 150.42 FBA B debug mode.
This parameter is read-only.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw REF1 sent by master to fieldbus adapter B.</td><td>-</td></tr>
<tr><td>150.45</td><td>FBA B reference 2</td><td>Displays the raw (unmodified) reference REF2 sent by the master (PLC) to fieldbus adapter B if debugging is enabled by parameter 150.42 FBA B debug mode.
This parameter is read-only.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw REF2 sent by master to fieldbus adapter B.</td><td>-</td></tr>
<tr><td>150.46</td><td>FBA B status word</td><td>Displays the status word sent to fieldbus adapter B. For the commands assigned to each bit, see chapter Fieldbus control through a fieldbus adapter.</td><td>-</td></tr>
<tr><td></td><td>00000000h … FFFFFFFFh</td><td>Status word sent to fieldbus adapter B.</td><td>1 = 1</td></tr>
<tr><td>150.47</td><td>FBA B actual value 1</td><td>Displays raw actual value ACT1 sent to fieldbus adapter B.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw ACT1 sent to fieldbus adapter B.</td><td>1 = 1</td></tr>
<tr><td>150.48</td><td>FBA B actual value 2</td><td>Displays raw actual value ACT2 sent to fieldbus adapter B.</td><td>-</td></tr>
<tr><td></td><td>-2147483648 … 2147483647</td><td>Raw ACT2 sent to fieldbus adapter B.</td><td>1 = 1</td></tr>
<tr><td>150.51</td><td>FBA B timelevel sel</td><td>Selects the communication speed for the fieldbus adapter B.
In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting.
<table><tr><th>Selection</th><th>Cyclic*</th><th>Acyclic**</th></tr><tr><td>Monitoring</td><td>10 ms</td><td>10 ms</td></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>500 µs</td></tr></table>
*Cyclic data consists of fieldbus Control and Status words, Act1 and Act2.
**Acyclic data consists of the parameter data mapped to parameter groups 155 FBA B data in and 156 FBA B data out.</td><td>Normal</td></tr>
<tr><td></td><td>Normal</td><td>Normal speed.</td><td>0</td></tr>
<tr><td></td><td>Fast</td><td>Fast speed.</td><td>1</td></tr>
<tr><td></td><td>Very fast</td><td>Very fast speed.</td><td>2</td></tr>
<tr><td></td><td>Monitoring</td><td>Low speed. Optimized for PC tool communication and monitoring usage.</td><td>3</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
151 FBA A settings		Fieldbus adapter A configuration.	
151.01	FBA A type	Displays the type of the connected fieldbus adapter module. **0** = Module is not found or is not properly connected, or is disabled by parameter 150.01 FBA A enable; **1** = FPBA; **32** = FCAN; **37** = FDNA; **101** = FCNA; **128** = FENA-11/21; **132** = FPNO; **135** = FECA; **136** = FEPL; **485** = FSCA; **502** = FMBT; **2222** = FEIP; **62944** = FSEA. **Note:** All types of the fieldbus adapter modules are not necessarily supported yet. This parameter is read-only.	-
151.02	FBA A Par2	Parameters 151.02…151.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily in use. **Note:** In supply units, only Trans16 profile is in use.	-
	0…65535	Fieldbus adapter configuration parameter.	1 = 1
…	…	…	…
151.26	FBA Par26	See parameter 151.02 FBA A Par2.	-
	0…65535	Fieldbus adapter configuration parameter.	1 = 1
151.27	FBA A par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to Done. **Note:** This parameter cannot be changed while the DC/DC converter unit is running.	Done
	Done	Refreshing done.	0
	Refresh	Refreshing.	1
151.28	FBA A par table ver	Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory. In format axyz, where a = major revision number; xy = minor revision number; z = correction number.	-
	0…65535	Parameter table revision of adapter module.	1 = 1
151.29	FBA A drive type code	Displays the type code of the fieldbus adapter module mapping file stored in the memory.	-
	0…65535	Type code of fieldbus adapter module mapping file.	1 = 1
151.30	FBA A mapping file ver	Displays the fieldbus adapter module mapping file revision stored in the memory of the DC/DC converter unit in decimal format. **Example:** 0x107 = revision 1.07.	-
	0…65535	Mapping file revision.	1 = 1
151.31	D2FBA A comm status	Displays the status of the fieldbus adapter module communication.	Idle
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1
	Time out	A time-out has occurred in the communication between the adapter and the DC/DC converter unit.	2
	Conf.err	Adapter configuration error: the major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module (see parameter 151.32 FBA A comm SW ver), or mapping file upload has failed more than three times.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5

No.	Name/Value	Description	Def/FbEq16
	Reset	Adapter is performing a hardware reset.	6
151.32	FBA A comm SW ver	Displays the common program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number. **Example:** 190A = revision 1.90A.	-
		Common program revision of adapter module.	1 = 1
151.33	FBA A appl SW ver	Displays the application program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number. **Example:** 190A = revision 1.90A.	-
		Application program version of adapter module.	1 = 1

152 FBA A data in		Selection of data to be transferred from DC/DC converter unit to fieldbus controller through 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.	
152.01	FBA A data in1	Parameters 152.01…152.12 select data to be transferred from the DC/DC converter unit to the fieldbus controller through fieldbus adapter A.	None
	None	None.	0
	CW 16bit	Control word (16 bits)	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	SW 16bit	Status word (16 bits)	4
	Act1 16bit	Actual value ACT1 (16 bits)	5
	Act2 16bit	Actual value ACT2 (16 bits)	6
	CW 32bit	Control word (32 bits)	11
	SW 32bit	Status word (32 bits)	14
	Act1 32bit	Actual value ACT1 (32 bits)	15
	Act2 32bit	Actual value ACT2 (32 bits)	16
	Other	The value is taken from another parameter.	-
…	…	…	…
152.12	FBA A data in12	See parameter 152.01 FBA A data in1.	None

No.	Name/Value	Description	Def/FbEq16
153 FBA A data out		Selection of data to be transferred from fieldbus controller to the DC/DC converter unit through 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.	
153.01	FBA data out1	Parameters 153.01…153.12 select data to be transferred from the fieldbus controller to the DC/DC converter unit through fieldbus adapter A.	None
	None	None.	0
	CW 16bit	Control word (16 bits)	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	CW 32bit	Control word (32 bits)	11
	Other	The value is taken from another parameter.	-
…	…	…	…
153.12	FBA data out12	See parameter 153.01 FBA data out1.	None
154 FBA B settings		Fieldbus adapter B configuration.	
154.01	FBA B type	Displays the type of the connected fieldbus adapter module. **0** = Module is not found or is not properly connected, or is disabled by parameter 150.31 FBA B enable; **1** = FPBA; **32** = FCAN; **37** = FDNA; **101** = FCNA; **128** = FENA-11/21; **132** = FPNO; **135** = FECA; **136** = FEPL; **485** = FSCA; **502** = FMBT; **2222** = FEIP; **62944** = FSEA. **Note:** All types of the fieldbus adapter modules are not necessarily supported yet. This parameter is read-only.	-
154.02	FBA B Par2	Parameters 154.02…154.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily used.	-
	0…65535	Fieldbus adapter configuration parameter.	1 = 1
…	…	…	…
154.26	FBA B Par26	See parameter 154.26 FBA B Par2.	-
	0…65535	Fieldbus adapter configuration parameter.	1 = 1
154.27	FBA B par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to Done. **Note:** This parameter cannot be changed while the DC/DC converter unit is running.	Done
	Done	Refreshing done.	0
	Refresh	Refreshing.	1
154.28	FBA B par table ver	Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory. In format axyz, where a = major revision number; xy = minor revision number; z = correction number.	-
		Parameter table revision of adapter module.	1 = 1
154.29	FBA B drive type code	Displays the type code of the fieldbus adapter module mapping file stored in the memory.	-
	0…65535	Type code of fieldbus adapter module mapping file.	1 = 1

No.	Name/Value	Description	Def/FbEq16
154.30	FBA B mapping file ver	Displays the fieldbus adapter module mapping file revision stored in the memory of the DC/DC converter unit in decimal format. **Example:** Integer 263 -> 0x107 = revision 1.07	-
	0…65535	Mapping file revision.	1 = 1
154.31	D2FBA B comm status	Displays the status of the fieldbus adapter module communication.	Idle
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1
	Time out	A time-out has occurred in the communication between the adapter and the DC/DC converter unit.	2
	Conf.err	Adapter configuration error: the major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module (see parameter 154.32 FBA B comm SW ver), or mapping file upload has failed more than three times.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5
	Reset	Adapter is performing a hardware reset.	6
154.32	FBA B comm SW ver	Displays the common program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number. **Example:** 190A = revision 1.90A.	-
		Common program revision of adapter module.	1 = 1
154.33	FBA B appl SW ver	Displays the application program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number or letter. **Example:** 190A = revision 1.90A.	-
		Application program version of adapter module.	1 = 1

155 FBA B data in		Selection of data to be transferred from the DC/DC converter unit to fieldbus controller through fieldbus adapter B. **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.	
155.01	FBA B data in1	Parameters 155.01…155.12 select data to be transferred from the DC/DC converter unit to the fieldbus controller through fieldbus adapter B.	None
	None	None.	0
	CW 16bit	Control word (16 bits)	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	SW 16bit	Status word (16 bits)	4
	Act1 16bit	Actual value ACT1 (16 bits)	5
	Act2 16bit	Actual value ACT2 (16 bits)	6
	CW 32bit	Control word (32 bits)	11
	SW 32bit	Status word (32 bits)	14

No.	Name/Value	Description	Def/FbEq16
	Act1 32bit	Actual value ACT1 (32 bits)	15
	Act2 32bit	Actual value ACT2 (32 bits)	16
	Other	The value is taken from another parameter.	-
…	…	…	
155.12	FBA B data in12	See parameter 155.01 FBA B data in1.	None

156 FBA B data out		Selection of data to be transferred from fieldbus controller to the DC/DC converter unit through fieldbus adapter B. **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.	
156.01	FBA B data out1	Parameters 156.01…156.12 select data to be transferred from the fieldbus controller to the DC/DC converter unit through fieldbus adapter B.	None
	None	None.	0
	CW 16bit	Control word (16 bits)	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	CW 32bit	Control word (32 bits)	11
	Other	The value is taken from another parameter.	-
…	…	…	…
156.12	FBA B data out12	See parameter 156.01 FBA B data out1.	None

160 DDCS communication		DDCS communication configuration.	
160.41	Extension adapter com port	Selects the channel used for connecting an optional FEA-03 extension adapter.	No connect
	No connect	None (communication disabled).	0
	Slot 1A	Channel A on FDCO module in slot 1.	1
	Slot 2A	Channel A on FDCO module in slot 2.	2
	Slot 3A	Channel A on FDCO module in slot 3.	3
	Slot 1B	Channel B on FDCO module in slot 1.	4
	Slot 2B	Channel B on FDCO module in slot 2.	5
	Slot 3B	Channel B on FDCO module in slot 3.	6
	RDCO CH 0	Channel 0 on RDCO module (with UCU control unit only).	13
160.51	DDCS controller comm port	Selects the DDCS channel used for connecting an external controller (such as an AC 800M).	No connect
	No connect	None (communication disabled).	0
	Slot 1A	Channel A on FDCO module in slot 1.	1
	Slot 2A	Channel A on FDCO module in slot 2.	2
	Slot 3A	Channel A on FDCO module in slot 3.	3
	Slot 1B	Channel B on FDCO module in slot 1.	4
	Slot 2B	Channel B on FDCO module in slot 2.	5
	Slot 3B	Channel B on FDCO module in slot 3.	6
	RDCO CH0	Channel 0 on RDCO module (with UCU control unit only).	11
160.52	DDCS controller node address	Selects the node address for communication with the external controller. No two nodes on-line may have the same address.	1
	1…254	Node address.	1 = 1

No.	Name/Value	Description	Def/FbEq16
160.55	DDCS controller HW connection	Selects the topology of the fiber optic link.	Star
	Ring	The devices are connected in a ring topology. Forwarding of messages is enabled.	0
	Star	The devices are connected in a star topology (for example, through a branching unit). Forwarding of messages is disabled.	1
160.57	DDCS controller link control	Defines the light intensity of the transmission LED of RDCO module channel CH0. (This parameter is effective only when parameter 160.51 DDCS controller comm port is set to RDCO CH0. FDCO modules have a hardware transmitter current selector.) In general, use higher values with longer fiber optic cables. The maximum setting is applicable to the maximum length of the fiber optic link.	10
	1…15	Light intensity.	1 = 1
160.58	DDCS controller comm loss time	Sets a time-out for communication with the external controller. If a communication break lasts longer than the time-out, the action specified by parameter 160.59 DDCS controller comm loss function is taken.	100 ms
	0 … 60000 ms	Time-out for communication with external controller.	1 = 1
160.59	DDCS controller comm loss function	Selects how the DC/DC converter unit reacts to a communication break between it and the external controller.	Fault
	No action	No action taken.	0
	Fault	DC/DC converter unit trips on 7E11 DDCS controller comm loss.	1
	Warning	DC/DC converter unit generates an AE6D DDCS controller comm loss warning. This occurs even though no control is expected from the external controller. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	5
160.60	DDCS controller ref1 type	Selects the type and scaling of reference 1 received from the external controller. The resulting value is shown by parameter 103.11 DDCS controller ref 1.	Transparent
	Transparent	No scaling is applied.	1
	General	Generic reference with a scaling of 100 = 1 (ie. integer and two decimals).	2
	DC voltage	Reserved.	8
	Active power	Reserved.	9
160.61	DDCS controller ref2 type	Selects the type and scaling of reference 2 received from the external controller. The resulting value is shown by parameter 103.12 DDCS controller ref 2. For the selections, see parameter 160.60 DDCS controller ref1 type.	Transparent
160.62	DDCS controller act1 type	Selects the type and scaling of actual value 1 transmitted to the external controller.	Transparent
	Transparent	Reserved.	1
	General	Reserved.	2
	DC voltage	Reserved.	8
	Active power	Reserved.	9
160.63	DDCS controller act2 type	Selects the type and scaling of actual value 2 transmitted to the external controller.	Transparent
	Transparent	Reserved.	1

No.	Name/Value	Description	Def/FbEq16
	General	Reserved.	2
	DC voltage	Reserved.	8
	Active power	Reserved.	9
160.64	Mailbox dataset selection	Selects dataset pair to be used in mailbox communication.	Dataset 32/33
	Dataset 32/33	Dataset 32 is used for query and dataset 33 for response.	0
	Dataset 24/25	Dataset 24 is used for query and dataset 25 for response	1

161 DDCS transmit		Defines the data sent to the DDCS link.	
161.51	Data set 11 data 1 selection	Selects the location where the value of data set 11 data word 1 is read from.	None
	None	None.	0
	CW 16bit	Virtual address for 16-bit control word.	1
	SW 16bit	Virtual address for 16-bit status word.	4
	Act1 16bit	Actual value ACT1 (16 bits)	5
	Act2 16bit	Actual value ACT2 (16 bits)	6
	Other	Source selection (see Terms and abbreviations on page 51).	-
161.52	Data set 11 data 2 selection	Selects the location where the value of data set 11 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.53	Data set 11 data 3 selection	Selects the location where the value of data set 11 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.54	Data set 13 data 1 selection	Selects the location where the value of data set 13 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.55	Data set 13 data 2 selection	Selects the location where the value of data set 13 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.56	Data set 13 data 3 selection	Selects the location where the value of data set 13 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.57	Data set 15 data 1 selection	Selects the location where the value of data set 15 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.58	Data set 15 data 2 selection	Selects the location where the value of data set 15 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.59	Data set 15 data 3 selection	Selects the location where the value of data set 15 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None

No.	Name/Value	Description	Def/FbEq16
161.60	Data set 17 data 1 selection	Selects the location where the value of data set 17 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.61	Data set 17 data 2 selection	Selects the location where the value of data set 17 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.62	Data set 17 data 3 selection	Selects the location where the value of data set 17 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.63	Data set 19 data 1 selection	Selects the location where the value of data set 19 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.64	Data set 19 data 2 selection	Selects the location where the value of data set 19 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.65	Data set 19 data 3 selection	Selects the location where the value of data set 19 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.66	Data set 21 data 1 selection	Selects the location where the value of data set 21 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.67	Data set 21 data 2 selection	Selects the location where the value of data set 21 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.68	Data set 21 data 3 selection	Selects the location where the value of data set 21 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.69	Data set 23 data 1 selection	Selects the location where the value of data set 23 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.70	Data set 23 data 2 selection	Selects the location where the value of data set 23 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.71	Data set 23 data 3 selection	Selects the location where the value of data set 23 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.72	Data set 25 data 1 selection	Selects the location where the value of data set 25 data word 1 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None

No.	Name/Value	Description	Def/FbEq16
161.73	Data set 25 data 2 selection	Selects the location where the value of data set 25 data word 2 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.74	Data set 25 data 3 selection	Selects the location where the value of data set 25 data word 3 is read from. For the selections, see parameter 161.51 Data set 11 data 1 selection.	None
161.101	Data set 11 data 1 value	Defines the raw data to be transmitted in data set 11 data word 1.	-
	0…65535	Raw data to be transmitted in data set 11 data word 1.	1 = 1
161.102	Data set 11 data 2 value	Defines the raw data to be transmitted in data set 11 data word 2.	-
	0…65535	Raw data to be transmitted in data set 11 data word 2.	1 = 1
161.103	Data set 11 data 3 value	Defines the raw data to be transmitted in data set 11 data word 3.	-
	0…65535	Raw data to be transmitted in data set 11 data word 3.	1 = 1
161.104	Data set 13 data 1 value	Defines the raw data to be transmitted in data set 13 data word 1.	-
	0…65535	Raw data to be transmitted in data set 13 data word 1.	1 = 1
161.105	Data set 13 data 2 value	Defines the raw data to be transmitted in data set 13 data word 2.	-
	0…65535	Raw data to be transmitted in data set 13 data word 2.	1 = 1
161.106	Data set 13 data 3 value	Defines the raw data to be transmitted in data set 13 data word 3.	-
	0…65535	Raw data to be transmitted in data set 13 data word 3.	1 = 1
161.107	Data set 15 data 1 value	Defines the raw data to be transmitted in data set 15 data word 1.	-
	0…65535	Raw data to be transmitted in data set 15 data word 1.	1 = 1
161.108	Data set 15 data 2 value	Defines the raw data to be transmitted in data set 15 data word 2.	-
	0…65535	Raw data to be transmitted in data set 15 data word 2.	1 = 1
161.109	Data set 15 data 3 value	Defines the raw data to be transmitted in data set 15 data word 3.	-
	0…65535	Raw data to be transmitted in data set 15 data word 3.	1 = 1
161.110	Data set 17 data 1 value	Defines the raw data to be transmitted in data set 17 data word 1.	-
	0…65535	Raw data to be transmitted in data set 17 data word 1.	1 = 1
161.111	Data set 17 data 2 value	Defines the raw data to be transmitted in data set 17 data word 2.	-
	0…65535	Raw data to be transmitted in data set 17 data word 2.	1 = 1
161.112	Data set 17 data 3 value	Defines the raw data to be transmitted in data set 17 data word 3.	-
	0…65535	Raw data to be transmitted in data set 17 data word 3.	1 = 1
161.113	Data set 19 data 1 value	Defines the raw data to be transmitted in data set 19 data word 1.	-
	0…65535	Raw data to be transmitted in data set 19 data word 1.	1 = 1
161.114	Data set 19 data 2 value	Defines the raw data to be transmitted in data set 19 data word 2.	-
	0…65535	Raw data to be transmitted in data set 19 data word 2.	1 = 1

No.	Name/Value	Description	Def/FbEq16
161.115	Data set 19 data 3 value	Defines the raw data to be transmitted in data set 19 data word 3.	-
	0...65535	Raw data to be transmitted in data set 19 data word 3.	1 = 1
161.116	Data set 21 data 1 value	Defines the raw data to be transmitted in data set 21 data word 1.	-
	0...65535	Raw data to be transmitted in data set 21 data word 1.	1 = 1
161.117	Data set 21 data 2 value	Defines the raw data to be transmitted in data set 21 data word 2.	-
	0...65535	Raw data to be transmitted in data set 21 data word 2.	1 = 1
161.118	Data set 21 data 3 value	Defines the raw data to be transmitted in data set 21 data word 3.	-
	0...65535	Raw data to be transmitted in data set 21 data word 3.	1 = 1
161.119	Data set 23 data 1 value	Defines the raw data to be transmitted in data set 23 data word 1.	-
	0...65535	Raw data to be transmitted in data set 23 data word 1.	1 = 1
161.120	Data set 23 data 2 value	Defines the raw data to be transmitted in data set 23 data word 2.	-
	0...65535	Raw data to be transmitted in data set 23 data word 2.	1 = 1
161.121	Data set 23 data 3 value	Defines the raw data to be transmitted in data set 23 data word 3.	-
	0...65535	Raw data to be transmitted in data set 23 data word 3.	1 = 1
161.122	Data set 25 data 1 value	Defines the raw data to be transmitted in data set 25 data word 1.	-
	0...65535	Raw data to be transmitted in data set 25 data word 1.	1 = 1
161.123	Data set 25 data 2 value	Defines the raw data to be transmitted in data set 25 data word 2.	-
	0...65535	Raw data to be transmitted in data set 25 data word 2.	1 = 1
161.124	Data set 25 data 3 value	Defines the raw data to be transmitted in data set 25 data word 3.	-
	0...65535	Raw data to be transmitted in data set 25 data word 3.	1 = 1
162 DDCS receive		Mapping of data received through the DDCS link.	
162.51	Data set 10 data 1 selection	Selects the location into which the value of data set 10 data word 1 is written.	None
	None	None.	0
	CW 16bit	Virtual address for 16-bit control word.	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	CW 32bit	Virtual address for 32-bit control word.	11
	Other	Source selection (see Terms and abbreviations on page 51).	-
162.52	Data set 10 data 2 selection	Selects the location into which the value of data set 10 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.53	Data set 10 data 3 selection	Selects the location into which the value of data set 10 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.54	Data set 12 data 1 selection	Selects the location into which the value of data set 12 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None

No.	Name/Value	Description	Def/FbEq16
162.55	Data set 12 data 2 selection	Selects the location into which the value of data set 12 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.56	Data set 12 data 3 selection	Selects the location into which the value of data set 12 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.57	Data set 14 data 1 selection	Selects the location into which the value of data set 14 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.58	Data set 14 data 2 selection	Selects the location into which the value of data set 14 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.59	Data set 14 data 3 selection	Selects the location into which the value of data set 14 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.60	Data set 16 data 1 selection	Selects the location into which the value of data set 16 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.61	Data set 16 data 2 selection	Selects the location into which the value of data set 16 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.62	Data set 16 data 3 selection	Selects the location into which the value of data set 16 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.63	Data set 18 data 1 selection	Selects the location into which the value of data set 18 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.64	Data set 18 data 2 selection	Selects the location into which the value of data set 18 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.65	Data set 18 data 3 selection	Selects the location into which the value of data set 18 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.66	Data set 20 data 1 selection	Selects the location into which the value of data set 20 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.67	Data set 20 data 2 selection	Selects the location into which the value of data set 20 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None

No.	Name/Value	Description	Def/FbEq16
162.68	Data set 20 data 3 selection	Selects the location into which the value of data set 20 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.69	Data set 22 data 1 selection	Selects the location into which the value of data set 22 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.70	Data set 22 data 2 selection	Selects the location into which the value of data set 22 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.71	Data set 22 data 3 selection	Selects the location into which the value of data set 22 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.72	Data set 24 data 1 selection	Selects the location into which the value of data set 24 data word 1 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.73	Data set 24 data 2 selection	Selects the location into which the value of data set 24 data word 2 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.74	Data set 24 data 3 selection	Selects the location into which the value of data set 24 data word 3 is written. For the selections, see parameter 162.51 Data set 10 data 1 selection.	None
162.101	Data set 10 data 1 value	Defines the raw data to be received in data set 10 data word 1.	-
	0...65535	Raw data to be received in data set 10 data word 1.	1 = 1
162.102	Data set 10 data 2 value	Defines the raw data to be received in data set 10 data word 2.	-
	0...65535	Raw data to be received in data set 10 data word 2.	1 = 1
162.103	Data set 10 data 3 value	Defines the raw data to be received in data set 10 data word 3.	-
	0...65535	Raw data to be received in data set 10 data word 3.	1 = 1
162.104	Data set 12 data 1 value	Defines the raw data to be received in data set 12 data word 1.	-
	0...65535	Raw data to be received in data set 12 data word 1.	1 = 1
162.105	Data set 12 data 2 value	Defines the raw data to be received in data set 12 data word 2.	-
	0...65535	Raw data to be received in data set 12 data word 2.	1 = 1
162.106	Data set 12 data 3 value	Defines the raw data to be received in data set 12 data word 3.	-
	0...65535	Raw data to be received in data set 12 data word 3.	1 = 1
162.107	Data set 14 data 1 value	Defines the raw data to be received in data set 14 data word 1.	-
	0...65535	Raw data to be received in data set 14 data word 1.	1 = 1
162.108	Data set 14 data 2 value	Defines the raw data to be received in data set 14 data word 2.	-
	0...65535	Raw data to be received in data set 14 data word 2.	1 = 1

No.	Name/Value	Description	Def/FbEq16
162.109	Data set 14 data 3 value	Defines the raw data to be received in data set 14 data word 3.	-
	0…65535	Raw data to be received in data set 14 data word 3.	1 = 1
162.110	Data set 16 data 1 value	Defines the raw data to be received in data set 16 data word 1.	-
	0…65535	Raw data to be received in data set 16 data word 1.	1 = 1
162.111	Data set 16 data 2 value	Defines the raw data to be received in data set 16 data word 2.	-
	0…65535	Raw data to be received in data set 16 data word 2.	1 = 1
162.112	Data set 16 data 3 value	Defines the raw data to be received in data set 16 data word 3.	-
	0…65535	Raw data to be received in data set 16 data word 3.	1 = 1
162.113	Data set 18 data 1 value	Defines the raw data to be received in data set 18 data word 1.	-
	0…65535	Raw data to be received in data set 18 data word 1.	1 = 1
162.114	Data set 18 data 2 value	Defines the raw data to be received in data set 18 data word 2.	-
	0…65535	Raw data to be received in data set 18 data word 2.	1 = 1
162.115	Data set 18 data 3 value	Defines the raw data to be received in data set 18 data word 3.	-
	0…65535	Raw data to be received in data set 18 data word 3.	1 = 1
162.116	Data set 20 data 1 value	Defines the raw data to be received in data set 20 data word 1.	-
	0…65535	Raw data to be received in data set 20 data word 1.	1 = 1
162.117	Data set 20 data 2 value	Defines the raw data to be received in data set 20 data word 2.	-
	0…65535	Raw data to be received in data set 20 data word 2.	1 = 1
162.118	Data set 20 data 3 value	Defines the raw data to be received in data set 20 data word 3.	-
	0…65535	Raw data to be received in data set 20 data word 3.	1 = 1
162.119	Data set 22 data 1 value	Defines the raw data to be received in data set 22 data word 1.	-
	0…65535	Raw data to be received in data set 22 data word 1.	1 = 1
162.120	Data set 22 data 2 value	Defines the raw data to be received in data set 22 data word 2.	-
	0…65535	Raw data to be received in data set 22 data word 2.	1 = 1
162.121	Data set 22 data 3 value	Defines the raw data to be received in data set 22 data word 3.	-
	0…65535	Raw data to be received in data set 22 data word 3.	1 = 1
162.122	Data set 24 data 1 value	Defines the raw data to be received in data set 24 data word 1.	-
	0…65535	Raw data to be received in data set 24 data word 1.	1 = 1
162.123	Data set 24 data 2 value	Defines the raw data to be received in data set 24 data word 2.	-
	0…65535	Raw data to be received in data set 24 data word 2.	1 = 1
162.124	Data set 24 data 3 value	Defines the raw data to be received in data set 24 data word 3.	-
	0…65535	Raw data to be received in data set 24 data word 3.	1 = 1

No.	Name/Value	Description	Def/FbEq16
191 BAMU configuration		Configuration of the measuring board (BAMU-1x).	
191.30	BAMU 1 channel	Defines the channel of the BAMU-1x board. Fiber optic connectors of the BAMU-1x board are connected to the first free channel on the control unit. For single modules with 3-phase modulator, the value of this parameter is 2. For two modules with 6-phase modulator, the value of this parameter is 3. 0 = Not in use.	0
	0…65535	Channel.	-
192 Additional actual values 2		Actual values for the additional phases of the 6-phase modulator.	
192.40	U phase current 2	U phase current [A] of the second DC/DC converter module in case of 6-phase modulator.	-
	-30000.0… 30000.0 A	U phase current.	1 = 1 A
192.41	V phase current 2	V phase current [A] of the second DC/DC converter module in case of 6-phase modulator.	-
	-30000.0… 30000.0 A	V phase current.	1 = 1 A
192.42	W phase current 2	W phase current [A] of the second DC/DC converter module in case of 6-phase modulator.	-
	-30000.0… 30000.0 A	W phase current.	1 = 1 A
195 HW configuration		Various hardware-related settings.	
195.01	Supply voltage	Selects the supply voltage range. This parameter is used by the control program to determine the nominal voltage of the supply network.	Not given
	Not given	No voltage defined.	0
	380 … 415 V	380 … 415 V.	2
	440 … 480 V	440 … 480 V.	3
	500 V	500 V.	4
	525 … 600 V	525 … 600 V.	5
	660 … 690 V	660 … 690 V.	6
195.04	Control board supply	Specifies how the control unit of the DC/DC converter unit is powered.	External 24V
	Internal 24V	The control unit is powered from the power unit it is connected to.	0
	External 24V	The control unit is powered from an external power supply.	1
	Redundant external 24V	Redundant supervision of 24 V signal. A warning (AE5C External power signal missing) is generated if the power supply is missing.	2
195.09	Fuse switch control	Activates communication to a xSFC charging controller. This setting is intended for use with modules that are connected to a DC bus through a DC switch/charging circuit controlled by a charging controller. The charging controller monitors the charging of the unit, and sends an enable command when the charging has finished. When the DC switch is opened, the charging controller stops the unit. For more information, see xSFC documentation.	Yes
	No	Communication with xSFC disabled.	0

No.	Name/Value	Description	Def/FbEq16
	Yes	Communication with xSFC enabled.	1
195.14	Connected modules	Shows which power modules have been detected. Single module = 0x0001, two modules = 0x0003.	-

Bit	Name	Description
0	Module 1	1 = Module 1 has been detected.
1	Module 2	1 = Module 2 has been detected.

	0000h…FFFFh	Power modules connected.	1 = 1
195.20	HW options word 1	Specifies hardware-related options that require differentiated parameter defaults. Activating a bit in this parameter makes the necessary changes in other parameters.	-

Bit	Name	Information
0	Reserved.	
1	Reserved.	
2	Reserved.	
3	Reserved.	
4	Reserved.	
5	Reserved.	
6	Reserved.	
7	Reserved.	
8	Reserved.	
9	Reserved.	
10	Reserved.	
11	INU-DSU communication	Reserved.
12	RO2 for LCU control	Reserved.
13	DOL fan	Direct-on-line cooling fan is used instead of speed-controlled cooling fan.
14	DIO1 for brake chopper feedback	Reserved.
15	ACS880-07CLC Compact drive	Reserved.

	0000h…FFFFh	Hardware options configuration word.	1 = 1
195.30	Parallel type list filter	(Only visible with a UCU control unit) Filters the list of drive/DC/DC converter unit types listed by parameter 195.31 Parallel type configuration.	No filter
	No filter	All types listed.	1
	-3 (380-415V)	-3 (380…415 V) types listed.	2
	-5 (380-500V)	-5 (380…500 V) types listed.	3
	-7 (525-690V)	-7 (525…690 V) types listed.	4
195.31	Parallel type configuration	(Only visible with a UCU control unit) Defines the drive/DC/DC converter unit type if it consists of parallel-connected modules. If the drive/DC/DC converter unit consists of a single module, leave the value at Not selected.	Not selected
	Not selected	The drive/DC/DC converter unit does not consist of parallel-connected modules, or type not selected.	0
	[Drive/DC/DC converter unit type]	Drive/DC/DC converter unit type consisting of parallel-connected modules.	-

No.	Name/Value	Description	Def/FbEq16
195.38	DOL fan start delay	Defines the start delay for a direct-on-line fan.	7 s
	0…60 s	Start delay for a direct-on-line fan.	1 = 1

196 System		Language selection; pass code; parameter save and restore; control unit reboot.	
196.01	Language	Selects the language of the parameter interface and other displayed information.	Not selected
	Not selected	No language selected.	0
	English UK	UK English.	1033
196.02	Pass code	Pass codes can be entered into this parameter to activate further access levels (see parameter 196.03 Access levels active) or to configure the user lock. Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool. Entering the user pass code (by default, “10000000”) enables parameters 196.100…196.102, which can be used to define a new user pass code and to select the actions that are to be prevented. Entering an invalid pass code will close the user lock if open, ie, hide parameters 196.100…196.102. After entering the code, check that the parameters are in fact hidden. If they are not, enter another (random) pass code. Entering several invalid pass codes introduces a delay before a new attempt can be made. Entering further invalid codes will progressively lengthen the delay. **Note:** You must change the default user pass code to maintain a high level of cybersecurity. Store the code in a safe place – the protection cannot be disabled even by ABB if the code is lost. See also section User lock (page 49).	0
	0…99999999	Pass code.	1 = 1
196.03	Access levels active	Shows which access levels have been activated by pass codes entered into parameter 196.02 Pass code. This parameter is read-only.	0001h
	0000h…FFFFh	Active access levels.	-
196.06	Parameter restore	Restores the original settings of the control program, ie, parameter default values. **Note:** This parameter cannot be changed while the converter is running.	Done
	Done	Restoring is completed.	0

Bit	Name
0	End user
1	Service
2	Advanced programmer
3…10	Reserved.
11	OEM access level 1
12	OEM access level 2
13	OEM access level 3
14	Parameter lock
15	Reserved.

No.	Name/Value	Description	Def/FbEq16
	Restore defs	All parameter values are restored to default values, except fieldbus adapter and drive-to-drive link data.	8
	Clear all	All parameter values are restored to default values, including fieldbus adapter configuration data. PC tool communication is interrupted during the restoring. The DC/DC converter unit CPU is re-booted after the restoring is completed.	62
	Reset all fieldbus settings	Fieldbus adapter settings (parameter groups 150…156) are restored to default values. This will also restore the default settings of the fieldbus adapter if one is connected, potentially including settings that cannot be accessed through parameters.	32
196.07	Parameter save manually	Saves the valid parameter values to permanent memory. **Note:** A new parameter value is saved automatically when changed from the PC tool or panel but not when altered through a fieldbus adapter connection.	Done
	Done	Save completed.	0
	Save	Save in progress.	1
196.08	Control board boot	Changing the value of this parameter to 1 reboots the control unit. The value reverts to 0 automatically.	0
	0…1	1 = Reboot control unit.	1 = 1
196.20	Time sync primary source	Defines the 1st priority external source for synchronization of the unit's time and date.	DDCS Controller
	Internal	No external source selected.	0
	DDCS Controller	External controller.	1
	Fieldbus A or B	Fieldbus interface A or B.	2
	Fieldbus A	Fieldbus interface A.	3
	Fieldbus B	Fieldbus interface B.	4
	Panel link	Control panel, or Drive composer PC tool connected to the control panel.	8
	Ethernet tool link	Drive composer PC tool through an FENA module.	9
196.24	Full days since 1st Jan 1980	Number of full days passed since beginning of the year 1980. This parameter, together with 196.25 Time in minutes within 24 h and 196.26 Time in ms within one minute makes it possible to set the date and time in the converter via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.	-
	1…59999	Days since beginning of 1980.	1 = 1
196.25	Time in minutes within 24 h	Number of full minutes passed since midnight. For example, the value 860 corresponds to 2:20 pm. See parameter 196.24 Full days since 1st Jan 1980.	0 min
	1…1439 min	Minutes since midnight.	1 = 1
196.26	Time in ms within one minute	Number of milliseconds passed since last minute. See parameter 196.24 Full days since 1st Jan 1980.	0 ms
	0…59999 ms	Number of milliseconds since last minute.	1 = 1

No.	Name/Value	Description	Def/FbEq16
196.29	Time sync source status	Time source status word. This parameter is read-only.	-

Bit	Name	Description
0	Time tick received	1 = 1st priority tick received: Tick has been received from 1st priority source.
1	Aux Time tick received	1 = 2nd priority tick received: Tick has been received from 2nd priority source.
2	Tick interval is too long	1 = Yes: Tick interval too long (accuracy compromised).
3	DDCS controller	1 = Tick received: Tick has been received from an external controller.
4	Master/Follower	1 = Tick received: Tick has been received through the master/follower link.
5	Reserved.	
6	D2D	1 = Tick received: Tick has been received through the drive-to-drive link.
7	FbusA	1 = Tick received: Tick has been received through fieldbus interface A.
8	FbusB	1 = Tick received: Tick has been received through fieldbus interface B.
9	EFB	1 = Tick received: Tick has been received through the embedded fieldbus interface.
10	Ethernet	1 = Tick received: Tick has been received through the Ethernet port on the UCU control unit.
11	Panel link	1 = Tick received: Tick has been received from the control panel, or Drive composer PC tool connected to the control panel.
12	Ethernet tool link	1 = Tick received: Tick has been received from Drive composer PC tool through an FENA module.
13	Parameter setting	1 = Tick received: Tick has been set by parameters 96.24…96.26.
14	RTC	1 = RTC time in use: Time and date have been read from the real-time clock.
15	Drive On-Time	1 = Drive on-time in use: Time and date are displaying drive on-time.

	0000h…FFFFh	Time source status word 1.	1 = 1
196.61	User data logger status word	Provides status information on the user data logger (see page 190).	0000b

Bit	Name	Description
0	Running	1 = The user data logger is running. The bit is cleared after the post-trigger time has passed.
1	Triggered	1 = The user data logger has been triggered. The bit is cleared when the logger is restarted.
2	Data available	1 = The user data logger contains data that can be read. Note that the bit is not cleared because the data is saved to the memory unit.
3	Configured	1 = The user data logger has been configured. Note that the bit is not cleared because the configuration data is saved to the memory unit.
4…15	Reserved	

	0000b…1111b	User data logger status word.	1 = 1
196.63	User data logger trigger	Triggers, or selects a source that triggers, the user data logger.	Off
	Off	0.	0
	On	1.	1

No.	Name/Value	Description	Def/FbEq16
	Other	Source selection (see Terms and abbreviations on page 51).	-
196.64	User data logger start	Starts, or selects a source that starts, the user data logger.	Off
	Off	0.	0
	On	1.	1
	Other	Source selection (see Terms and abbreviations on page 51).	-
196.65	Factory data logger time level	Selects the sampling interval for the factory data logger (see page 190).	500us
	500us	500 microseconds.	500
	2ms	2 milliseconds.	2000
	10ms	10 milliseconds.	10000
196.70	Disable adaptive program	Enables/disables the adaptive program (if present). See also section Adaptive programming (page 34).	No
	No	Adaptive program enabled.	0
	Yes	Adaptive program disabled.	1
196.100	Change user pass code	(Visible when user lock is open) To change the current user pass code, enter a new code into this parameter as well as 196.101 Confirm user pass code. A warning will be active until the new pass code is confirmed. To cancel changing the pass code, close the user lock without confirming. To close the lock, enter an invalid pass code in parameter 196.02 Pass code, activate parameter 196.08 Control board boot, or cycle the power. See also section User lock (page 49).	10000000
	10000000… 99999999	New user pass code.	-
196.101	Confirm user pass code	(Visible when user lock is open) Confirms the new user pass code entered in 196.100 Change user pass code.	
	10000000… 99999999	Confirmation of new user pass code.	-

No.	Name/Value	Description	Def/FbEq16
196.102	User lock functionality	(Visible when user lock is open) Selects the actions or functionalities to be prevented by the user lock. Note that the changes made take effect only when the user lock is closed. See parameter 196.02 Pass code. **Note:** We recommend you select all the actions and functionalities unless otherwise required by the application.	0000h

Bit	Name	Information
0	Disable ABB access levels	1 = ABB access levels (service, advanced programmer, etc.; see 196.03) disabled
1	Freeze parameter lock state	1 = Changing the parameter lock state prevented, ie, pass code 358 has no effect
2	Disable file download	1 = Loading of files to converter prevented. This applies to • firmware upgrades • safety functions module configuration • parameter restore • loading an adaptive program • loading and debugging an application program • changing home view of control panel • editing converter texts • editing the favorite parameters list on control panel • configuration settings made through control panel such as time/date formats and enabling/disabling clock display.
3	Disable FB write to hidden	1 = Access to parameters on disabled access levels from fieldbus prevented.
4…5	Reserved	
6	Protect AP	1 = Creating a backup and restoring from a backup prevented.
7	Disable panel Bluetooth	1 = Bluetooth disabled on ACS-AP-W control panel. If the drive is part of a panel bus, Bluetooth is disabled on all panels.
8…10	Reserved	
11	Disable OEM access level 1	1 = OEM access level 1 disabled
12	Disable OEM access level 2	1 = OEM access level 2 disabled
13	Disable OEM access level 3	1 = OEM access level 3 disabled
14…15	Reserved	

0000h…FFFFh	Selection of actions to be prevented by user lock.	-

No.	Name/Value	Description	Def/FbEq16
197 Chopper control		DC/DC converter control settings.	
197.04	Calibration request	Selects the mode for the offset calibration of the current transducer. For the best possible performance and accuracy of the energy storage voltage estimation, the current transducer offsets should be calibrated at least once during the start-up of the DC/DC converter. As the DC bus voltage can in some situations drop to the energy storage voltage level, current may flow from the energy storage to the DC bus via the freewheeling diodes inside the DC/DC converter despite of it being in a stopped state. In this situation the offset calibration, if enabled always when stopped, can fail and give wrong results. In that case it is recommended to do the calibration only once during commissioning when the DC bus voltage is higher than the energy storage voltage. **Note:** Do not enable the calibration if the DC bus voltage is at the same level or lower than the energy storage voltage. If the DC bus voltage cannot be increased, then disconnect the energy storage from the DC/DC converter before doing the calibration.	Do once
	Disabled	Current offset calibration is disabled.	0
	Do once	Calibrates current offsets once (assuming the power stage communication is active) and saves the results to the non-volatile memory. When done, the value reverts automatically to Disabled.	1
	Always when stopped	Calibrates current offsets always when the power stage communication is active. Results are not saved to the non-volatile memory.	2
	Reset offsets	Resets offsets and restores normal operation. This selection can be used if current offset calibration may have failed, for example because of a freewheeling diode current during calibration when the DC bus voltage has dropped to the energy storage voltage level. Zero-offsets are saved to the non-volatile memory. When done, the value reverts automatically to Disabled.	3
197.10	DC voltage offset	Defines the offset for DC bus voltage measurement. Offset is needed for correcting the actual value in case there are two units controlling the DC bus voltage. With offset, the measurements from these two units can be set to the same value. To do this, 1. Make sure that the DC bus of the drive system is powered and at nominal voltage, and that all inverter units are stopped. 2. Check the value of parameter 101.01 DC voltage on each DC/DC converter unit. 3. Using the reading from one unit as a reference point, adjust the offset on the other units so that the reading of 101.01 DC voltage is the same on all units.	0.00 V
	-100.00…100.00 V	Offset for DC voltage measurement.	1 V = 10

No.	Name/Value	Description	Def/FbEq16
197.11	DC voltage charging limit	Defines the DC voltage charging limit as percent of the nominal (101.62 Nominal DC voltage). Above this limit +10% the DC/DC converter can be started, and below this limit +5% the DC/DC converter is stopped. Example: 101.01 DC voltage after charging is 700 V and 101.62 Nominal DC voltage is 932 V. To get the DC/DC converter running, this parameter must be set to 700 V / (1.1 × 932) × 100% = 68%.	70.00%
	0.00…200.00%	DC voltage charging limit.	1% = 10
197.13	Control mode	Selects the control mode for DC/DC converter.	DC voltage
	DC voltage	DC voltage.	0
	Power	Power.	1
	Add	Add mode.	4
197.14	ES voltage source	Selects the signal source for energy storage voltage value.	BAMU
	Estimate used	Energy storage voltage is taken from the estimate (102.03 ES voltage estimated).	0
	Zero	The value is set to zero. No measurement or estimate is used.	1
	BAMU	Energy storage voltage is received from BAMU-1x measuring board (ie, the customer voltage measurement is connected to the BAMU-1x measuring board in the DC/DC converter cubicle).	2
	Parameter 197.15	Energy storage voltage is taken from parameter 197.15 ES voltage input.	3
	AI1	Energy storage voltage is received from AI1.	4
	AI2	Energy storage voltage is received from AI2.	5
197.15	ES voltage input	The control program reads the energy storage voltage actual value from this parameter when enabled with parameter 197.14 ES voltage source. External energy storage voltage measurement can be cyclically sent to the converter through fieldbus or converter-to-converter link.	0 V
	0.00…15000.00 V	External energy storage voltage input.	1 V = 10
197.16	ES voltage offset	Defines the offset for energy storage voltage measurement. Offset is needed for correcting the actual value in case there are two units controlling the energy storage voltage. With offset, the BAMU-1x board measurements from these two units can be set to the same value.	0.00 V
	-100.00…100.00 V	Offset for energy storage voltage measurement.	1 V = 10
197.17	ES volt est interval	Defines the time interval at which the energy storage voltage (102.03 ES voltage estimated) is estimated when current is so small that the energy storage voltage cannot otherwise be accurately estimated. Converter injects small current pulses at the interval defined here to be able to estimate the energy storage voltage. Pulses can either charge or discharge the energy storage depending on the current limits and energy storage voltage level. **Note:** If you set this value to zero, you disable the current pulses and make the energy storage voltage estimation unreliable at a low current.	1.000 s
	0.000…20.000 s	Energy storage voltage estimation interval.	1000 = 1 s

No.	Name/Value	Description	Def/FbEq16
206	I/O bus configuration	Distributed I/O bus settings.	
207	I/O bus service	Distributed I/O bus settings.	
208	I/O bus diagnostics	Distributed I/O bus settings.	
209	I/O bus fan identification	Distributed I/O bus settings.	
(Groups only visible with a UCU control unit) These groups contain parameters related to the distributed I/O bus, which is used with some drives for monitoring the cooling fans of the cabinet system. For details, see CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).			

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Additional parameter data

Contents of this chapter

This chapter lists the parameters with some additional data. For parameter descriptions, see chapter Parameters (page 51).

Terms and abbreviations

Term	Definition
Actual signal	Signal measured or calculated by the DC/DC converter unit. Usually can only be monitored but not adjusted; some counter-type signals can however be reset by entering the value 0.
Analog src	Parameter can be set to the value of another parameter by choosing Other, and selecting the source parameter from a list. In addition to the Other selection, the parameter may offer other pre-selected settings.
Binary src	Value of the parameter can be taken from a specific bit in another parameter value (Other). Sometimes the value can be fixed to 0 (False) or 1 (True). In addition to the Other, False and True selections, the parameter may offer other pre-selected settings.
Data	Data parameter.
FbEq32	32-bit fieldbus equivalent: Scaling between the value shown on the panel and the integer used in fieldbus communication when a 32-bit value is selected for transmission to an external system. Corresponding 16-bit scalings are listed in chapter Parameters (page 51).
List	Selection list.
No.	Parameter number.
PB	Packed boolean.
Real	16-bit value 16-bit value (31 bits + sign) = integer value = fractional value
Type	Data type. See Analog src, Binary src, List, PB, Real.

Fieldbus addresses

Refer to the User’s manual of the fieldbus adapter.

Parameter groups 101...107

No.	Name	Type	Range	Unit	FbEq32
101 Actual values					
101.01	DC voltage	Real	0.00 ... 2000.00	V	100 = 1 V
101.12	Power	Real	-30000.00... 30000.00	kW	100 = 1 kW
101.13	Power %	Real	-1000.0...1000.0	%	10 = 1%
101.20	Converter current	Real	0.00...30000.00	A	100 = 1 A
101.21	Converter current %	Real	0.0...1000.0	%	10 = 1%
101.22	kWh supply	Real	-1000...1000	kWh	1 = 1 kWh
101.23	MWh supply	Real	-1000...1000	MWh	1 = 1 MWh
101.24	GWh supply	Real	-32768...32767	GWh	1 = 1 GWh
101.25	kWh motoring	Real	0...1000	kWh	1 = 1 kWh
101.26	MWh motoring	Real	0...1000	MWh	1 = 1 MWh
101.27	GWh motoring	Real	0...32767	GWh	1 = 1 GWh
101.28	kWh generating	Real	0...1000	kWh	1 = 1 kWh
101.29	MWh generating	Real	0...1000	MWh	1 = 1 MWh
101.30	GWh generating	Real	0...32767	GWh	1 = 1 GWh
101.31	Ambient temperature	Real	-50...150	°C	1 = 1°C
101.61	Nominal supply voltage	Real	0...2000	V	1 = 1 V
101.62	Nominal DC voltage	Real	0...2000	V	1 = 1 V
101.63	Nominal current	Real	0...30000	A	1 = 1 A
101.64	Nominal power	Real	0...30000	kW	1 = 1 kW
101.70	Ambient temperature %	Real	-200.00...200.00	%	100 = 1%
102 Actual values					
102.01	DC voltage	Real	0.0...1500.0	V	1 V = 10
102.02	ES voltage used	Real	0.0...1500.0	V	1 V = 10
102.03	ES voltage estimated	Real	0.0...1500.0	V	1 V = 10
102.05	U phase current	Real	-30000.0...30000.0	A	10 = 1 A
102.06	V phase current	Real	-30000.0...30000.0	A	10 = 1 A
102.07	W phase current	Real	-30000.0...30000.0	A	10 = 1 A
102.08	Total current	Real	-30000.0...30000.0	A	10 = 1 A
102.09	Total current %	Real	-1000.00...1000.00	%	1% = 10
102.10	RMS current	Real	0.0...30000.0	A	10 = 1 A
102.11	Modulation index %	Real	-100.00...100.00	%	1% = 10
102.12	Power	Real	-30000.0...30000.0	kW	10 = 1 kW
102.13	Power %	Real	-1000.00...1000.00	%	1% = 10
103 Input references					
103.01	Panel reference 1	Real	-100000.00 ... 100000.00	-	100 = 1
103.05	FB A reference 1	Real	-100000.00 ... 100000.00	-	100 = 1
103.06	FB A reference 2	Real	-100000.00 ... 100000.00	-	100 = 1
103.11	DDCS controller ref 1	Real	-30000.00 ... 30000.00	-	100 = 1
103.12	DDCS controller ref 2	Real	-30000.00 ... 30000.00	-	100 = 1
104 Warnings and faults					
104.01	Tripping fault	Data	0000h...FFFFh	-	1 = 1
104.02	Active fault 2	Data	0000h...FFFFh	-	1 = 1
104.03	Active fault 3	Data	0000h...FFFFh	-	1 = 1
104.04	Active fault 4	Data	0000h...FFFFh	-	1 = 1
104.05	Active fault 5	Data	0000h...FFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
104.06	Active warning 1	Data	0000h...FFFFh	-	1 = 1
104.07	Active warning 2	Data	0000h...FFFFh	-	1 = 1
104.08	Active warning 3	Data	0000h...FFFFh	-	1 = 1
104.09	Active warning 4	Data	0000h...FFFFh	-	1 = 1
104.10	Active warning 5	Data	0000h...FFFFh	-	1 = 1
104.11	Latest fault	Data	0000h...FFFFh	-	1 = 1
104.12	2nd latest fault	Data	0000h...FFFFh	-	1 = 1
104.13	3rd latest fault	Data	0000h...FFFFh	-	1 = 1
104.14	4th latest fault	Data	0000h...FFFFh	-	1 = 1
104.15	5th latest fault	Data	0000h...FFFFh	-	1 = 1
104.16	Latest warning	Data	0000h...FFFFh	-	1 = 1
104.17	2nd latest warning	Data	0000h...FFFFh	-	1 = 1
104.18	3rd latest warning	Data	0000h...FFFFh	-	1 = 1
104.19	4th latest warning	Data	0000h...FFFFh	-	1 = 1
104.20	5th latest warning	Data	0000h...FFFFh	-	1 = 1
104.25	Faulted modules	PB	0000h...FFFFh	-	1 = 1
105 Diagnostics					
105.01	On-time counter	Real	0... 65535	d	1 = 1 d
105.02	Run-time counter	Real	0... 65535	d	1 = 1 d
105.09	Time from power-up	Real	0...4294967295	-	1 = 1
105.11	Converter temperature %	Real	-40.0 ... 160.0	%	10 = 1%
105.18	Control board humidity	Real	0...100	%	1 = 1%
106 Control and status words					
106.01	Main control word	PB	0000h...FFFFh	-	1 = 1
106.03	FBA A transparent control word	PB	00000000h...FFFFFFFFh	-	1 = 1
106.11	Main status word	PB	0000h...FFFFh	-	1 = 1
106.16	Status word 1	PB	0000h...FFFFh	-	1 = 1
106.18	Start inhibit status word	PB	0000h...FFFFh	-	1 = 1
106.30	MSW bit 11 sel	Binary src	-	-	1 = 1
106.31	MSW bit 12 sel	Binary src	-	-	1 = 1
106.32	MSW bit 13 sel	Binary src	-	-	1 = 1
106.33	MSW bit 15 sel	Binary src	-	-	1 = 1
106.50	User status word1	PB	-	-	1 = 1
106.60	User status word 1 bit 0 sel	PB	-	-	1 = 1
106.61	User status word 1 bit 1 sel	PB	-	-	1 = 1
106.62	User status word 1 bit 2 sel	PB	-	-	1 = 1
106.63	User status word 1 bit 3 sel	PB	-	-	1 = 1
106.64	User status word 1 bit 4 sel	PB	-	-	1 = 1
106.65	User status word 1 bit 5 sel	PB	-	-	1 = 1
106.66	User status word 1 bit 6 sel	PB	-	-	1 = 1
106.67	User status word 1 bit 7 sel	PB	-	-	1 = 1
106.68	User status word 1 bit 8 sel	PB	-	-	1 = 1
106.69	User status word 1 bit 9 sel	PB	-	-	1 = 1
106.70	User status word 1 bit 10 sel	PB	-	-	1 = 1
106.71	User status word 1 bit 11 sel	PB	-	-	1 = 1
106.72	User status word 1 bit 12 sel	PB	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
106.73	User status word 1 bit 13 sel	PB	-	-	1 = 1
106.74	User status word 1 bit 14 sel	PB	-	-	1 = 1
106.75	User status word 1 bit 15 sel	PB	-	-	1 = 1
107 System info					
107.03	Drive rating id	List	-	-	1 = 1
107.04	Firmware name	List	-	-	1 = 1
107.05	Firmware version	Data	-	-	1 = 1
107.06	Loading package name	List	-	-	1 = 1
107.07	Loading package version	Data	-	-	1 = 1
107.08	Bootloader version	Data	-	-	1 = 1
107.11	Cpu usage	Real	0…100	%	1 = 1%
107.13	PU logic version number	Data	-	-	1 = 1
107.14	FPGA logic version name	List	-	-	1 = 1
107.15	FPGA logic version number	Data	-	-	1 = 1
107.30	Adaptive program status	Data	0000h…FFFFh	-	1 = 1
107.60	Device DNA bits [95..64]	Data	0000h…FFFFh	-	1 = 1
107.61	Device DNA bits [63..32]	Data	0000h…FFFFh	-	1 = 1
107.62	Device DNA bits [31..0]	Data	0000h…FFFFh	-	1 = 1
107.63	Remove all Control Tokens	Data	0000h…FFFFh	-	1 = 1
107.64	Active control tokens 1	Data	0000h…FFFFh	-	1 = 1

Parameter groups 110...209

No.	Name	Type	Range	Unit	FbEq32
110 Standard DI, RO					
110.01	DI status	PB	0000h...FFFFh	-	1 = 1
110.02	DI delayed status	PB	0000h...FFFFh	-	1 = 1
110.03	DI force selection	PB	0000h...FFFFh	-	1 = 1
110.04	DI force data	PB	0000h...FFFFh	-	1 = 1
110.05	DI1 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.06	DI1 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.07	DI2 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.08	DI2 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.09	DI3 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.10	DI3 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.11	DI4 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.12	DI4 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.13	DI5 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.14	DI5 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.15	DI6 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.16	DI6 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.21	RO status	PB	0000h...FFFFh	-	1 = 1
110.24	RO1 source	Binary src	-	-	1 = 1
110.25	RO1 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.26	RO1 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.27	RO2 source	Binary src	-	-	1 = 1
110.28	RO2 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.29	RO2 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.30	RO3 source	Binary src	-	-	1 = 1
110.31	RO3 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.32	RO3 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
110.51	DI filter time	Real	0.3 ... 100.0	ms	10 = 1 ms
110.99	RO/DIO control word	PB	0000h...FFFFh	-	1 = 1
111 Standard DIO, FI, FO					
111.01	DIO status	PB	0000h...FFFFh	-	1 = 1
111.02	DIO delayed status	PB	0000h...FFFFh	-	1 = 1
111.05	DIO1 function	List	0...2	-	1 = 1
111.06	DIO1 output source	Binary src	-	-	1 = 1
111.07	DIO1 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
111.08	DIO1 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
111.09	DIO2 function	List	0...1	-	1 = 1
111.10	DIO2 output source	Binary src	-	-	1 = 1
111.11	DIO2 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
111.12	DIO2 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
111.38	Freq in 1 actual value	Real	0...16000	Hz	1 = 1 Hz
111.39	Freq in 1 scaled	Real	-32768.000 ... 32767.000	-	1000 = 1
111.42	Freq in 1 min	Real	0...16000	Hz	1 = 1 Hz
111.43	Freq in 1 max	Real	0...16000	Hz	1 = 1 Hz
111.44	Freq in 1 at scaled min	Real	-32768.000 ... 32767.000	-	1000 = 1
111.45	Freq in 1 at scaled max	Real	-32768.000 ... 32767.000	-	1000 = 1
111.54	Freq out 1 actual value	Real	0...16000	Hz	1 = 1 Hz

No.	Name	Type	Range	Unit	FbEq32
111.58	Freq out 1 src min	Real	-32768.000 … 32767.000	-	1000 = 1
111.59	Freq out 1 src max	Real	-32768.000 … 32767.000	-	1000 = 1
111.60	Freq out 1 at src min	Real	0…16000	Hz	1 = 1 Hz
111.61	Freq out 1 at src max	Real	0…16000	Hz	1 = 1 Hz
111.81	DIO filter time	Real	0.3 … 100.0	ms	10 = 1 ms
112 Standard AI					
112.03	AI supervision function	List	0…2	-	1 = 1
112.04	AI supervision selection	PB	0000h…FFFFh	-	1 = 1
112.11	AI1 actual value	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.12	AI1 scaled value	Real	-32768.000 … 32767.000	-	1000 = 1
112.15	AI1 unit selection	List	2…10	-	1 = 1
112.16	AI1 filter time	Real	0.000 … 30.000	s	1000 = 1 s
112.17	AI1 min	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.18	AI1 max	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.19	AI1 scaled at AI1 min	Real	-32768.000 … 32767.000	-	1000 = 1
112.20	AI1 scaled at AI1 max	Real	-32768.000 … 32767.000	-	1000 = 1
112.21	AI2 actual value	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.22	AI2 scaled value	Real	-32768.000 … 32767.000	-	1000 = 1
112.25	AI2 unit selection	List	2…10	-	1 = 1
112.26	AI2 filter time	Real	0.000 … 30.000	s	1000 = 1s
112.27	AI2 min	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.28	AI2 max	Real	-22.000 … 22.000 mA or -11.000 … 11.000 V	mA or V	1000 = 1 mA
112.29	AI2 scaled at AI2 min	Real	-32768.000 … 32767.000	-	1000 = 1
112.30	AI2 scaled at AI2 max	Real	-32768.000 … 32767.000	-	1000 = 1
113 Standard AO					
113.11	AO1 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
113.12	AO1 source	Analog src	-	-	1 = 1
113.16	AO1 filter time	Real	0.000 … 30.000	s	1000 = 1 s
113.17	AO1 source min	Real	-32768.0 … 32767.0	-	10 = 1
113.18	AO1 source max	Real	-32768.0 … 32767.0	-	10 = 1
113.19	AO1 out at AO1 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
113.20	AO1 out at AO1 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
113.21	AO2 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
113.22	AO2 source	Analog src	-	-	1 = 1
113.26	AO2 filter time	Real	0.000 … 30.000	s	1000 = 1 s
113.27	AO2 source min	Real	-32768.0 … 32767.0	-	10 = 1
113.28	AO2 source max	Real	-32768.0 … 32767.0	-	10 = 1
113.29	AO2 out at AO2 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
113.30	AO2 out at AO2 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
113.91	AO1 data storage	Real	-327.68 … 327.67	-	100 = 1
113.92	AO2 data storage	Real	-327.68 … 327.67	-	100 = 1
114 Extension I/O module 1					
114.01	Module 1 type	List	0…4	-	1 = 1
114.02	Module 1 location	Real	1…254	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
114.03	Module 1 status	List	0…24	-	1 = 1
DIx (114.01 Module 1 type = FDIO-01)					
114.05	DI status	PB	00000000h…FFFFFFFFh	-	1 = 1
114.06	DI delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
114.08	DI filter time	Real	0.8 … 100.0	ms	10 = 1 ms
114.12	DI1 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
114.13	DI1 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
114.17	DI2 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
114.18	DI2 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
114.22	DI3 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
114.23	DI3 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
Common parameters for DIOx (114.01 Module 1 type = FIO-01 or FIO-11)					
114.05	DIO status	PB	00000000h…FFFFFFFFh	-	1 = 1
114.06	DIO delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
DIO1/DIO2 (114.01 Module 1 type = FIO-01 or FIO-11)					
114.09	DIO1 configuration	List	0…1	s	1 = 1
114.10	DIO1 filter gain (Not visible when 114.01 Module 1 type = FIO-01)	List	0…3	-	1 = 1
114.11	DIO1 output source	Binary src	-	-	1 = 1
114.12	DIO1 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.13	DIO1 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
114.14	DIO2 configuration	List	0…1	-	1 = 1
114.15	DIO2 filter gain (Not visible when 114.01 Module 1 type = FIO-01)	List	0…3	-	1 = 1
114.16	DIO2 output source	Binary src	-	-	1 = 1
114.17	DIO2 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.18	DIO2 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
DIO3/DIO4 (114.01 Module 1 type = FIO-01)					
114.19	DIO3 configuration	List	0…1	-	1 = 1
114.21	DIO3 output source	Binary src	-	-	1 = 1
114.22	DIO3 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.23	DIO3 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
114.24	DIO4 configuration	List	0…1	-	1 = 1
114.26	DIO4 output source	Binary src	-	-	1 = 1
114.27	DIO4 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.28	DIO4 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
RO1/RO2 (114.01 Module 1 type = FIO-01 or FDIO-01)					
114.31	RO status	PB	0000h…FFFFh	-	1 = 1
114.34	RO1 source	Binary src	-	-	1 = 1
114.35	RO1 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.36	RO1 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
114.37	RO2 source	Binary src	-	-	1 = 1
114.38	RO2 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
114.39	RO2 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
Common parameters for AIx (114.01 Module 1 type = FIO-11 or FAIO-01)					
114.19	AI supervision function	List	0…2	-	1 = 1
114.20	AI supervision selection	PB	0000h…FFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
114.22	AI force sel	PB	00000000h...FFFFFFFFh	-	1 = 1
AI1/AI2 (114.01 Module 1 type = FIO-11 or FAIO-01)					
114.26	AI1 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.27	AI1 scaled value	Real	-32768.000 ... 32767.000	-	1000 = 1
114.28	AI1 force data	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.29	AI1 HW switch pos	List	-	-	1 = 1
114.30	AI1 unit selection	List	-	-	1 = 1
114.31	AI1 filter gain	List	0...7	-	1 = 1
114.32	AI1 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
114.33	AI1 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.34	AI1 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.35	AI1 scaled at AI1 min	Real	-32768.000 ... 32767.000	-	1000 = 1
114.36	AI1 scaled at AI1 max	Real	-32768.000 ... 32767.000	-	1000 = 1
114.41	AI2 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.42	AI2 scaled value	Real	-32768.000 ... 32767.000	-	1 = 1
114.43	AI2 force data	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.44	AI2 HW switch pos	List	-	-	1 = 1
114.45	AI2 unit selection	List	-	-	1 = 1
114.46	AI2 filter gain	List	0...7	-	1 = 1
114.47	AI2 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
114.48	AI2 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.49	AI2 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.50	AI2 scaled at AI2 min	Real	-32768.000 ... 32767.000	-	1000 = 1
114.51	AI2 scaled at AI2 max	Real	-32768.000 ... 32767.000	-	1000 = 1
AI3 (114.01 Module 1 type = FIO-11)					
114.56	AI3 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.57	AI3 scaled value	Real	-32768.000 ... 32767.000	-	1000 = 1
114.58	AI3 force data	Real	-22.000 ... 22.000	mA or V	1000 = unit
114.59	AI3 HW switch pos	List	-	-	1 = 1
114.60	AI3 unit selection	List	-	-	1 = 1
114.61	AI3 filter gain	List	0...7	-	1 = 1
114.62	AI3 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
114.63	AI3 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.64	AI3 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
114.65	AI3 scaled at AI3 min	Real	-32768.000 ... 32767.000	-	1000 = 1
114.66	AI3 scaled at AI3 max	Real	-32768.000 ... 32767.000	-	1000 = 1
Common parameters for AOx (114.01 Module 1 type = FIO-11 or FAIO-01)					
114.71	AO force selection	PB	00000000h...FFFFFFFFh	-	1 = 1
AO1 (114.01 Module 1 type = FIO-11 or FAIO-01)					
114.76	AO1 actual value	Real	0.000 ... 22.000	mA	1000 = 1 mA
114.77	AO1 source	Analog src	-	-	1 = 1
114.78	AO1 force data	Real	0.000 ... 22.000	mA	1000 = 1 mA
114.79	AO1 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
114.80	AO1 source min	Real	-32768.0 ... 32767.0	-	10 = 1
114.81	AO1 source max	Real	-32768.0 ... 32767.0	-	10 = 1
114.82	AO1 out at AO1 src min	Real	0.000 ... 22.000	mA	1000 = 1 mA
114.83	AO1 out at AO1 src max	Real	0.000 ... 22.000	mA	1000 = 1 mA
AO2 (114.01 Module 1 type = FAIO-01)					
114.86	AO2 actual value	Real	0.000 ... 22.000	mA	1000 = 1 mA

No.	Name	Type	Range	Unit	FbEq32
114.87	AO2 source	Analog src	-	-	1 = 1
114.88	AO2 force data	Real	0.000 … 22.000	mA	1000 = 1 mA
114.89	AO2 filter time	Real	0.000 … 30.000	s	1000 = 1 s
114.90	AO2 source min	Real	-32768.0 … 32767.0	-	10 = 1
114.91	AO2 source max	Real	-32768.0 … 32767.0	-	10 = 1
114.92	AO2 out at AO2 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
114.93	AO2 out at AO2 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
115 Extension I/O module 2					
115.01	Module 2 type	List	0…4	-	1 = 1
115.02	Module 2 location	Real	1…254	-	1 = 1
115.03	Module 2 status	List	0…24	-	1 = 1
DIx (115.01 Module 2 type = FDIO-01)					
115.05	DI status	PB	00000000h…FFFFFFFFh	-	1 = 1
115.06	DI delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
115.08	DI filter time	Real	0.8 … 100.0	ms	10 = 1 ms
115.12	DI1 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
115.13	DI1 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
115.17	DI2 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
115.18	DI2 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
115.22	DI3 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
115.23	DI3 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
Common parameters for DIOx (115.01 Module 2 type = FIO-01 or FIO-11)					
115.05	DIO status	PB	00000000h…FFFFFFFFh	-	1 = 1
115.06	DIO delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
DIO1/DIO2 (115.01 Module 2 type = FIO-01 or FIO-11)					
115.09	DIO1 configuration	List	0…1	-	1 = 1
115.10	DIO1 filter gain (Not visible when 115.01 Module 2 type = FIO-01)	List	0…3	-	1 = 1
115.11	DIO1 output source	Binary src	-	-	1 = 1
115.12	DIO1 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
115.13	DIO1 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
115.14	DIO2 configuration	List	0…1	-	1 = 1
115.15	DIO2 filter gain (Not visible when 115.01 Module 2 type = FIO-01)	List	0…3	-	1 = 1
115.16	DIO2 output source	Binary src	-	-	1 = 1
115.17	DIO2 ON delay	Real	0.0 … 3000.0	s	10 = 1
115.18	DIO2 OFF delay	Real	0.0 … 3000.0	s	10 = 1
DIO3/DIO4 (115.01 Module 2 type = FIO-01)					
115.19	DIO3 configuration	List	0…1	-	1 = 1
115.21	DIO3 output source	Binary src	-	-	1 = 1
115.22	DIO3 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
115.23	DIO3 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
115.24	DIO4 configuration	List	0…1	-	1 = 1
115.26	DIO4 output source	Binary src	-	-	1 = 1
115.27	DIO4 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
115.28	DIO4 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s

No.	Name	Type	Range	Unit	FbEq32
RO1/RO2 (115.01 Module 2 type = FIO-01 or FDIO-01)					
115.31	RO status	PB	0000h...FFFFh	-	1 = 1
115.34	RO1 source	Binary src	-	-	1 = 1
115.35	RO1 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
115.36	RO1 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
115.37	RO2 source	Binary src	-	-	1 = 1
115.38	RO2 ON delay	Real	0.0 ... 3000.0	s	10 = 1 s
115.39	RO2 OFF delay	Real	0.0 ... 3000.0	s	10 = 1 s
Common parameters for AIx (115.01 Module 2 type = FIO-11 or FAIO-01)					
115.19	AI supervision function	List	0...2	-	1 = 1
115.20	AI supervision selection	PB	0000h...FFFFh	-	1 = 1
115.22	AI force sel	PB	00000000h...FFFFFFFFh	-	1 = 1
AI1/AI2 (115.01 Module 2 type = FIO-11 or FAIO-01)					
115.26	AI1 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.27	AI1 scaled value	Real	-32768.000 ... 32767.000	-	1000 = 1
115.28	AI1 force data	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.29	AI1 HW switch pos	List	-	-	1 = 1
115.30	AI1 unit selection	List	-	-	1 = 1
115.31	AI1 filter gain	List	0...7	-	1 = 1
115.32	AI1 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
115.33	AI1 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.34	AI1 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.35	AI1 scaled at AI1 min	Real	-32768.000 ... 32767.000	-	1000 = 1
115.36	AI1 scaled at AI1 max	Real	-32768.000 ... 32767.000	-	1000 = 1
115.41	AI2 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.42	AI2 scaled value	Real	-32768.000 ... 32767.000	-	1000 = 1
115.43	AI2 force data	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.44	AI2 HW switch pos	List	-	-	1 = 1
115.45	AI2 unit selection	List	-	-	1 = 1
115.46	AI2 filter gain	List	0...7	-	1 = 1
115.47	AI2 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
115.48	AI2 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.49	AI2 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.50	AI2 scaled at AI2 min	Real	-32768.000 ... 32767.000	-	1000 = 1
115.51	AI2 scaled at AI2 max	Real	-32768.000 ... 32767.000	-	1000 = 1
AI3 (115.01 Module 2 type = FIO-11)					
115.56	AI3 actual value	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.57	AI3 scaled value	Real	-32768.000 ... 32767.000	-	1000 = 1
115.58	AI3 force data	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.59	AI3 HW switch pos	List	-	-	1 = 1
115.60	AI3 unit selection	List	-	-	1 = 1
115.61	AI3 filter gain	List	0...7	-	1 = 1
115.62	AI3 filter time	Real	0.000 ... 30.000	s	1000 = 1 s
115.63	AI3 min	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.64	AI3 max	Real	-22.000 ... 22.000	mA or V	1000 = 1 unit
115.65	AI3 scaled at AI3 min	Real	-32768.000 ... 32767.000	-	1000 = 1
115.66	AI3 scaled at AI3 max	Real	-32768.000 ... 32767.000	-	1000 = 1
Common parameters for AOx (115.01 Module 2 type = FIO-11 or FAIO-01)					
115.71	AO force selection	PB	00000000h...FFFFFFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
AO1 (115.01 Module 2 type = FIO-11 or FAIO-01)					
115.76	AO1 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
115.77	AO1 source	Analog src	-	-	1 = 1
115.78	AO1 force data	Real	0.000 … 22.000	mA	1000 = 1 mA
115.79	AO1 filter time	Real	0.000 … 30.000	s	1000 = 1 s
115.80	AO1 source min	Real	-32768.0 … 32767.0	-	10 = 1
115.81	AO1 source max	Real	-32768.0 … 32767.0	-	10 = 1
115.82	AO1 out at AO1 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
115.83	AO1 out at AO1 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
AO2 (115.01 Module 2 type = FAIO-01)					
115.86	AO2 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
115.87	AO2 source	Analog src	-	-	1 = 1
115.88	AO2 force data	Real	0.000 … 22.000	mA	1000 = 1 mA
115.89	AO2 filter time	Real	0.000 … 30.000	s	1000 = 1 s
115.90	AO2 source min	Real	-32768.0 … 32767.0	-	10 = 1
115.91	AO2 source max	Real	-32768.0 … 32767.0	-	10 = 1
115.92	AO2 out at AO2 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
115.93	AO2 out at AO2 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
116 Extension I/O module 3					
116.01	Module 3 type	List	0…4	-	1 = 1
116.02	Module 3 location	Real	1…254	-	1 = 1
116.03	Module 3 status	List	0…24	-	1 = 1
DIx (116.01 Module 3 type = FDIO-01)					
116.05	DI status	PB	00000000h…FFFFFFFFh	-	1 = 1
116.06	DI delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
116.08	DI filter time	Real	0.8 … 100.0	ms	10 = 1 ms
116.12	DI1 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
116.13	DI1 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
116.17	DI2 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
116.18	DI2 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
116.22	DI3 ON delay	Real	0.00 … 3000.00	s	100 = 1 s
116.23	DI3 OFF delay	Real	0.00 … 3000.00	s	100 = 1 s
Common parameters for DIOx (116.01 Module 3 type = FIO-01 or FIO-11)					
116.05	DIO status	PB	00000000h…FFFFFFFFh	-	1 = 1
116.06	DIO delayed status	PB	00000000h…FFFFFFFFh	-	1 = 1
DIO1/DIO2 (116.01 Module 3 type = FIO-01 or FIO-11)					
116.09	DIO1 configuration	List	0…1	-	1 = 1
116.10	DIO1 filter gain (Not visible when 116.01 Module 3 type = FIO-01)	List	0…3	-	1 = 1
116.11	DIO1 output source	Binary src	-	-	1 = 1
116.12	DIO1 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
116.13	DIO1 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
116.14	DIO2 configuration	List	0…1	-	1 = 1
116.15	DIO2 filter gain (Not visible when 116.01 Module 3 type = FIO-01)	List	0…3	-	1 = 1
116.16	DIO2 output source	Binary src	-	-	1 = 1
116.17	DIO2 ON delay	Real	0.0 … 3000.0	s	10 = 1 s

No.	Name	Type	Range	Unit	FbEq32
116.18	DIO2 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
DIO3/DIO4 (116.01 Module 3 type = FIO-01)					
116.19	DIO3 configuration	List	0…1	-	1 = 1
116.21	DIO3 output source	Binary src	-	-	1 = 1
116.22	DIO3 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
116.23	DIO3 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
116.24	DIO4 configuration	List	0…1	-	1 = 1
116.26	DIO4 output source	Binary src	-	-	1 = 1
116.27	DIO4 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
116.28	DIO4 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
RO1/RO2 (116.01 Module 3 type = FIO-01 or FDIO-01)					
116.31	RO status	PB	0000h…FFFFh	-	1 = 1
116.34	RO1 source	Binary src	-	-	1 = 1
116.35	RO1 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
116.36	RO1 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
116.37	RO2 source	Binary src	-	-	1 = 1
116.38	RO2 ON delay	Real	0.0 … 3000.0	s	10 = 1 s
116.39	RO2 OFF delay	Real	0.0 … 3000.0	s	10 = 1 s
Common parameters for AIx (116.01 Module 3 type = FIO-11 or FAIO-01)					
116.19	AI supervision function	List	0…2	-	1 = 1
116.20	AI supervision selection	PB	0000h…FFFFh	-	1 = 1
116.22	AI force sel	PB	00000000h…FFFFFFFFh	-	1 = 1
AI1/AI2 (116.01 Module 3 type = FIO-11 or FAIO-01)					
116.26	AI1 actual value	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.27	AI1 scaled value	Real	-32768.000 … 32767.000	-	1000 = 1
116.28	AI1 force data	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.29	AI1 HW switch pos	List	-	-	1 = 1
116.30	AI1 unit selection	List	-	-	1 = 1
116.31	AI1 filter gain	List	0…7	-	1 = 1
116.32	AI1 filter time	Real	0.000 … 30.000	s	1000 = 1 s
116.33	AI1 min	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.34	AI1 max	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.35	AI1 scaled at AI1 min	Real	-32768.000 … 32767.000	-	1000 = 1
116.36	AI1 scaled at AI1 max	Real	-32768.000 … 32767.000	-	1000 = 1
116.41	AI2 actual value	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.42	AI2 scaled value	Real	-32768.000 … 32767.000	-	1000 = 1
116.43	AI2 force data	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.44	AI2 HW switch pos	List	-	-	1 = 1
116.45	AI2 unit selection	List	-	-	1 = 1
116.46	AI2 filter gain	List	0…7	-	1 = 1
116.47	AI2 filter time	Real	0.000 … 30.000	s	1000 = 1 s
116.48	AI2 min	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.49	AI2 max	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.50	AI2 scaled at AI2 min	Real	-32768.000 … 32767.000	-	1000 = 1
116.51	AI2 scaled at AI2 max	Real	-32768.000 … 32767.000	-	1000 = 1
AI3 (116.01 Module 3 type = FIO-11)					
116.56	AI3 actual value	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.57	AI3 scaled value	Real	-32768.000 … 32767.000	-	1000 = 1
116.58	AI3 force data	Real	-22.000 … 22.000	mA or V	1000 = 1 unit

No.	Name	Type	Range	Unit	FbEq32
116.59	AI3 HW switch pos	List	-	-	1 = 1
116.60	AI3 unit selection	List	-	-	1 = 1
116.61	AI3 filter gain	List	0…7	-	1 = 1
116.62	AI3 filter time	Real	0.000 … 30.000	s	1000 = 1 s
116.63	AI3 min	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.64	AI3 max	Real	-22.000 … 22.000	mA or V	1000 = 1 unit
116.65	AI3 scaled at AI3 min	Real	-32768.000 … 32767.000	-	1000 = 1
116.66	AI3 scaled at AI3 max	Real	-32768.000 … 32767.000	-	1000 = 1
Common parameters for AOx (116.01 Module 3 type = FIO-11 or FAIO-01)					
116.71	AO force selection	PB	00000000h…FFFFFFFFh	-	1 = 1
AO1 (116.01 Module 3 type = FIO-11 or FAIO-01)					
116.76	AO1 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
116.77	AO1 source	Analog src	-	-	1 = 1
116.78	AO1 force data	Real	0.000 … 22.000	mA	1000 = 1 mA
116.79	AO1 filter time	Real	0.000 … 30.000	s	1000 = 1 s
116.80	AO1 source min	Real	-32768.0 … 32767.0	-	10 = 1
116.81	AO1 source max	Real	-32768.0 … 32767.0	-	10 = 1
116.82	AO1 out at AO1 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
116.83	AO1 out at AO1 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
AO2 (116.01 Module 3 type = FAIO-01)					
116.86	AO2 actual value	Real	0.000 … 22.000	mA	1000 = 1 mA
116.87	AO2 source	Analog src	-	-	1 = 1
116.88	AO2 force data	Real	0.000 … 22.000	mA	1000 = 1 mA
116.89	AO2 filter time	Real	0.000 … 30.000	s	1000 = 1 s
116.90	AO2 source min	Real	-32768.0 … 32767.0	-	10 = 1
116.91	AO2 source max	Real	-32768.0 … 32767.0	-	10 = 1
116.92	AO2 out at AO2 src min	Real	0.000 … 22.000	mA	1000 = 1 mA
116.93	AO2 out at AO2 src max	Real	0.000 … 22.000	mA	1000 = 1 mA
119 Operation mode					
119.17	Local control disable	List	0…1	-	1 = 1
120 Start/stop					
120.01	Ext1 commands	List	0…16	-	1 = 1
120.02	Ext1 start trigger type	List	0…1	-	1 = 1
120.03	Ext1 in1 source	Binary src	-	-	1 = 1
120.04	Ext1 in2 source	Binary src	-	-	1 = 1
120.12	Run enable 1 source	Binary src	-	-	1 = 1
120.19	Enable start command	Binary src	-	-	1 = 1
121 Start/stop mode					
121.04	Emergency stop mode	List	0…2	-	1 = 1
121.05	Emergency stop source	Binary src	-	-	1 = 1
122 Power reference					
122.01	User Power ref	Real	-	-	100 = 1
122.02	Power ref sel	List	-	-	1 = 1
122.03	Power ref 1	Real	-	-	100 = 1
122.04	Power ref scale	Real	-1000.00 …1000.00	-	100 = 1
122.05	Power ref 2	Real	-	-	100 = 1
122.06	Power ref type	List	0…3	-	1 = 1
122.07	Ipower ref %	Real	-1000.0 …1000.0	%	10 = 1%

No.	Name	Type	Range	Unit	FbEq32
122.14	Ipower ref ramp up	Real	0.000... 100000.000	ms	1 = 1000 ms
122.15	Ipower ref ramp down	Real	0.000... 100000.000	ms	1 = 1000 ms
122.16	Ipower ref out %	Real	-200.0...200.0	%	10 = 1%
123 DC voltage reference					
123.01	User DC voltage ref	Real	0.00 ... 2000.00	V	100 = 1 V
123.02	DC voltage ref selection	List	-	-	1 = 1
123.03	DC voltage ref 1	Real	0.00 ... 2000.00	V	100 = 1 V
123.05	DC voltage ref 2	Real	0.00 ... 2000.00	V	100 = 1 V
123.06	DC voltage ref max	Real	0...2000	V	1 = 1 V
123.07	DC voltage ref min	Real	0 ...1100	V	1 = 1 V
123.08	DC voltage ref lim	Real	0.00 ... 2000.00	V	100 = 1 V
123.09	DC voltage ref ramp up	Real	0...10000	ms	1 = 1 ms
123.10	DC voltage ref ramp down	Real	0...10000	ms	1 = 1 ms
123.11	DC voltage ref out	Real	0.00 ... 2000.00	V	100 = 1 V
123.12	DC voltage ref scale	Real	-100.00...100.00	-	1 = 100
123.15	DC voltage ref shape time	Real	0.0...10000.0	ms	10 = 1 ms
128 DC voltage controller					
128.01	DC voltage control select	List	0...1	-	1 = 1
128.02	Voltage error filtered	Real	-1500.00...1500.00	V	1 V = 10
128.03	DC voltage error filtering time	Real	0...100000	ms	1 = 1 ms
128.04	DC voltage window control	List	0...1	-	1 = 1
128.05	DC voltage window high	Real	0.00...1000.00	V	1 V = 100
128.06	DC voltage window low	Real	-1000.00...0.00	V	1 V = 100
128.07	DC voltage window coef	Real	0.000...1.000	-	1 = 1000
128.08	DC voltage ctrl proportional gain	Real	0.00...1000.00	-	1 = 100
128.09	DC voltage ctrl integration time	Real	0...1000	ms	1 = 1 ms
128.10	DC voltage control droop	List	0...1	-	1 = 1
128.11	DC voltage drooping rate	Real	0.0...100.0	%	1% = 10
128.12	DC voltage control cur ref %	Real	-1000.00...1000.00	%	1% = 100
129 Current controller					
129.01	Current reference used %	Real	-1000.00...1000.00	%	1% = 100
129.03	Current max lim %	Real	-1000.00...1000.00	%	1% = 100
129.04	Current min lim %	Real	-1000.00...1000.00	%	1% = 100
129.14	Current reference stop limit	Real	0.00...100.00	%	1% = 10
130 Limits					
130.101	DDC limit word 1	Binary src	-	-	1 = 1
130.103	Minimum current available	Real	-30000...30000	A	1 = 1 A
130.104	Maximum current available	Real	-30000...30000	A	1 = 1 A
130.109	Max charge current	Real	0...30000	A	1 = 1 A
130.110	Max discharge current	Real	-30000...0	A	1 = 1 A
130.111	Minimum DC bus voltage	Real	0.00...1500.00	V	1 V = 1
130.112	Maximum DC bus voltage	Real	0.00...1500.00	V	1 V = 1
130.113	Minimum ES voltage	Real	-100.00...1500.00	V	1 V = 1
130.114	Maximum ES voltage	Real	0.00...1500.00	V	1 V = 1

No.	Name	Type	Range	Unit	FbEq32
130.115	ES limit dead zone	Real	0.00…1500.00	V	1 V = 100
130.116	ES limit hysteresis	Real	0.00…1500.00	V	1 V = 100
130.117	ES limit trig level	Real	0.00…1500.00	V	1 V = 100
130.118	ES limit cur ramp	Real	0.00…100.00	%/ms	100 = 1 %/ms
130.119	Minimum current	Real	-30000.0…0.0	A	10 = 1 A
130.120	Maximum current	Real	0.0…30000.0	A	10 = 1 A
130.121	Charge current ESUV	Real	0.0…30000.0	A	10 = 1 A
130.122	Disharge current ESOV	Real	-30000.0…0.0	A	10 = 1 A
130.126	Power charging lim	Real	0.0…30000.0	kW	10 = 1 kW
130.127	Power discharging lim	Real	-30000.0…0.0	kW	10 = 1 kW
130.130	DC voltage bus lim coef	Real	0.00…10000.00	-	100 = 1
130.131	ES volt lim coef	Real	0.00…10000.00	-	100 = 1
131 Fault functions					
131.01	External event 1 source	Binary src	-	-	1 = 1
131.02	External event 1 type	List	0…3	-	1 = 1
131.03	External event 2 source	Binary src	-	-	1 = 1
131.04	External event 2 type	List	0…3	-	1 = 1
131.05	External event 3 source	Binary src	-	-	1 = 1
131.06	External event 3 type	List	0…3	-	1 = 1
131.07	External event 4 source	Binary src	-	-	1 = 1
131.08	External event 4 type	List	0…3	-	1 = 1
131.09	External event 5 source	Binary src	-	-	1 = 1
131.10	External event 5 type	List	0…3	-	1 = 1
131.11	Fault reset selection	Binary src	-	-	1 = 1
131.12	Autoreset selection	PB	0000h…FFFFh	-	1 = 1
131.13	User selectable fault	Real	0…65535	-	1 = 1
131.14	Number of trials	Real	0…5	-	1 = 1
131.15	Total trials time	Real	1.0 … 600.0	s	10 = 1 s
131.16	Delay time	Real	0.0 … 120.0	s	10 = 1 s
131.21	Supply phase loss	List	0…1	-	1 = 1
131.22	ES under voltage level	Real	-100.0…2000.0	V	1 V = 10
131.23	ES over voltage level	Real	0.0…2000.0	V	1 V = 10
131.24	ES voltage difference	Real	0.0…2000.0	V	1 V = 10
131.25	User current fault limit	Real	0.00…600.00	%	1 V = 10
131.28	Ext earth leakage signal source	Binary src	-	-	1 = 1
131.29	Ext earth leakage action	List	0…1	-	1 = 1
131.32	Aux circuit breaker fault source	Binary src	-	-	1 = 1
131.33	Cabinet temperature fault source	Binary src	-	-	1 = 1
131.34	Cabinet temperature supervision	List	0…1	-	1 = 1
131.35	Main fan fault function	List	0…2	-	1 = 1
131.38	Fuse trip fault source	Binary src	-	-	1 = 1
131.39	Brake chopper fault source	Binary src	-	-	1 = 1
131.40	Disable warning messages	PB	0000h…FFFFh	-	1 = 1
131.55	Ext I/O comm loss event	List	0…2	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
133 Generic timer & counter					
133.01	Counter status	PB	0000h...FFFFh	-	1 = 1
133.10	On-time 1 actual	Real	0...4294967295	s	1 = 1
133.11	On-time 1 limit	Real	0...4294967295	s	1 = 1
133.12	On-time 1 function	PB	0000h...FFFFh	-	1 = 1
133.13	On-time 1 source	Binary src	-	-	1 = 1
133.14	On-time 1 warning select	List	-	-	1 = 1
133.20	On-time 2 actual	Real	0...4294967295	s	1 = 1
133.21	On-time 2 limit	Real	0...4294967295	s	1 = 1
133.22	On-time 2 function	PB	0000h...FFFFh	-	1 = 1
133.23	On-time 2 source	Binary src	-	-	1 = 1
133.24	On-time 2 warning select	List	-	-	1 = 1
133.30	Edge counter 1 actual	Real	0...4294967295	-	1 = 1
133.31	Edge counter 1 limit	Real	0...4294967295	-	1 = 1
133.32	Edge counter 1 func	PB	0000h...FFFFh	-	1 = 1
133.33	Edge counter 1 source	Binary src	-	-	1 = 1
133.34	Edge counter 1 divider	Real	1...4294967295	-	1 = 1
133.35	Edge counter 1 warning selection	List	-	-	1 = 1
133.40	Edge counter 2 actual	Real	0...4294967295	-	1 = 1
133.41	Edge counter 2 limit	Real	0...4294967295	-	1 = 1
133.42	Edge counter 2 function	PB	0000h...FFFFh	-	1 = 1
133.43	Edge counter 2 source	Binary src	-	-	1 = 1
133.44	Edge counter 2 divider	Real	1...4294967295	-	1 = 1
133.45	Edge counter 2 warning selection	List	-	-	1 = 1
133.50	Value counter 1 actual	Real	-2147483008 ... 2147483008	-	1 = 1
133.51	Value counter 1 limit	Real	-2147483008 ... 2147483008	-	1 = 1
133.52	Value counter 1 function	PB	0000h...FFFFh	-	1 = 1
133.53	Value counter 1 source	Analog src	-	-	1 = 1
133.54	Value counter 1 divider	Real	0.001 ... 2147483.647	-	1000 = 1
133.55	Value counter 1 warning select	List	-	-	1 = 1
133.60	Value counter 2 actual	Real	-2147483008 ... 2147483008	-	1 = 1
133.61	Value counter 2 limit	Real	-2147483008 ... 2147483008	-	1 = 1
133.62	Value counter 2 function	PB	0000h...FFFFh	-	1 = 1
133.63	Value counter 2 source	Analog src	-	-	1 = 1
133.64	Value counter 2 divider	Real	0.001 ... 2147483.647	-	1000 = 1
133.65	Value counter 2 warning selection	List	-	-	1 = 1
136 Load analyzer					
136.01	PVL signal source	Analog src	-	-	1 = 1
136.02	PVL filter time	Real	0.00 ... 120.00	s	100 = 1 s
136.06	AL2 signal source	Analog src	-	-	1 = 1
136.07	AL2 signal scaling	Real	0.00 ... 32767.00	-	100 = 1
136.09	Reset loggers	List	0...3	-	1 = 1
136.10	PVL peak value	Real	-32768.00 ... 32767.00	-	100 = 1
136.11	PVL peak date	Data	-	-	1 = 1
136.12	PVL peak time	Data	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
136.13	PVL current at peak	Real	-32768.00 … 32767.00	A	100 = 1 A
136.14	PVL DC voltage at peak	Real	0.00 … 2000.00	V	100 = 1 V
136.15	PVL power at peak	Real	0.00 … 30000.00	kW	100 = 1 kW
136.16	PVL reset date	Data	-	-	1 = 1
136.17	PVL reset time	Data	-	-	1 = 1
136.20	AL1 below 10%	Real	0.00 … 100.00	%	100 = 1%
136.21	AL1 10 to 20%	Real	0.00 … 100.00	%	100 = 1%
136.22	AL1 20 to 30%	Real	0.00 … 100.00	%	100 = 1%
136.23	AL1 30 to 40%	Real	0.00 … 100.00	%	100 = 1%
136.24	AL1 40 to 50%	Real	0.00 … 100.00	%	100 = 1%
136.25	AL1 50 to 60%	Real	0.00 … 100.00	%	100 = 1%
136.26	AL1 60 to 70%	Real	0.00 … 100.00	%	100 = 1%
136.27	AL1 70 to 80%	Real	0.00 … 100.00	%	100 = 1%
136.28	AL1 80 to 90%	Real	0.00 … 100.00	%	100 = 1%
136.29	AL1 over 90%	Real	0.00 … 100.00	%	100 = 1%
136.40	AL2 below 10%	Real	0.00 … 100.00	%	100 = 1%
136.41	AL2 10 to 20%	Real	0.00 … 100.00	%	100 = 1%
136.42	AL2 20 to 30%	Real	0.00 … 100.00	%	100 = 1%
136.43	AL2 30 to 40%	Real	0.00 … 100.00	%	100 = 1%
136.44	AL2 40 to 50%	Real	0.00 … 100.00	%	100 = 1%
136.45	AL2 50 to 60%	Real	0.00 … 100.00	%	100 = 1%
136.46	AL2 60 to 70%	Real	0.00 … 100.00	%	100 = 1%
136.47	AL2 70 to 80%	Real	0.00 … 100.00	%	100 = 1%
136.48	AL2 80 to 90%	Real	0.00 … 100.00	%	100 = 1%
136.49	AL2 over 90%	Real	0.00 … 100.00	%	100 = 1%
136.50	AL2 reset date	Data	-	-	1 = 1
136.51	AL2 reset time	Data	-	-	1 = 1
146 Monitoring settings					
146.01	Power scaling	Real	0.1…30000.0	-	10 = 1
146.04	DC voltage scaling	Real	0.10…30000.00	V	100 = 1 V
146.11	Current RMS period	Real	1…100	s	1 = 1 s
147 Data storage					
147.01	Data storage 1 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.02	Data storage 2 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.03	Data storage 3 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.04	Data storage 4 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.05	Data storage 5 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.06	Data storage 6 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.07	Data storage 7 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.08	Data storage 8 real32	Real	-2147483.000…2147483.000	-	1000 = 1
147.11	Data storage 1 int32	Real	-2147483648…2147483647	-	1 = 1
147.12	Data storage 2 int32	Real	-2147483648…2147483647	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
147.13	Data storage 3 int32	Real	-2147483648…2147483647	-	1 = 1
147.14	Data storage 4 int32	Real	-2147483648…2147483647	-	1 = 1
147.15	Data storage 5 int32	Real	-2147483648…2147483647	-	1 = 1
147.16	Data storage 6 int32	Real	-2147483648…2147483647	-	1 = 1
147.17	Data storage 7 int32	Real	-2147483648…2147483647	-	1 = 1
147.18	Data storage 8 int32	Real	-2147483648…2147483647	-	1 = 1
147.21	Data storage 1 int16	Real	-32768…32767	-	1 = 1
147.22	Data storage 2 int16	Real	-32768…32767	-	1 = 1
147.23	Data storage 3 int16	Real	-32768…32767	-	1 = 1
147.24	Data storage 4 int16	Real	-32768…32767	-	1 = 1
147.25	Data storage 5 int16	Real	-32768…32767	-	1 = 1
147.26	Data storage 6 int16	Real	-32768…32767	-	1 = 1
147.27	Data storage 7 int16	Real	-32768…32767	-	1 = 1
147.28	Data storage 8 int16	Real	-32768…32767	-	1 = 1
149 Panel port communication					
149.01	Node ID number	Real	1…32	-	1 = 1
149.03	Baud rate	List	0…7	-	1 = 1
149.04	Communication loss time	Real	0.3 … 3000.0	s	10 = 1 s
149.05	Communication loss action	List	0…1	-	1 = 1
149.06	Refresh settings	List	0…1	-	1 = 1
150 FBA					
150.01	FBA A enable	List	0…3	-	1 = 1
150.02	FBA A comm loss func	List	0…5	-	1 = 1
150.03	FBA A comm loss t out	Real	0.3 … 6553.5	s	10 = 1 s
150.04	FBA A ref1 type	List	-	-	1 = 1
150.05	FBA A ref2 type	List	-	-	1 = 1
150.07	FBA A actual 1 type	List	-	-	1 = 1
150.08	FBA A actual 2 type	List	-	-	1 = 1
150.10	FBA A act1 transparent source	Analog src	-	-	1 = 1
150.11	FBA A act2 transparent source	Analog src	-	-	1 = 1
150.12	FBA A debug mode	List	0…1	-	1 = 1
150.13	FBA A control word	Data	00000000h …FFFFFFFFh	-	1 = 1
150.14	FBA A reference 1	Real	-2147483648 … 2147483647	-	1 = 1
150.15	FBA A reference 2	Real	-2147483648 … 2147483647	-	1 = 1
150.16	FBA A status word	Data	00000000h …FFFFFFFFh	-	1 = 1
150.17	FBA A actual value 1	Real	-2147483648 …2147483647	-	1 = 1
150.18	FBA A actual value 2	Real	-2147483648 …2147483647	-	1 = 1
150.21	FBA A timelevel sel	List	0…3	-	1 = 1
150.31	FBA B enable	List	0…3	-	1 = 1
150.32	FBA B comm loss func	List	0…5	-	1 = 1
150.33	FBA B comm loss timeout	Real	0.3 … 6553.5	s	10 = 1 s
150.34	FBA B ref1 type	List	-	-	1 = 1
150.35	FBA B ref2 type	List	-	-	1 = 1
150.37	FBA B actual 1 type	List	1…2	-	1 = 1
150.38	FBA B actual 2 type	List	1…2	-	1 = 1
150.40	FBA B act1 transparent source	Analog src	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
150.41	FBA B act2 transparent source	Analog src	-	-	1 = 1
150.42	FBA B debug mode	List	0…1	-	1 = 1
150.43	FBA B control word	Real	00000000h … FFFFFFFFh	-	1 = 1
150.44	FBA B reference 1	Real	-2147483648 … 2147483647	-	1 = 1
150.45	FBA B reference 2	Real	-2147483648 … 2147483647	-	1 = 1
150.46	FBA B status word	Data	00000000h … FFFFFFFFh	-	1 = 1
150.47	FBA B actual value 1	Real	-2147483648 …2147483647	-	1 = 1
150.48	FBA B actual value 2	Real	-2147483648 …2147483647	-	1 = 1
150.51	FBA B timelevel sel	List	0…3	-	1 = 1
151 FBA A settings					
151.01	FBA A type	List	-	-	1 = 1
151.02	FBA A Par2	Real	0…65535	-	1 = 1
…	…	…	…	…	…
151.26	FBA Par26	Real	0…65535	-	1 = 1
151.27	FBA A par refresh	List	0…1	-	1 = 1
151.28	FBA A par table ver	Data	-	-	1 = 1
151.29	FBA A drive type code	Real	0…65535	-	1 = 1
151.30	FBA A mapping file ver	Real	0…65535	-	1 = 1
151.31	D2FBA A comm status	List	0…6	-	1 = 1
151.32	FBA A comm SW ver	Data	-	-	1 = 1
151.33	FBA A appl SW ver	Data	-	-	1 = 1
152 FBA A data in					
152.01	FBA A data in1	List	-	-	1 = 1
…	…	…	…	…	…
152.12	FBA A data in12	List	-	-	1 = 1
153 FBA A data out					
153.01	FBA data out1	List	-	-	1 = 1
…	…	…	…	…	…
153.12	FBA data out12	List	-	-	1 = 1
154 FBA B settings					
154.01	FBA B type	List	-	-	1 = 1
154.02	FBA B Par2	Real	0…65535	-	1 = 1
…	…	…	…	…	
154.26	FBA B Par26	Real	0…65535	-	1 = 1
154.27	FBA B par refresh	List	0…1	-	1 = 1
154.28	FBA B par table ver	Data	-	-	1 = 1
154.29	FBA B drive type code	Real	0…65535	-	1 = 1
154.30	FBA B mapping file ver	Real	0…65535	-	1 = 1
154.31	D2FBA B comm status	List	0…6	-	1 = 1
154.32	FBA B comm SW ver	Data	-	-	1 = 1
154.33	FBA B appl SW ver	Data	-	-	1 = 1
155 FBA B data in					
155.01	FBA B data in1	List	-	-	1 = 1
…	…	…	…	…	
155.12	FBA B data in12	List	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
156 FBA B data out					
156.01	FBA B data out1	List	-	-	1 = 1
...	...	...	...	...	
156.12	FBA B data out12	List	-	-	1 = 1
160 DDCS communication					
160.41	Extension adapter com port	List	-	-	-
160.51	DDCS controller comm port	List	-	-	-
160.52	DDCS controller node address	Real	1...254	-	-
160.55	DDCS controller HW connection	List	0...1	-	-
160.57	DDCS controller link control	Real	1...15	-	-
160.58	DDCS controller comm loss time	Real	0...60000	ms	-
160.59	DDCS controller comm loss function	List	0...5	-	-
160.60	DDCS controller ref1 type	List	0...10	-	-
160.61	DDCS controller ref2 type	List	0...10	-	-
160.62	DDCS controller act1 type	List	0...10	-	-
160.63	DDCS controller act2 type	List	0...10	-	-
160.64	Mailbox dataset selection	List	0...1	-	-
161 DDCS transmit					
161.51	Data set 11 data 1 selection	List	0...24	-	-
161.52	Data set 11 data 2 selection	List	0...24	-	-
161.53	Data set 11 data 3 selection	List	0...24	-	-
161.54	Data set 13 data 1 selection	List	0...24	-	-
161.55	Data set 13 data 2 selection	List	0...24	-	-
161.56	Data set 13 data 3 selection	List	0...24	-	-
161.57	Data set 15 data 1 selection	List	0...24	-	-
161.58	Data set 15 data 2 selection	List	0...24	-	-
161.59	Data set 15 data 3 selection	List	0...24	-	-
161.60	Data set 17 data 1 selection	List	0...24	-	-
161.61	Data set 17 data 2 selection	List	0...24	-	-
161.62	Data set 17 data 3 selection	List	0...24	-	-
161.63	Data set 19 data 1 selection	List	0...24	-	-
161.64	Data set 19 data 2 selection	List	0...24	-	-
161.65	Data set 19 data 3 selection	List	0...24	-	-
161.66	Data set 21 data 1 selection	List	0...24	-	-
161.67	Data set 21 data 2 selection	List	0...24	-	-
161.68	Data set 21 data 3 selection	List	0...24	-	-
161.69	Data set 23 data 1 selection	List	0...24	-	-
161.70	Data set 23 data 2 selection	List	0...24	-	-
161.71	Data set 23 data 3 selection	List	0...24	-	-
161.72	Data set 25 data 1 selection	List	0...24	-	-
161.73	Data set 25 data 2 selection	List	0...24	-	-
161.74	Data set 25 data 3 selection	List	0...24	-	-
161.101	Data set 11 data 1 value	Real	0...65535	-	-
161.102	Data set 11 data 2 value	Real	0...65535	-	-
161.103	Data set 11 data 3 value	Real	0...65535	-	-

No.	Name	Type	Range	Unit	FbEq32
161.104	Data set 13 data 1 value	Real	0…65535	-	-
161.105	Data set 13 data 2 value	Real	0…65535	-	-
161.106	Data set 13 data 3 value	Real	0…65535	-	-
161.107	Data set 15 data 1 value	Real	0…65535	-	-
161.108	Data set 15 data 2 value	Real	0…65535	-	-
161.109	Data set 15 data 3 value	Real	0…65535	-	-
161.110	Data set 17 data 1 value	Real	0…65535	-	-
161.111	Data set 17 data 2 value	Real	0…65535	-	-
161.112	Data set 17 data 3 value	Real	0…65535	-	-
161.113	Data set 19 data 1 value	Real	0…65535	-	-
161.114	Data set 19 data 2 value	Real	0…65535	-	-
161.115	Data set 19 data 3 value	Real	0…65535	-	-
161.116	Data set 21 data 1 value	Real	0…65535	-	-
161.117	Data set 21 data 2 value	Real	0…65535	-	-
161.118	Data set 21 data 3 value	Real	0…65535	-	-
161.119	Data set 23 data 1 value	Real	0…65535	-	-
161.120	Data set 23 data 2 value	Real	0…65535	-	-
161.121	Data set 23 data 3 value	Real	0…65535	-	-
161.122	Data set 25 data 1 value	Real	0…65535	-	-
161.123	Data set 25 data 2 value	Real	0…65535	-	-
161.124	Data set 25 data 3 value	Real	0…65535	-	-
162 DDCS receive					
162.51	Data set 10 data 1 selection	List	0…21	-	-
162.52	Data set 10 data 2 selection	List	0…21	-	-
162.53	Data set 10 data 3 selection	List	0…21	-	-
162.54	Data set 12 data 1 selection	List	0…21	-	-
162.55	Data set 12 data 2 selection	List	0…21	-	-
162.56	Data set 12 data 3 selection	List	0…21	-	-
162.57	Data set 14 data 1 selection	List	0…21	-	-
162.58	Data set 14 data 2 selection	List	0…21	-	-
162.59	Data set 14 data 3 selection	List	0…21	-	-
162.60	Data set 16 data 1 selection	List	0…21	-	-
162.61	Data set 16 data 2 selection	List	0…21	-	-
162.62	Data set 16 data 3 selection	List	0…21	-	-
162.63	Data set 18 data 1 selection	List	0…21	-	-
162.64	Data set 18 data 2 selection	List	0…21	-	-
162.65	Data set 18 data 3 selection	List	0…21	-	-
162.66	Data set 20 data 1 selection	List	0…21	-	-
162.67	Data set 20 data 2 selection	List	0…21	-	-
162.68	Data set 20 data 3 selection	List	0…21	-	-
162.69	Data set 22 data 1 selection	List	0…21	-	-
162.70	Data set 22 data 2 selection	List	0…21	-	-
162.71	Data set 22 data 3 selection	List	0…21	-	-
162.72	Data set 24 data 1 selection	List	0…21	-	-
162.73	Data set 24 data 2 selection	List	0…21	-	-
162.74	Data set 24 data 3 selection	List	0…21	-	-
162.101	Data set 10 data 1 value	Real	0…65535	-	-
162.102	Data set 10 data 2 value	Real	0…65535	-	-
162.103	Data set 10 data 3 value	Real	0…65535	-	-

No.	Name	Type	Range	Unit	FbEq32
162.104	Data set 12 data 1 value	Real	0…65535	-	-
162.105	Data set 12 data 2 value	Real	0…65535	-	-
162.106	Data set 12 data 3 value	Real	0…65535	-	-
162.107	Data set 14 data 1 value	Real	0…65535	-	-
162.108	Data set 14 data 2 value	Real	0…65535	-	-
162.109	Data set 14 data 3 value	Real	0…65535	-	-
162.110	Data set 16 data 1 value	Real	0…65535	-	-
162.111	Data set 16 data 2 value	Real	0…65535	-	-
162.112	Data set 16 data 3 value	Real	0…65535	-	-
162.113	Data set 18 data 1 value	Real	0…65535	-	-
162.114	Data set 18 data 2 value	Real	0…65535	-	-
162.115	Data set 18 data 3 value	Real	0…65535	-	-
162.116	Data set 20 data 1 value	Real	0…65535	-	-
162.117	Data set 20 data 2 value	Real	0…65535	-	-
162.118	Data set 20 data 3 value	Real	0…65535	-	-
162.119	Data set 22 data 1 value	Real	0…65535	-	-
162.120	Data set 22 data 2 value	Real	0…65535	-	-
162.121	Data set 22 data 3 value	Real	0…65535	-	-
162.122	Data set 24 data 1 value	Real	0…65535	-	-
162.123	Data set 24 data 2 value	Real	0…65535	-	-
162.124	Data set 24 data 3 value	Real	0…65535	-	-
191 BAMU configuration					
191.30	BAMU 1 channel	Real	0…65535	-	1 = 1
192 Additional actual values 2					
192.40	U phase current 2	Real	-30000.0…30000.0	A	100 = 1 A
192.41	V phase current 2	Real	-30000.0…30000.0	A	100 = 1 A
192.42	W phase current 2	Real	-30000.0…30000.0	A	100 = 1 A
195 HW configuration					
195.01	Supply voltage	List	-	-	1 = 1
195.04	Control board supply	List	0…2	-	1 = 1
195.09	Fuse switch control	List	0…1	-	1 = 1
195.14	Connected modules	PB	0000h…FFFFh	-	1 = 1
195.20	HW options word 1	PB	0000h…FFFFh	-	1 = 1
195.30	Parallel type list filter	List	1…4	-	1 = 1
195.31	Parallel type configuration	List	-	-	1 = 1
195.38	DOL fan start delay	Real	0…60	s	-
196 System					
196.01	Language	List	-	-	1 = 1
196.02	Pass code	Data	0…99999999	-	1 = 1
196.03	Access levels active	PB	0000h…FFFFh	-	1 = 1
196.06	Parameter restore	List	-	-	1 = 1
196.07	Parameter save manually	List	0…1	-	1 = 1
196.08	Control board boot	Real	0…1	-	1 = 1
196.20	Time sync primary source	List	0…9	-	1 = 1
196.24	Full days since 1st Jan 1980	Real	1…59999	-	1 = 1
196.25	Time in minutes within 24 h	Real	0…1439	-	1 = 1
196.26	Time in ms within one minute	Real	0…59999	-	1 = 1
196.29	Time sync source status	PB	0000h…FFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
196.61	User data logger status word	PB	0000h…FFFFh	-	1 = 1
196.63	User data logger trigger	Binary src	-	-	-
196.64	User data logger start	Binary src	-	-	-
196.65	Factory data logger time level	List	-	-	1 = 1
196.70	Disable adaptive program	Data	0…1	-	1 = 1
(Parameters 196.100…196.102 only visible when enabled by parameter 196.02)					
196.100	Change user pass code	Data	10000000…99999999	-	1 = 1
196.101	Confirm user pass code	Data	10000000…99999999	-	1 = 1
196.102	User lock functionality	PB	0000h…FFFFh	-	1 = 1
197 Chopper control					
197.04	Calibration request	List	0…3	-	1 = 1
197.10	DC voltage offset	Real	-100.00…100.00	V	1 V = 100
197.11	DC voltage charging limit	Real	0.00…200.00	%	1% = 1
197.13	Control mode	List	0…4	-	1 = 1
197.14	ES voltage source	List	0…5	-	1 = 1
197.15	ES voltage input	Real	0.00…15000.00	V	1 V = 10
197.16	ES voltage offset	Real	-100.00…100.00	V	1 V = 100
197.17	ES volt est interval	Real	0.000…20.000	s	1000 = 1 s
206 I/O bus configuration **207 I/O bus service** **208 I/O bus diagnostics** **209 I/O bus fan identification**					
(Groups only visible with a UCU control unit) These groups contain parameters related to the distributed I/O bus, which is used with some drives for monitoring the cooling fans of the cabinet system. For details, see CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).					

8

Fault tracing

Contents of this chapter

The chapter lists the warning and fault messages including possible causes and corrective actions.

The warning/fault code is displayed on the control panel, as well as the Drive composer PC tool. A warning or a fault message indicates abnormal status. Most warning and fault causes can be identified and corrected using the information in this chapter. If not, an ABB representative should be contacted.

In this chapter, the warnings and faults are sorted by code.

Safety

WARNING! Only qualified electricians are allowed to service the DC/DC converter unit. Read the complete safety instructions before working on the DC/DC converter unit. See ACS880 multidrives cabinets and modules safety instructions (3AUA0000102301 [English]) for air-cooled units, and ACS880 liquid-cooled multidrives cabinets and modules safety instructions (3AXD50000048633 [English]) for liquid-cooled units.

How to reset

After the cause of the fault has been corrected, the active fault can be reset from the control panel or Drive composer PC tool. The control panel can be in local or remote (external) control mode. When the fault has been removed, the DC/DC converter unit can be restarted.

Faults can also be reset from an external source selected by parameter 131.11 Fault reset selection.

Warning/fault history

Event log

One of the logs contains faults and fault resets. The other log lists warnings and pure events, as well as clearing entries. Both logs contain 64 most recent events. All indications are stored in the event logs with a time stamp and other information.

The event log can be accessed from the main Menu on the control panel. It can also be accessed (and reset) using the Drive composer PC tool.

Auxiliary code

Some events generate an auxiliary code that often helps in pinpointing the problem. On the control panel, the auxiliary code is stored as part of the details of the event; in the Drive composer PC tool, the auxiliary code is shown in the event listing.

Factory data logger

The DC/DC converter has a data logger that samples preselected values at 500-microsecond (default; see parameter 196.65 Factory data logger time level) intervals. By default, approximately 700 samples recorded immediately before and after a fault are saved to the memory unit of the DC/DC converter. The fault data of the last five faults is accessible in the event log when viewed in the Drive composer pro PC tool. (The fault data is not accessible through the control panel.)

The values that are recorded in the factory data log are 102.02 ES voltage used, 102.01 DC voltage, 102.08 Total current, 106.11 Main status word, 130.101 DDC limit word 1, 106.01 Main control word, 102.05 U phase current, 102.06 V phase current, 102.07 W phase current. The selection of parameters cannot be changed by the user.

Other data loggers

User data logger

A custom data logger can be configured using the Drive composer pro PC tool. This functionality enables the free selection of up to eight 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 by parameter 196.61 User data logger status word. The triggering sources can be selected by parameters 196.63 User data logger trigger and 196.64 User data logger start). The configuration, status and collected data is saved to the memory unit for later analysis.

PSL2 data logger

The UCU control unit used with certain DC/DC converter types (especially those with parallel-connected DC/DC converter modules) contains a data logger that collects data from the modules to help fault tracing and analysis. The data is stored onto the microSDHC memory card inserted into the UMU memory unit and can be analyzed by ABB service personnel.

Parameters that contain warning/fault information

The codes of active warnings and faults (maximum five each), and five previously occurred warnings and faults are stored in the parameters of groups 104 Warnings and faults (page 58).

Warning messages

Code (hex)	Warning	Cause	What to do
AE0C	BU DC link difference	DC link voltage difference detected by the branching unit.	Check DC fuses. Check converter module connections to DC link.
AE14	Excess temperature	High temperature difference between the IGBTs of different phases.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against DC/DC converter power. See AE19 Measurement circuit temperature (page 192).
AE15	Excess temperature difference	High temperature difference between the semiconductors of different phases.	Check cooling of power module(s). Check the auxiliary code (format XXXY YYZZ). “XXX” indicates the source of difference (**0:** Single module, difference between phase IGBTs, **1:** parallel-connected modules, minimum-maximum difference between all IGBTs of all modules, **2:** parallel-connected modules, minimum-maximum difference between auxiliary power supply boards). With parallel-connected modules, “Y YY” specifies through which control unit channel the highest temperature was measured. “ZZ” specifies the phase (**0:** single module, **1:** U-phase [parallel connection], **2:** V-phase [parallel connection], **3:** W-phase [parallel connection]).
AE16	IGBT temperature	IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against DC/DC converter power.
AE19	Measurement circuit temperature	Problem with internal temperature measurement.	Check the auxiliary code (format XXXY YYZZ). “Y YY” specifies through which control unit channel the fault was received. “ZZ” specifies the location: **1:** U-phase IGBT, **2:** V-phase IGBT, **3:** W-phase IGBT, **4:** PCB compartment fan or power supply board, **5:** Power unit INT board, **6:** Brake chopper, **7:** Air inlet (sensor connected to INT board X10), **8:** du/dt filter, **FAh:** Ambient temperature.
AE1A	PU board powerfail	Power unit power supply failure.	Contact your local ABB representative.
AE1B	PU communication internal	Communication errors detected between the control unit and the power unit.	Check the connections between the control unit and the power unit.
AE1C	Measurement circuit ADC	Measurement circuit analog-to-digital converter fault.	Contact your local ABB representative.

Code (hex)	Warning	Cause	What to do
AE1E	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
AE20	Internal SW error	Internal SW error	Contact your local ABB representative, quoting the auxiliary code.
AE24	Voltage category unselected	The supply voltage range has not been defined.	Define supply voltage range (parameter 195.01 Supply voltage).
AE25	FBA A parameter conflict	The DC/DC converter unit does not have a functionality requested by PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups 150 FBA and 151 FBA A settings.
AE26	FBA B parameter conflict	The DC/DC converter unit does not have a functionality requested by PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups 150 FBA and 154 FBA B settings.
AE27	AI parametrization	The current/voltage jumper setting of an analog input does not correspond to parameter settings.	Check the auxiliary code. The code identifies the analog input whose settings are in conflict. Adjust parameter 112.15 /112.25. **Note:** Control unit reboot (either by cycling the power or through parameter 196.08 Control board boot) is required to validate any changes in the hardware settings.
AE2E	Extension AI parameterization	The hardware current/voltage setting of an analog input (on an I/O extension module) does not correspond to parameter settings.	Check the auxiliary code (format XX00 00YY). “XX” specifies the number of the I/O extension module (**01:** parameter group 114 Extension I/O module 1, **02:** 115 Extension I/O module 2, **03:** 116 Extension I/O module 3). “YY” specifies the analog input on the module. For example, in case of I/O extension module 1, analog input AI1 (auxiliary code 0000 0101), the hardware current/voltage setting on the module is shown by parameter 114.29. The corresponding parameter setting is 114.30. Adjust either the hardware setting on the module or the parameter to solve the mismatch. **Note:** Control unit reboot (either by cycling the power or through parameter 196.08 Control board boot) is required to validate any changes in the hardware settings.
AE2F	Extension I/O configuration failure	The I/O extension module types and locations specified by parameters do not match the detected configuration.	Check the event log for an auxiliary code. The code indicates which I/O extension module is affected. Check the type and location settings of the modules (parameters 114.01, 114.02, 115.01, 115.02, 116.01 and 116.02). Check that the modules are properly installed.

Code (hex)	Warning	Cause	What to do
AE30	FB A communication	Cyclical communication between DC/DC converter unit and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 150 FBA, 151 FBA A settings, 152 FBA A data in and 153 FBA A data out. Check cable connections. Check if communication master is able to communicate.
AE31	FB B communication	Cyclical communication between DC/DC converter unit and fieldbus adapter module B or between PLC and fieldbus adapter module B is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 150 FBA, 154 FBA B settings, 155 FBA B data in and 156 FBA B data out. Check cable connections. Check if communication master is able to communicate.
AE3E	Panel loss Programmable warning: 149.05 Communication loss action	Control panel or PC tool selected as active control location has ceased communicating.	Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform.
AE45	On-time 1 warning (Editable message text) Programmable warning: 133.14 On-time 1 warning select	Warning generated by on-time timer 1.	Check the source of the warning (parameter 133.13 On-time 1 source).
AE46	On-time 2 warning (Editable message text) Programmable warning: 133.24 On-time 2 warning select	Warning generated by on-time timer 2.	Check the source of the warning (parameter 133.23 On-time 2 source).
AE47	Edge counter 1 warning (Editable message text) Programmable warning: 133.35 Edge counter 1 warning selection	Warning generated by edge counter 1.	Check the source of the warning (parameter 133.33 Edge counter 1 source).
AE48	Edge counter 2 warning (Editable message text) Programmable warning: 133.45 Edge counter 2 warning selection	Warning generated by edge counter 2.	Check the source of the warning (parameter 133.43 Edge counter 2 source).

Code (hex)	Warning	Cause	What to do
AE49	Value counter 1 warning (Editable message text) Programmable warning: 133.55 Value counter 1 warning select	Warning generated by value counter 1.	Check the source of the warning (parameter 133.53 Value counter 1 source).
AE4A	Value counter 2 warning (Editable message text) Programmable warning: 133.65 Value counter 2 warning selection	Warning generated by value counter 2.	Check the source of the warning (parameter 133.63 Value counter 2 source).
AE51	External warning 1 Programmable warning: 131.01 External event 1 source 131.02 External event 1 type	Fault in external device 1.	Check the external devices. Check setting of parameter 131.01 External event 1 source.
AE52	External warning 2 (Editable message text) Programmable warning: 131.03 External event 2 source 131.04 External event 2 type	Fault in external device 2.	Check the external device. Check setting of parameter 131.03 External event 2 source.
AE53	External warning 3 (Editable message text) Programmable warning: 131.05 External event 3 source 131.06 External event 3 type	Fault in external device 3.	Check the external device. Check setting of parameter 131.05 External event 3 source.
AE54	External warning 4 (Editable message text) Programmable warning: 131.07 External event 4 source 131.08 External event 4 type	Fault in external device 4.	Check the external device. Check setting of parameter 131.07 External event 4 source.
AE55	External warning 5 (Editable message text) Programmable warning: 131.09 External event 5 source 131.10 External event 5 type	Fault in external device 5.	Check the external device. Check setting of parameter 131.09 External event 5 source.

Code (hex)	Warning	Cause	What to do
AE57	Autoreset	A fault is about to be autoreset.	Informative warning. See the settings in parameter group 131 Fault functions.
AE58	Emergency stop (off2)	DC/DC converter unit has received an emergency stop (mode selection off2) command.	Check that it is safe to continue operation. Return emergency stop push button to normal position. Restart the DC/DC converter unit. If the emergency stop was unintentional, check the source of the stop signal (for example, 121.05 Emergency stop source, or control word received from an external control system).
AE59	Emergency stop (off1 or off3)	DC/DC converter unit has received an emergency stop (mode selection off1 or off3) command.	
AE5A	Enable start signal missing	No enable start signal received.	Check the setting of (and the source selected by) parameter 120.19 Enable start command.
AE5B	Run enable missing	No run enable signal is received.	Check setting of parameter 120.12 Run enable 1 source. Switch signal on or check wiring of selected source.
AE5C	External power signal missing	195.04 Control board supply is set to External 24V but no voltage is connected to the XPOW connector of the control unit.	Check the external 24 V DC power supply to the control unit, or change the setting of parameter 195.04 Control board supply.
AE5F	Temperature warning	DC/DC converter module temperature is excessive due to eg. module overload or fan failure. (Control program generates first a warning, then a fault.)	Check module cooling air flow and fan operation. Check ambient temperature. If it exceeds 40 °C (104 °F), ensure that load current does not exceed derated load capacity. See appropriate Hardware manual. Check inside of cabinet and heatsink of DC/DC converter module for dust pick-up. Clean whenever necessary. Check the wiring and status of thermal switches inside the cabinet.
AE60	Control board temperature	High control board temperature.	Check proper cooling of the cabinet.
AE67	AI supervision	An analog signal is outside the limits specified for the analog input.	Check the event log for an auxiliary code (format XYY). “X” specifies the location of the input (**0**: AI on control unit; **1**: I/O extension module 1, etc.), “YY” specifies the input and limit (**01:** AI1 under minimum, **02:** AI1 over maximum, **03:** AI2 under minimum, **04:** AI2 over maximum). Check signal level at the analog input. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group 112 Standard AI.

Code (hex)	Warning	Cause	What to do
AE6D	DDCS controller comm loss	DDCS (fiber optic) communication between the DC/DC converter unit and external controller is lost.	Check status of controller. See the user documentation of the controller. Check settings of parameter group 160 DDCS communication. Check cable connections. If necessary, replace cables.
AE6E	Internal SW error	Internal SW error	Contact your local ABB representative. Quote the auxiliary code (check the event details in the event log).
AE6F	Ambient temperature	Redundant measurement supervision has indicated a difference in the duplicated measurements that is outside the limits.	Contact your local ABB representative.
AE73	Fan	Cooling fan stuck or disconnected.	Check the auxiliary code to identify the fan. Code 0 denotes main fan 1. Other codes (format XYZ): “X” specifies state code (**1:** ID run, **2:** normal). “Y” specifies the index of the converter module connected to control unit (**0...n**). “Z” specifies the index of the fan (**1:** Main fan 1, **2:** Main fan 2, **3:** Main fan 3, **4:** Auxiliary fan 1, **5:** Auxiliary fan 2, **6:** Auxiliary fan 3, **7:** Filter fan 1, **8:** Filter fan 2, **9:** Filter fan 3). Note that modules are coded starting from 0. For example, the code **101** means that Main fan 1 of module 1 (connected to control unit channel V1T/V1R) has faulted during its ID run. Check fan operation and connection. Replace fan if faulty.
AE75	SD card	Error related to SD card used to store data (UCU control unit only).	Check the auxiliary code. See actions for each code below.
	1	No SD card	Insert a compatible, writable microSDHC memory card into the UMU memory unit.
	2	SD card write-protected	
	3	SD card unreadable	
AE7F	User pass code not changed	User pass code has not been changed.	For improved cybersecurity, it is highly recommended that you set a user pass code to prevent, for example, the changing of parameter values and/or the loading of firmware and other files. Refer to section User lock on page 49 for instructions on changing the pass code.

Code (hex)	Warning	Cause	What to do
AE86	Parameters not set	Limit parameters are not set. This warning activates when parameter 130.111 Minimum DC bus voltage > 130.112 Maximum DC bus voltage, 130.113 Minimum ES voltage > 130.114 Maximum ES voltage, 130.116 ES limit hysteresis < 130.117 ES limit trig level, 130.127 Power discharging lim > 130.126 Power charging lim, or 130.120 Maximum current < 130.119 Minimum current.	Check the parameters of parameter group 130 Limits. **Note:** Converter cannot be started if this warning is active.
AE8C	Control unit battery	The battery of the control unit is low.	Replace control unit battery. This warning can be suppressed by using parameter 131.40.

Fault messages

Code (hex)	Fault	Cause	What to do
2E00	Overcurrent	Too high inverter load or short circuit.	Check the load and busbars.
2E02	Short circuit	DC/DC converter has detected short circuit.	Check supply cable. Check there are no power factor correction capacitors or surge absorbers in supply cable. Check the auxiliary code (format XXXY YYZZ). With parallel-connected modules, “Y YY” specifies through which control unit channel the fault was received. “ZZ” indicates the location of the short circuit (**0**: No detailed information available, **1**: Upper branch of U-phase, **2**: Lower branch of U-phase, **4**: Upper branch of V-phase, **8**: Lower branch of V-phase, **10**: Upper branch of W-phase, **20**: Lower branch of W-phase, **other**: combinations of the above). After correcting the cause of the fault, reboot the control unit (using parameter 196.08 Control board boot) or by cycling power.
2E04	IGBT overload	Excessive IGBT junction to case temperature.	Check the load.
2E05	BU current difference	Phase current difference between parallel-connected modules.	Check cable connections. Check mains supply and fuses.
2E08	External earth fault	External earth fault trigged by input selected with parameter 131.28 Ext earth leakage signal source.	Check external earth fault source.
2E0C	User current fault	Sum current of the three phases has exceeded the limit defined with parameter 131.25 User current fault limit.	Check the value of parameter 131.25 User current fault limit. Check current limits of parameters 130.119 Minimum current and 130.120 Maximum current. Check that the DC bus voltage is not dropping (against the energy storage voltage) so that the current can flow uncontrolled from the energy storage to the DC bus via the freewheeling diodes.
3E04	DC link overvoltage	Excessive intermediate circuit DC voltage	Check that parameter 195.01 Supply voltage is set according to the supply voltage in use. With parallel-connected modules, check the auxiliary code (format XXXY YYZZ). “Y YY” specifies through which control unit channel the fault was received.

Code (hex)	Fault	Cause	What to do
3E06	BU DC link difference	Difference in DC voltages between parallel-connected DC/DC converter modules.	Check the DC fuses. Check the connection to the DC bus. Check the auxiliary code (format XXXY YYZZ). “XXX” specifies the source of the first error (see “YYY”). “YYY” specifies the module through which control unit channel the fault was received (**1:** Channel 1, **2:** Channel 2, **4:** Channel 3, **8:** Channel 4, …, **800:** Channel 12). If the problem persists, contact your local ABB representative.
3E0B	Output phase loss Programmable fault: 131.21 Supply phase loss	Output circuit fault due to missing output connection (all the phases are not connected).	Connect output cable.
3E11	ES voltage difference	Measured and estimated energy storage voltages differ from each other more than allowed (estimated voltage being higher).	Check parameter 131.24 ES voltage difference. Check the energy storage voltage measurement circuit (if connected). Use value 0 when the measurement is not available.
3E12	ES overvoltage	Measured or estimated energy storage voltage has exceeded the fault limit.	Check parameter 131.23 ES over voltage level. Check parameters 130.113 Minimum ES voltage and 130.114 Maximum ES voltage. Check the energy storage voltage measurement circuit (if connected). Check parameter 197.14 ES voltage source. Use selection Zero when the measurement is not available.
3E13	ES undervoltage	Measured or estimated energy storage voltage is not sufficient.	Check parameter 131.22 ES under voltage level. Check parameters 130.113 Minimum ES voltage and 130.114 Maximum ES voltage. Check the energy storage voltage measurement circuit (if connected). Check parameter 197.14 ES voltage source. Use selection Zero when the measurement is not available.
4E01	Cooling	Power module temperature is excessive.	Check ambient temperature. If it exceeds 40 °C (104 °F), ensure that load current does not exceed derated load capacity. See appropriate hardware manual. Check power module cooling air flow and fan operation. Check inside of cabinet and heatsink of power module for dust pick-up. Clean whenever necessary.

Code (hex)	Fault	Cause	What to do
4E02	IGBT temperature	IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against DC/DC converter power.
4E03	Excess temperature	DC/DC converter module heat sink temperature is excessive due to eg. module overload, fan failure or heatsink sensor. (Control program generates first a warning, then a fault.)	See AE14 Excess temperature (page 192).
4E04	Excess temperature difference	High temperature difference between the semiconductors of different phases. The amount of available temperatures depends on the frame size.	See AE15 Excess temperature difference (page 192).
4E06	Cabinet temperature fault	A measurement device connected to supply unit digital input or DI1 has tripped to a fault. Input is selected with parameter 131.33 Cabinet temperature fault source. Excessive temperature of the busbars/fuses due to cabinet fan failure. Excessive temperature of the chokes inside the DC/DC converter module due to a phase loss. Excessive temperature of the heat sink of the DC/DC converter module due to module fan failure. (Control program generates first a warning, then a fault.)	Check parameter 131.34 Cabinet temperature supervision. Check cabinet temperature source. Replace the cabinet fan. Check the input fuses and the input connection. Replace the module fan.
4E07	Control board temperature	High control board temperature.	Check proper cooling of the cabinet.
4E09	Ambient temperature	Redundant measurement supervision has indicated a difference in the duplicated measurements that is outside the limits.	Contact your local ABB representative.
5E00	Fan	Cooling fan stuck or disconnected.	See AE73 Fan (page 197).
5E03	XSTO circuit open	Circuit connected to XSTO:IN1 and/or XSTO:IN2 is open.	Check XSTO circuit connections. See section Default I/O connection diagram (UCU) on page 46. For more information, see appropriate hardware manual.
5E04	PU logic error	The memory of the power unit logic is cleared.	Contact your local ABB representative.

Code (hex)	Fault	Cause	What to do
5E05	Rating ID mismatch	The hardware of the DC/DC converter unit does not match the information stored in the memory unit. This may occur eg. after a firmware update or memory unit replacement.	Cycle the power to the DC/DC converter. If the control unit is externally powered, reboot the control unit (using parameter 196.08 Control board boot) or by cycling its power. Check the auxiliary code. The auxiliary codes are as follows: 1 = Ratings pf the power unit and control unit are not the same. Rating ID has changed. 2 = Parallel connection rating ID has changed. 3 = Power unit types are not the same in all power units. 4 = Parallel connection rating ID is active in a single power unit setup. 5 = It is not possible to implement the selected rating with the current power units. 6 = Power unit rating ID is 0. 7 = Reading power unit rating ID or power unit type failed on connection. With parallel connection faults, the format of the auxiliary code is 0X0Y. “Y” indicates the auxiliary code, “X” indicates the first faulty power unit channel in hexadecimal (1…A). If the problem persists, contact your local ABB representative.
5E07	PU communication	The way the control unit is powered does not correspond to parameter setting.	Check setting of 195.04 Control board supply.
		Communication errors detected between the control unit and the power unit.	Check the connection between the control unit and the power unit. Check the auxiliary code (format XXXY YYZZ). With parallel-connected modules, “Y YY” specifies the affected control unit channel (**0**: broadcast). “ZZ” specifies the error source (**1**: Transmitter side [link error], **2**: Transmitter side [no communication], **3**: Receiver side [link error], **4**: Receiver side [no communication], **5**: Transmitter FIFO error [see “XXX”], **6**: Module [xINT board] not found, **7**: BAMU board not found). “XXX” specifies the transmitter FIFO error code (**1**: Internal error [invalid call parameter], **2**: Internal error [configuration not supported], **3**: Transmission buffer full).
5E08	Power unit lost	Connection between the control unit and the power unit is lost.	Check the connection between the control unit and the power unit.
5E09	PU communication internal	Internal communication error.	Contact your local ABB representative.

Code (hex)	Fault	Cause	What to do
5E0A	Measurement circuit ADC	Measurement circuit analog-to-digital converter fault.	Contact your local ABB representative.
5E0B	PU board powerfail	Power unit power supply failure.	Check the auxiliary code (format ZZZY YYXX). “YY Y” specifies the affected module (**0...C**). “XX” specifies the affected power supply (**1**: Power supply 1, **2**: Power supply 2).
5E0D	PU communication configuration	Version check cannot find a matching power unit FPGA logic, or number of connected modules differs from specified.	Check the auxiliary code (format ZZZY YYXX). “XX” specifies the configuration error cause (**1**: Found BAMU 1 configured in wrong channel, **2**: Found BAMU 2 configured in wrong channel, **3**: Found PUs configured in wrong channels, **4**: Found PU configured in wrong channel, **5**: Found too many PUs). Check settings of parameters 195.31 Parallel type configuration and 191.30 BAMU 1 channel. Cycle the power to the drive. If the control unit is externally powered, also reboot the control unit (using parameter 196.08 Control board boot) or by cycling its power. If the number of connected power modules is correct, update the FPGA logic of the power unit. If the problem persists, contact your local ABB representative.
5E0F	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
5E10	Charging feedback	Incorrect parameter setting.	Check the setting of 195.09 Fuse switch control. The parameter should be enabled only if an xSFC charging controller is installed.
		The charging switch and DC switch were operated out of sequence, or a start command was issued before the unit was ready.	The normal power-up sequence is: 1. Close charging switch. 2. After charging finishes (charging OK lamp lights), close DC switch. 3. Open charging switch.
		Charging circuit fault.	Check the charging circuit.
5E11	Unknown PU fault	Unidentified power unit logic fault.	Check the logic and firmware compatibility. Contact your local ABB representative.
5E13	Auxiliary circuit breaker fault	Circuit breaker fault trigged by input selected with parameter 131.32 Aux circuit breaker fault source.	By default the feedback is connected to DI4.
5E14	Measurement circuit temperature	Problem with internal temperature measurement of the converter.	See AE19 Measurement circuit temperature (page 192).
5EA1	SoC overtemperature	System on a chip (SoC) temperature is too high.	Check proper cooling of the drive/control unit.

Code (hex)	Fault	Cause	What to do
6E00	FPGA version incompatible	Firmware and FPGA versions are incompatible.	Update power unit FPGA logic or firmware (whichever is older). Reboot the control unit (using parameter 196.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E01	FBA A mapping file	Fieldbus adapter A mapping file read error.	Contact your local ABB representative.
6E02	FBA B mapping file	Fieldbus adapter B mapping file read error.	Contact your local ABB representative.
6E03	Task overload	Internal fault. **Note:** This fault cannot be reset.	Reboot the control unit (using parameter 196.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E04	Stack overflow	Internal fault. **Note:** This fault cannot be reset.	Reboot the control unit (using parameter 196.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E05	Internal file load	File read error. **Note:** This fault cannot be reset.	Reboot the control unit (using parameter 196.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E06	Internal record load	Internal record load error.	Contact your local ABB representative.
6E07	Application loading	Application file incompatible or corrupted. **Note:** This fault cannot be reset.	Contact your local ABB representative.
6E08	Memory unit detached	The memory unit was detached when the control unit was powered.	Switch off the power to the control unit and reinstall the memory unit. In case the memory unit was not actually removed when the fault occurred, check that the memory unit is properly inserted into its connector. Reboot the control unit (using parameter 196.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E0A	User set fault	Loading of the user parameter set failed because • requested set does not exist • set is not compatible with the control program • converter was switched off during loading.	Ensure that a valid user parameter set exists. Reload.
6E0B	Kernel overload	Operating system error. **Note:** This fault cannot be reset.	Contact your local ABB representative.
6E0C	Parameter system	Parameter load or save failed.	Try forcing a save using parameter 196.07 Parameter save manually. Retry.

Code (hex)	Fault	Cause	What to do
6E0D	FBA A parameter conflict	The DC/DC converter unit does not have a functionality requested by PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups 150 FBA and 151 FBA A settings.
6E0E	FBA B parameter conflict	The DC/DC converter unit does not have a functionality requested by PLC, or requested functionality has not been activated.	Check PLC programming. Check settings of parameter groups 150 FBA and 154 FBA B settings.
6E15	Text data overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
6E16	Text 32-bit table overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
6E17	Text 64-bit table overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
6E18	Text file overflow	Internal fault.	Reset the fault. Contact your local ABB representative if the fault persists.
6E1A	Rating ID fault	Rating ID load error.	Contact your local ABB representative.
6E1B	Backup/Restore Timeout	A control panel or PC tool fails to communicate with the converter during backup or restoring operation.	Check the control panel or PC tool communication, and if it is still in backup/restore state.
6E1C	Emergency stop fault	The converter has received an emergency stop command.	Check that it is safe to continue operation. Return the emergency stop pushbutton to normal position. Restart the converter.
6E1D	Internal SW error	Internal error.	Contact your local ABB representative. Quote the auxiliary code (check the event details in the event log).
6E1F	Licensing fault	A license that is required for the DC/DC converter unit to function properly is missing.	Record the auxiliary codes of all active licensing faults and contact your product vendor for further instructions.
6E20	Fault reset	Fault reset has been requested and done.	Informative fault.
6E27	Adaptive program	Error running the adaptive program.	Check the auxiliary code (format XXXX YYYY). “XXXX” specifies the number of the function block (**0000** = generic error). “YYYY” indicates the problem (see actions for each code below).
	000A	Program corrupted or block non-existent	Restore the template program or download the program to the DC/DC converter.
	000C	Required block input missing	Check the inputs of the block.
	000E	Program corrupted or block non-existent	Restore the template program or download the program to the DC/DC converter.
	0011	Program too large.	Remove blocks until the error stops.
	0012	Program is empty.	Correct the program and download it to the DC/DC converter.

Code (hex)	Fault	Cause	What to do
	001C	A non-existing parameter or block is used in the program.	Edit the program to correct the parameter reference, or to use an existing block.
	001D	Parameter type invalid for selected pin.	Edit the program to correct the parameter reference.
	001E	Output to parameter failed because the parameter was write-protected.	Check the parameter reference in the program. Check for other sources affecting the target parameter.
	0023	Program file incompatible with current firmware version.	Adapt the program to current block library and firmware version.
	0024		
	002A	Too many blocks.	Edit the program to reduce the number of blocks.
	Other	–	Contact your local ABB representative, quoting the auxiliary code.
7E00	Option module comm loss	Communication between converter and option module (FEN-xx and/or FIO-xx) is lost.	Check that the option modules are properly seated in their slots. Check that the option modules or slot connectors are not damaged. To pinpoint the problem, try installing the modules into different slots.
7E01	Panel loss	Control panel or PC tool selected as active control location has ceased communicating.	Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform.
7E0B	FBA A communication Programmable fault: 150.02 FBA A comm loss func	Cyclical communication between DC/DC converter unit and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 150 FBA, 151 FBA A settings, 152 FBA A data in and 153 FBA A data out. Check cable connections. Check if communication master is able to communicate.
7E0C	FBA B communication Programmable fault: 150.32 FBA B comm loss func	Cyclical communication between DC/DC converter unit and fieldbus adapter module B or between PLC and fieldbus adapter module B is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 150 FBA, 154 FBA B settings, 155 FBA B data in and 156 FBA B data out. Check cable connections. Check if communication master is able to communicate.
7E11	DDCS controller comm loss	DDCS (fiber optic) communication between the DC/DC converter unit and external controller is lost.	Check status of controller. See the user documentation of the controller. Check settings of parameter group 160 DDCS communication. Check cable connections. If necessary, replace cables.

Code (hex)	Fault	Cause	What to do
8E06	AI supervision	An analog signal is outside the limits specified for the analog input.	Check the event log for an auxiliary code (format XXXX XYZZ). “Y” specifies the location of the input (**0:** Control unit, **1:** I/O extension module 1, **2:** I/O extension module 2, **3:** I/O extension module 3). “ZZ” specifies the limit (**01:** AI1 under minimum, **02:** AI1 above maximum, **03:** AI2 under minimum, **04:** AI2 above maximum). Check signal level at the analog input. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group 112 Standard AI.
9E01	External fault 1 Programmable fault: 131.01 External event 1 source 131.02 External event 1 type	Fault in external device 1.	Check external devices for faults. Check setting of parameter 131.01 External event 1 source.
9E02	External fault 2 (Editable message text) Programmable fault: 131.03 External event 2 source 131.04 External event 2 type	Fault in external device 2.	Check the external device. Check setting of parameter 131.03 External event 2 source.
9E03	External fault 3 (Editable message text) Programmable fault: 131.05 External event 3 source 131.06 External event 3 type	Fault in external device 3.	Check the external device. Check setting of parameter 131.05 External event 3 source.
9E04	External fault 4 (Editable message text) Programmable fault: 131.07 External event 4 source 131.08 External event 4 type	Fault in external device 4.	Check the external device. Check setting of parameter 131.07 External event 4 source.
9E05	External fault 5 (Editable message text) Programmable fault: 131.09 External event 5 source 131.10 External event 5 type	Fault in external device 5.	Check the external device. Check setting of parameter 131.09 External event 5 source.
FE00	FB A force trip	A fault trip command has been received through fieldbus adapter A.	Check the fault information provided by the PLC.

9

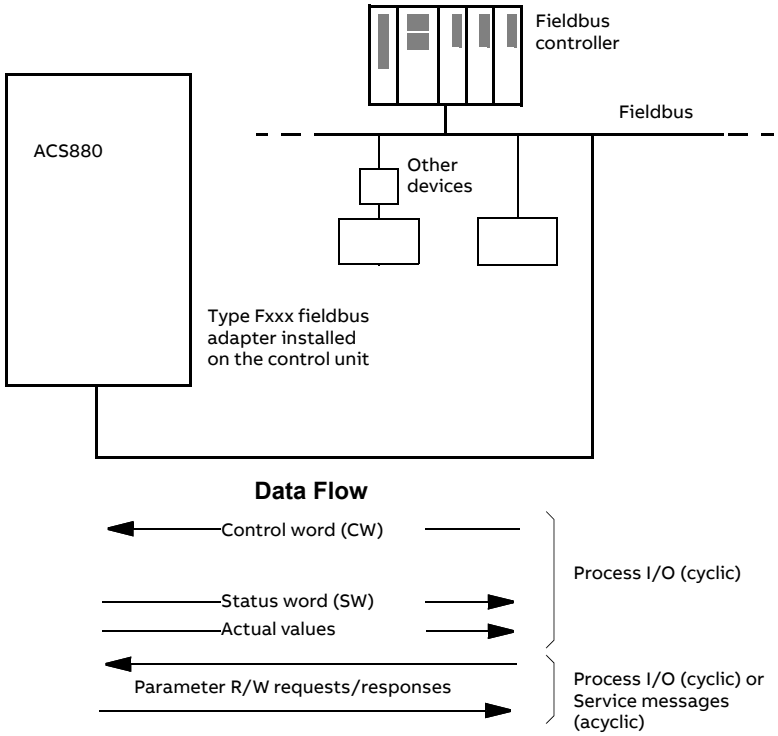
Fieldbus control through a fieldbus adapter

Contents of this chapter

This chapter describes how the DC/DC converter unit can be controlled by external devices over a communication network (fieldbus) through an optional fieldbus adapter module.

System overview

The user can control the DC/DC converter unit through a fieldbus interface if the unit is equipped with an optional fieldbus adapter (for example, option +K454). Then the DC/DC converter unit can be connected to an external control system through a serial communication link. The fieldbus adapter can be installed into any free slot on the control unit.



The DC/DC converter unit can be set to receive its control information through the fieldbus interface, or the control can be distributed between the fieldbus interface and other available sources such as digital and analog inputs.

Fieldbus adapters are available for various serial communication systems and protocols, for example

- CANopen (FCAN-01 adapter)
- ControlNet (FCNA-01 adapter)
- DeviceNet (FDNA-01 adapter)
- EtherCAT (FECA-01 adapter)
- EtherNet/IP (FENA-11, FENA-21 or FEIP-21 adapter)
- Modbus/RTU (FSCA-01 adapter)
- Modbus TCP (FENA-11, FENA-21 or FMBT-21 adapter)
- POWERLINK (FEPL-02 adapter)
- PROFIBUS DP (FPBA-01 adapter)
- PROFINET IO (FENA-11, FENA-21 or FPNO-21 adapter).

Note: The text and examples in this chapter describe the configuration of one fieldbus adapter (FBA A) by parameters 150.01…150.21 and parameter groups 151…153. The second adapter (FBA B), if present, is configured in a similar fashion by parameters 150.31…150.51 and parameter groups 154…156.

Note: If FENA-xx Ethernet adapter is used for Ethernet tool network and Drive composer PC tool, use the FENA-xx adapter as fieldbus adapter B. Configure the FENA-xx adapter through parameters 150.31…150.51 and parameter groups 154…156. Normally, use the fieldbus adapter module as fieldbus adapter A. See Ethernet tool network for ACS880 drives application guide (3AUA0000125635 [English]), and FENA-01/-11 Ethernet adapter module user's manual (3AUA0000093568 [English]).

Basics of the fieldbus control interface

The cyclic communication between a fieldbus system and the DC/DC converter unit consists of 16/32-bit input and output data words. The DC/DC converter unit supports at the maximum the use of 12 data words (16 bits) in each direction.

Data transmitted from the DC/DC converter unit to the fieldbus controller is defined by parameters 152.01 FBA A data in1 … 152.12 FBA A data in12. The data transmitted from the fieldbus controller to the DC/DC converter unit is defined by parameters 153.01 FBA data out1 … 153.12 FBA data out12.

Control word and Status word

The Control word is the principal means for controlling the DC/DC converter unit from a fieldbus system. It is sent by the fieldbus master station to the DC/DC converter unit through the adapter module. The DC/DC converter unit switches between its states according to the bit-coded instructions on the Control word, and returns status information to the master in the Status word.

The contents of the Control word and the Status word are detailed on pages 215 and 216 respectively.

If parameter 150.12 FBA A debug mode is set to Fast, the Control word received from the fieldbus is shown by parameter 150.13 FBA A control word, and the Status word transmitted to the fieldbus network by 150.16 FBA A status word.

References

References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference is formed by calculating the two’s complement from the corresponding positive reference.

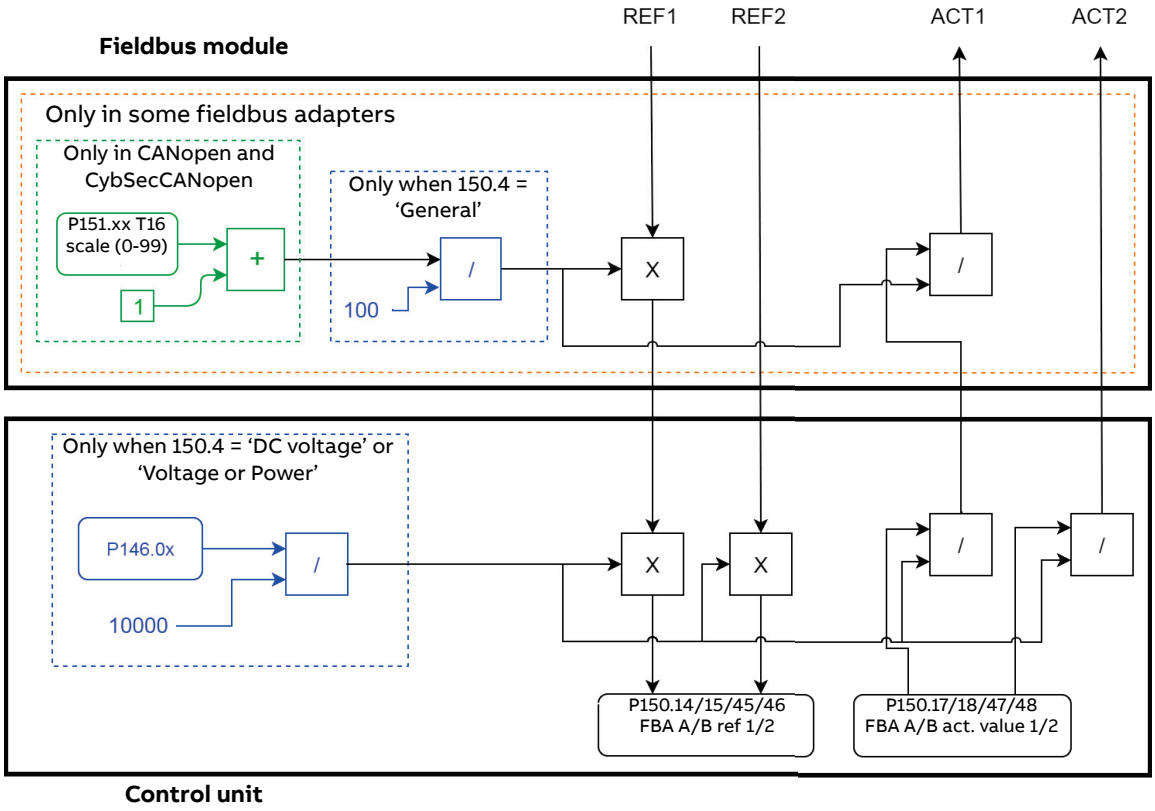
ABB drives can receive control information from multiple sources including analog and digital inputs, the control panel and a fieldbus adapter module. In order to have the DC/DC converter unit controlled through the fieldbus, the module must be defined as the source for control information, eg. reference.

If parameter 150.12 is set to Fast, the references received from the fieldbus are displayed by 150.14 FBA A reference 1 and 150.15 FBA A reference 2.

Scaling of references

Note: The scalings described below are for the ABB Drives communication profile. Fieldbus-specific communication profiles may use different scalings. For more information, see the manual of the fieldbus adapter.

The references are scaled as defined by parameters 146.01…146.04.



Example: PLC reference is 600. Parameter 152.02 FBA A data in1 is set to Ref1 16bit. Reference Ref1/Act1 is scaled first by parameter 151.06 T16 scale since the supply units are identified automatically as Transparent 16 profile. After that the value is scaled in parameter group 146 Monitoring settings, for example using parameter 146.01 Power scaling.

Example for PROFIBUS:

146.04 DC voltage scaling is set to 1000,
151.06 T16 scale is set to 99, which equals to coefficient 100. 0 equals to coefficient 1.
PLC reference is 105.

Scaled value is calculated as follows:

105 [PLC reference] × 100 [T16 scale] × (1000 [par. 146.04] / 10000) = 1050 V.

Since the value is in 16-bit format and if the reference is 900, parameter 151.06 T16 scale causes the value to be 90000. This causes overflow. Then parameter 151.06 T16 scale needs to be changed first to zero, before reference 900 is possible.

Parameter 151.06 T16 scale is in use only in some of the fieldbus adapters and only for Ref1/Act1. For more information, see the manual of the fieldbus adapter.

Actual values

Actual values are 16-bit words containing information on the operation of the DC/DC converter unit.

The types of the monitored signals are selected by parameters 150.07 FBA A actual 1 type and 150.08 FBA A actual 2 type.

If parameter 150.12 FBA A debug mode is set to Fast, the actual values sent to the fieldbus are displayed by 150.17 FBA A actual value 1 and 150.18 FBA A actual value 2.

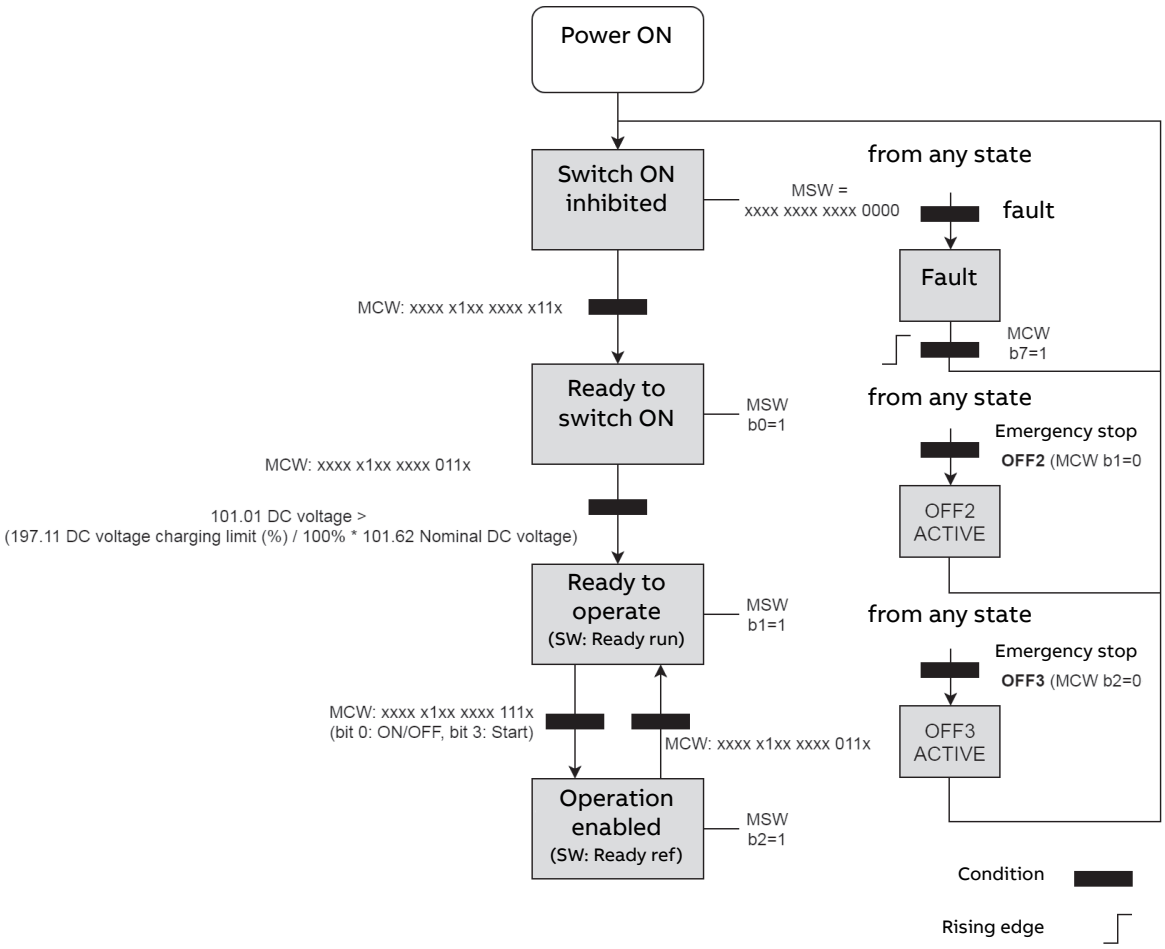
Contents of the fieldbus Control word

Bit	Name	Value	Description
0	ON/OFF	1	Control is active.
		0	Control is not active.
1	Off2 control	1	Continue operation (OFF2 inactive)
		0	Emergency stop
2	Off3 control	1	Continue operation (OFF3 inactive)
		0	Emergency stop
3	Start	1	Start modulating.
		0	Stop modulating.
4	-	1	Not in use.
		0	Not in use.
5	-	1	Not in use.
		0	Not in use.
6	-	1	Not in use.
		0	Not in use.
7	Reset	0=>1	Fault reset if an active fault exists.
		0	- (no reset)
8	-	1	Not in use.
		0	Not in use.
9	-	1	Not in use.
		0	Not in use.
10	Remote command	1	Drive in remote mode, fieldbus control enabled.
		0	Drive in local mode, Control word bits 0…7 received and executed by drive. Control word bits 8…15 and reference 1 and 2 received by drive but not executed.
11	Ext ctrl loc	1	Select External Control Location EXT2. Effective if control location is parameterized to be selected from fieldbus.
		0	Select External Control Location EXT1. Effective if control location is parameterized to be selected from fieldbus.
12	User bit 0	1	User bit 0 from external control location.
		0	User bit 0 from external control location.
13	User bit 1	1	User bit 1 from external control location.
		0	User bit 1 from external control location.
14	User bit 2	1	User bit 2 from external control location.
		0	User bit 2 from external control location.
15	User bit 3	1	User bit 3 from external control location.
		0	User bit 3 from external control location.

Contents of the fieldbus Status word

Bit	Name	Value	Description
0	Ready to switch ON	1	Ready to switch ON **Note:** If the DC/DC converter unit is switched off, the Start enable must be on for Ready to switch ON = 1. If the DC/DC converter unit is switched on, Ready to switch ON = 1 regardless of the Start enable.
		0	Not ready to switch ON
1	Ready run	1	Ready to operate. Start command is on.
		0	Start command is not given.
2	Ready ref	1	Operation enabled
		0	Operation inhibited
3	Tripped	1	Fault
		0	No fault active
4	-	1	Not in use.
		0	Not in use.
5	-	1	Not in use.
		0	Not in use.
6	-	1	Not in use.
		0	Not in use.
7	Warning	1	A warning is active
		0	No warnings active
8	Operating	1	DC/DC converter is running.
		0	DC/DC converter is not running.
9	Remote command	1	Drive in remote mode, fieldbus control enabled.
		0	Drive in local mode, Control word bits 0…7 received and executed by drive. Control word bits 8…15 and reference 1 and 2 received by drive but not executed.
10	Ready for load	1	Ready for load.
		0	Not ready for load.
11	User bit 0	1	See parameter 106.30 MSW bit 11 sel.
		0	See parameter 106.30 MSW bit 11 sel.
12	User bit 1	1	See parameter 106.31 MSW bit 12 sel.
		0	See parameter 106.31 MSW bit 12 sel.
13	User bit 2	1	See parameter 106.32 MSW bit 13 sel.
		0	See parameter 106.32 MSW bit 13 sel.
14	Charging	1	Charging state is active.
		0	Charging state is not active.
15	User bit 3	1	See parameter 106.33 MSW bit 15 sel.
		0	See parameter 106.33 MSW bit 15 sel.

The state diagram



Notation:

xxx: Any bit value combination.

MSW: 106.11 Main status word

MCW: 106.01 Main control word

Setting up the DC/DC converter for fieldbus control

Before configuring the DC/DC converter unit for fieldbus control, the adapter module must be mechanically and electrically installed according to the instructions given in the User's manual of the appropriate fieldbus adapter module.

Note: To be able to switch the DC/DC converter unit on and off (Run enable signal) through the fieldbus, the Run enable command at the digital input must be on (1). That is the case when the operating switch is switched to the on (1) position.

1. Power up the DC/DC converter unit.
2. Enable the communication between the DC/DC converter unit and the fieldbus adapter module by setting parameter 150.01 FBA A enable to Option slot 1.
3. With 150.02 FBA A comm loss func, select how the DC/DC converter unit should react to a fieldbus communication break.
   Note: This function monitors both the communication between the fieldbus master and the adapter module and the communication between the adapter module and the DC/DC converter unit.
4. With 150.03 FBA A comm loss t out, define the time between communication break detection and the selected action.
5. Select application-specific values for the rest of the parameters in group 150 FBA.
6. Set the fieldbus adapter module configuration parameters in group 151 FBA A settings. At the minimum, set the required node address and the communication profile. Set profile to transparent 16 mode.
   Note: The parameter indexes and names vary as the way the different fieldbus adapters use these parameters.
   Example: For the FPBA-xx adapter, set parameter 51.05 Profile to mode Trans16.
7. Define the process data transferred to and from the DC/DC converter unit in parameter groups 152 FBA A data in and 153 FBA A data out.
   Note: The adapter module sets the Status word and Control word automatically into parameters 152.01 and 153.01 respectively.
8. Save the valid parameter values to permanent memory by setting parameter 196.07 Parameter save manually to Save.
9. Validate the settings made in parameter groups 151, 152 and 153 by setting parameter 151.27 FBA A par refresh to Refresh.
10. Select the fieldbus adapter A as the source of the start and stop commands for external control location EXT1 by setting parameter 120.01 Ext1 commands to Fieldbus A.

Set the relevant control parameters to control the DC/DC converter unit according to the application.

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Drive-to-drive link

This feature is not supported by the current firmware version.

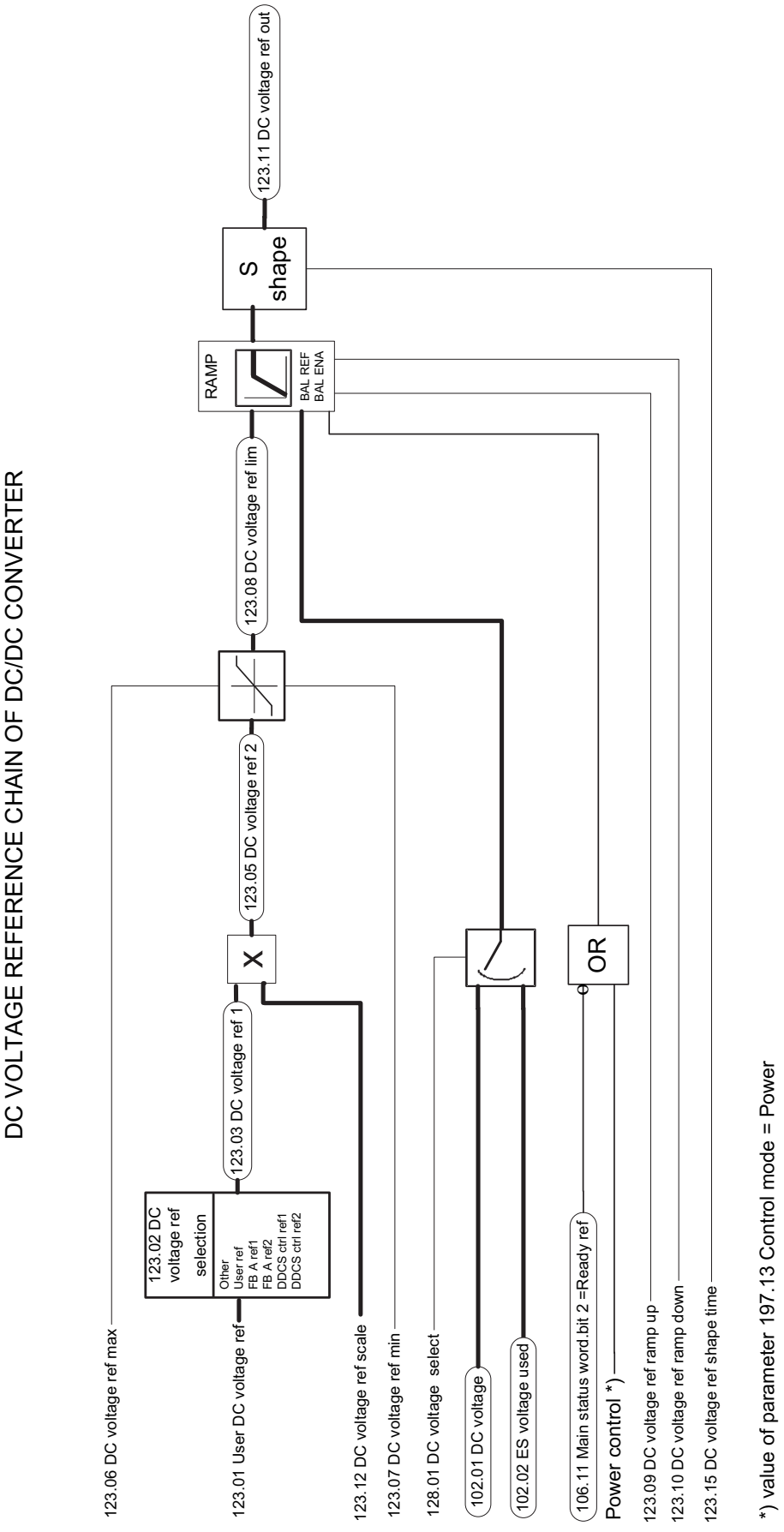
11

Control chain and converter logic diagrams

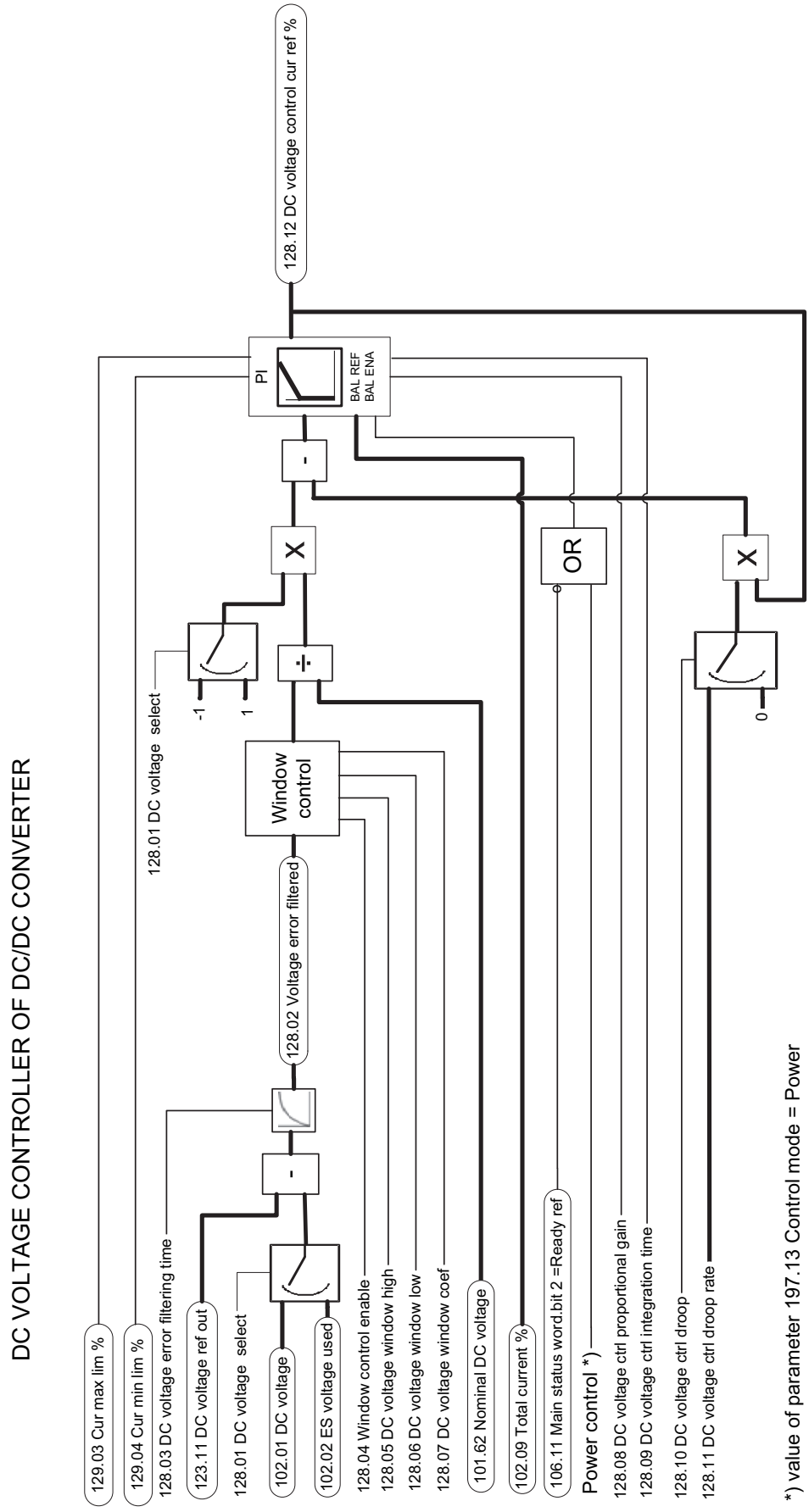
Contents of this chapter

This chapter contains block diagrams describing the DC/DC converter control chains and logic.

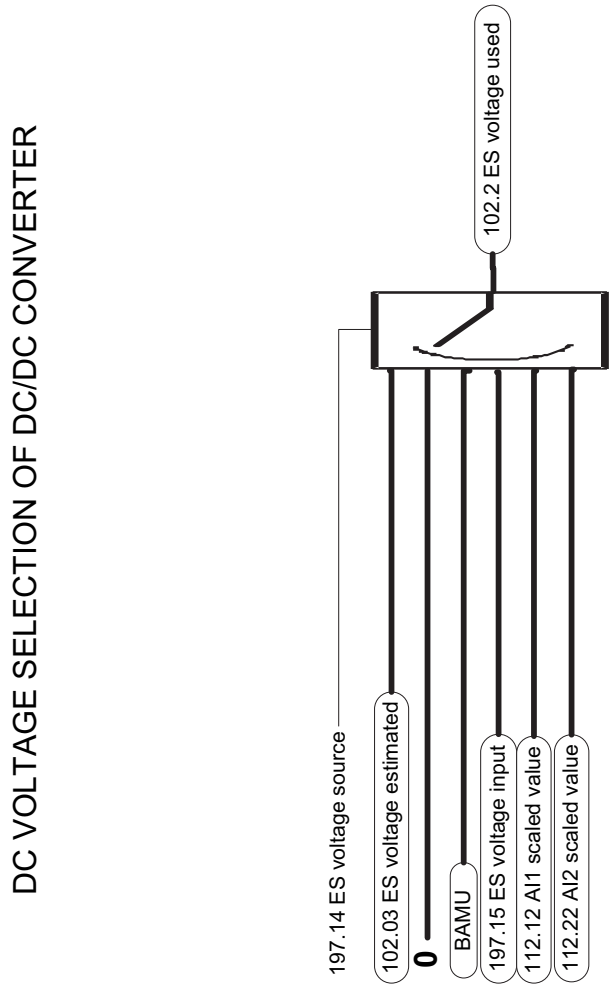
DC voltage reference chain



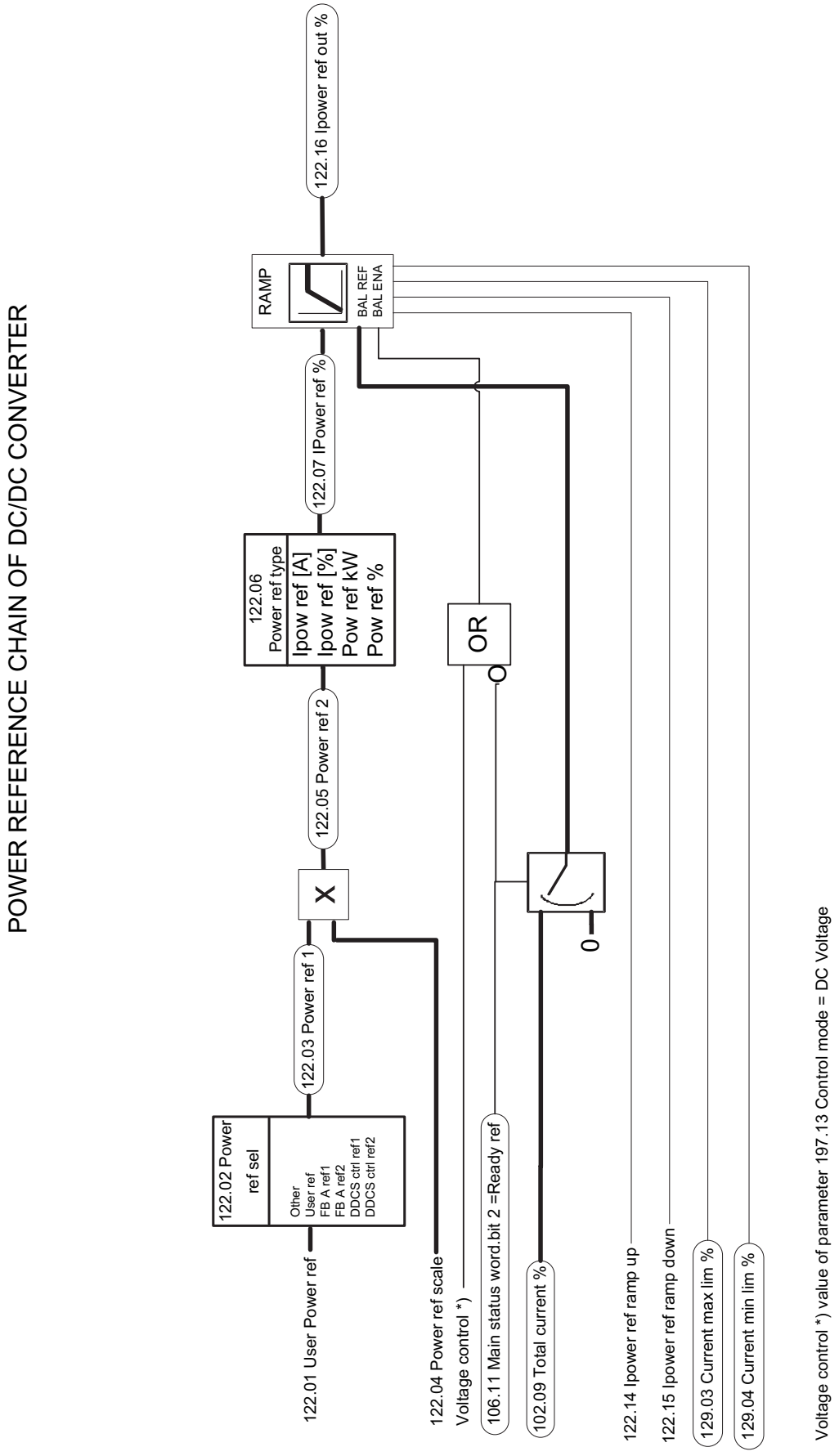
DC voltage controller



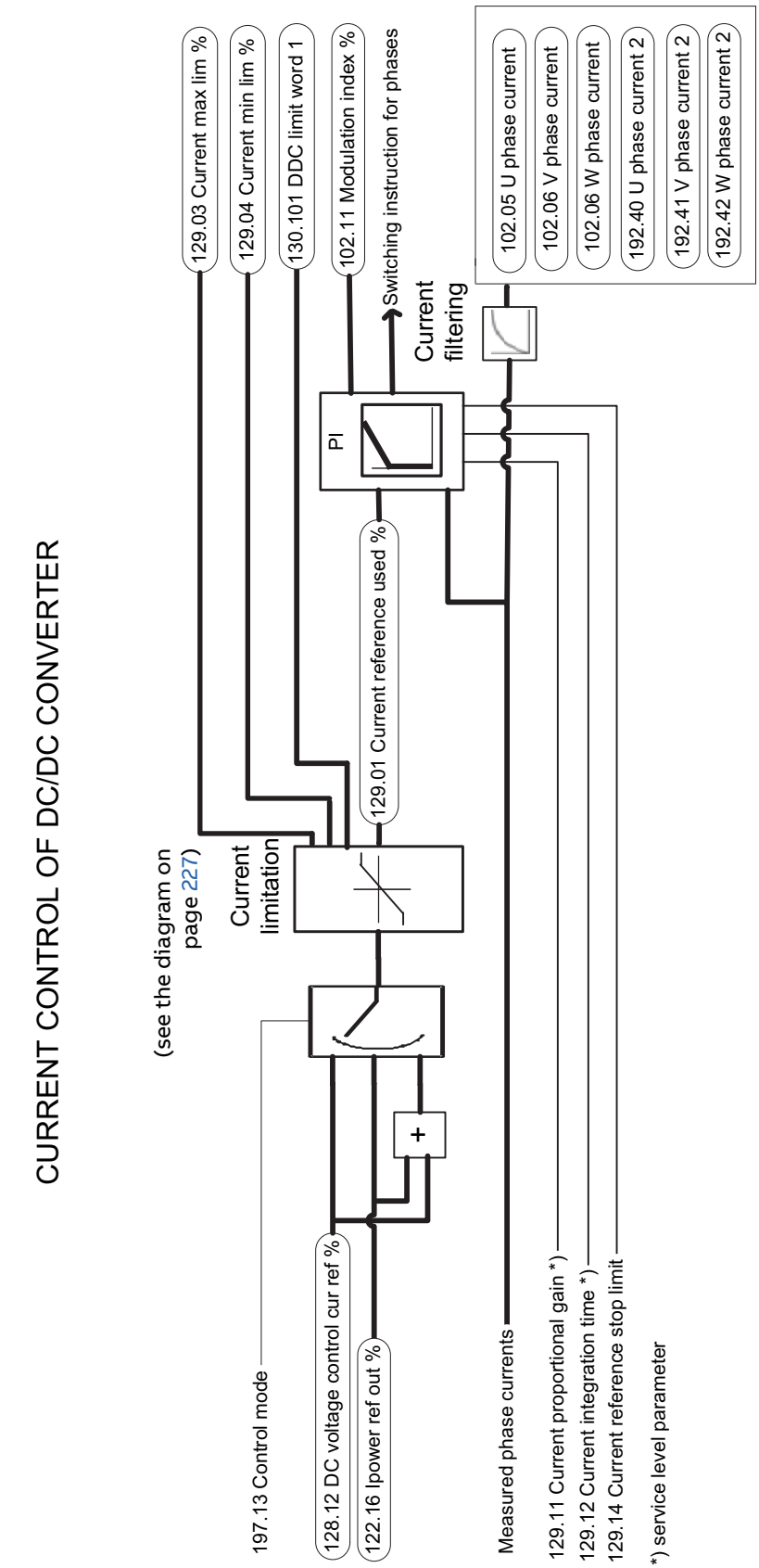
Energy storage voltage selection



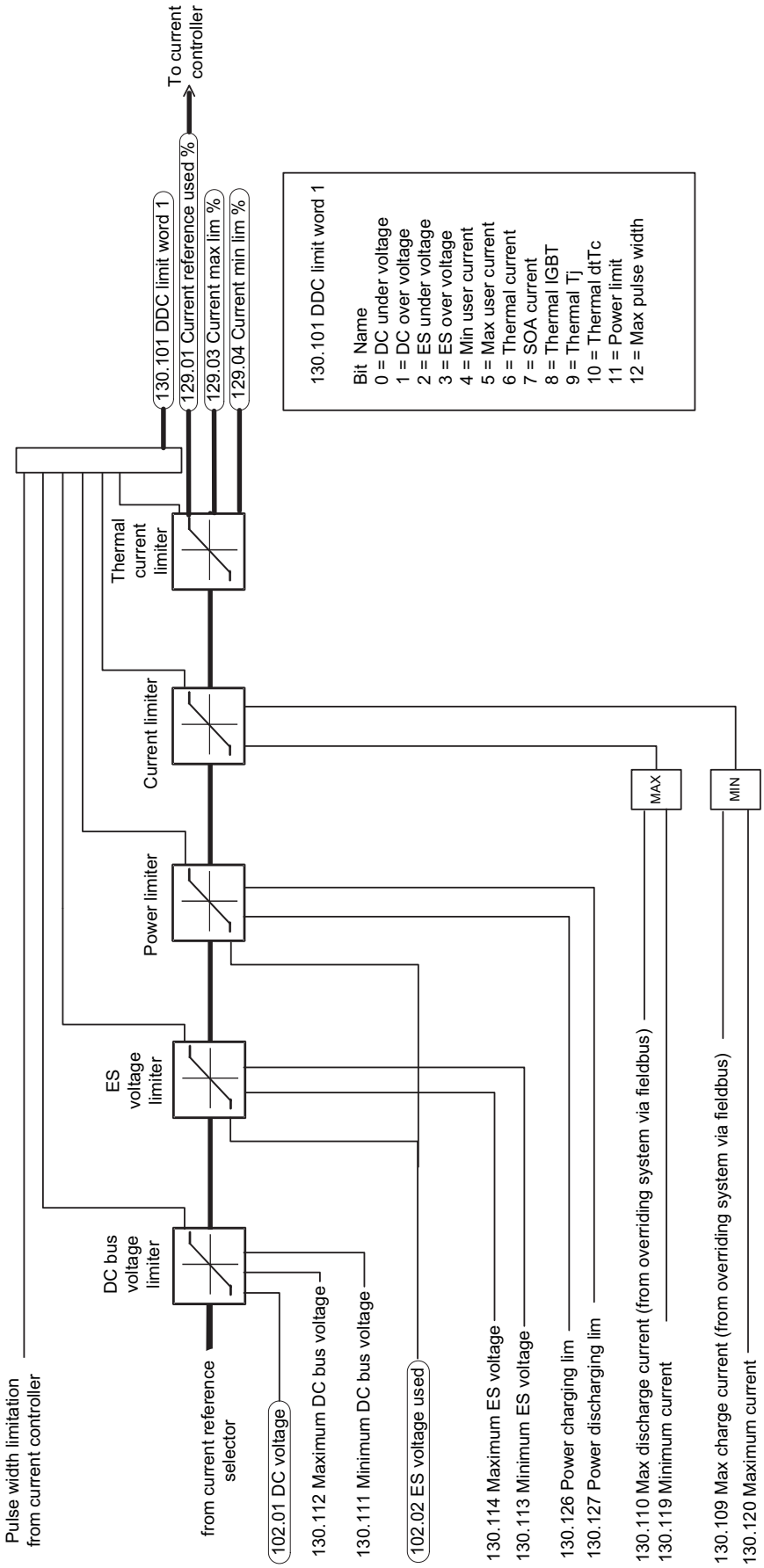
Power reference chain



Current control



Current limitation



Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to new.abb.com/contact-centers.

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