ABB INDUSTRIAL DRIVES

ACS880 IGBT supply control program (YISLX and YLHLX)

Firmware manual

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Firmware manual

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2. Start-up

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Further information

1

Introduction to the manual

What this chapter contains

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

Applicability

This manual applies to ACS880 IGBT supply control program (YISLX v1.0x or later) and ACS880 IGBT supply control program 2Q (YLHLX v1.0x or later) used in ACS880 drives.

The manual covers two versions of the control program: IGBT supply control program for the regenerative drives, and IGBT supply control program for the ultra-low harmonic drives (non-regenerative). The regenerative drives are ACS880 multidrive with IGBT supply unit (ACS880-204, ACS880-204LC, ACS880-207, ACS880-207LC), ACS880-14, ACS880-17 and ACS880-17LC. The ultra-low harmonic drives are ACS880-34, ACS880-37 and ACS880-37LC.

Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, or use the drive. See ACS880 multidrive cabinets and modules safety instructions (3AUA0000102301 [English]) for air-cooled units, and ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633) for liquid-cooled units.

- Read the **firmware function-specific warnings and notes** before changing parameter values. These warnings and notes are included in the parameter descriptions presented in chapter Parameters.

Target audience

This manual is intended for people who design, commission, or operate the drive system.

Terms and abbreviations

Term	Description
ACS-AP-I	Industrial assistant non-Bluetooth control panel
ACS-AP-W	Industrial assistant control panel with Bluetooth interface
AI	Analog input; an interface for analog input signals.
AO	Analog output; an interface for analog output signals.
BAMU	Auxiliary measurement unit
Control unit	The part in which the control program runs.
DC link	DC circuit between line-side converter and motor-side converter
DDCS	Distributed drives communication system protocol
DI	Digital input
DO	Digital output; an interface for digital output signals.
EFB	Embedded fieldbus
FAIO-01	Analog I/O extension module
FBA	Fieldbus adapter
FCAN	Optional CANopen® adapter module
FCNA-01	Optional ControlNet™ adapter module
FDCO-01	DDCS communication module with two pairs of 10 Mbit/s DDCS channels
FDIO-01	Optional digital I/O extension module
FDNA-01	Optional DeviceNet™ adapter module
FEA-03	Optional I/O extension adapter
FECA-01	Optional EtherCAT® adapter module
FENA-11	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP® and PROFINET IO® protocols
FENA-21	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
FEPL-02	Optional Ethernet POWERLINK adapter module
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
FPBA-01	Optional PROFIBUS DP® adapter module
FSCA-01	Optional RS-485 (Modbus/RTU) adapter
IGBT	Insulated gate bipolar transistor

Term	Description
IGBT supply unit	IGBT supply module(s) under control of one control unit, and related components.
INU	Inverter unit
Inverter unit	Inverter module(s) under control of one control unit, and related components. One inverter unit typically controls one motor.
ISU	IGBT supply unit
LCL filter	Inductor-capacitor-inductor filter
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
PLC	Programmable logic controller
RDCO	Optical DDCS communication module
RO	Relay output
STO	Safe torque off (IEC/EN 61800-5-2)
UCU	Type of control unit
ZCU	Type of control unit

Cyber security 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.

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 board.

2

Start-up

See the appropriate hardware manual.

3

Using the control panel

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

4

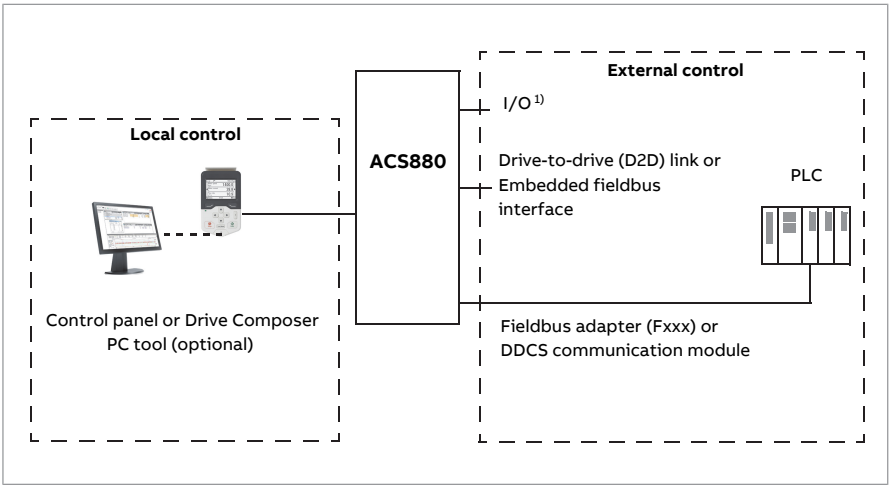
Control locations and operating modes

What this chapter contains

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

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 supply unit is in external control, control commands are given through

- the I/O terminals (digital and analog inputs), or optional I/O extension modules
- the embedded fieldbus interface or an optional fieldbus adapter module
- the external (DDCS) controller interface, and/or
- the drive-to-drive link.

External references are given through the fieldbus interface, analog inputs or drive-to-drive link.

Two external control locations, EXT1 and EXT2, are available. The user can select control signals (e.g. start and stop) and control modes for both external control locations. Depending on the user selection, either EXT1 or EXT2 is active at a time. Selection between EXT1/EXT2 is done via any binary source such as a digital input or fieldbus control word (see parameter 119.11 Ext1/Ext2 selection).

Note: Typically, ABB wires essential external control signals and status monitoring signals of a supply unit 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

The control commands are given from the control panel keypad or from a PC equipped with Drive composer when the supply unit is in local control.

Local control is mainly used during commissioning and maintenance. The control panel always overrides the external control signal sources when used in local control. 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 supply unit on and off by the panel, you must still have the external Run enable and Start enable signals switched on at the appropriate digital inputs of the supply unit. See section Run enable, Start/stop and Start enable control (page 25). Changing the control location to local can be disabled by parameter 119.17 Local control disable.

The user can select by a parameter (149.5 Communication loss action) how the supply unit reacts to a control panel loss or PC tool communication break.

Operating modes

The IGBT supply unit can operate in three operating modes with different types of reference:

- DC control
- power control
- AC voltage control (option +N8053).

In DC control and power control modes, the reactive power reference is possible simultaneously. The mode is selectable for each control location (Local, EXT1 and EXT2) in parameter group 119 Operation mode. For control chain diagrams of the DC control and power control modes, see chapter Control chain diagrams.

5

Program features

What this chapter contains

The control program contains all of the parameters including actual signals. This chapter describes some of the more important functions of the control program, how to use them and how to program them to operate.

Overview of the control program

ACS880 IGBT supply control program controls the IGBT supply unit with an IGBT bridge type supply module. The main functions of the control program are:

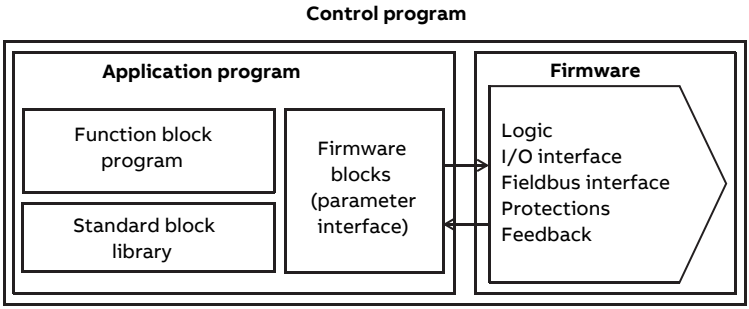
- maintain DC or active power reference,
- maintain reactive power reference,
- control external charging circuit (when used),
- control main contactor.

In addition, the control program protects the unit against overtemperature, DC or AC overvoltage and DC undervoltage. See section Charging (page 45). The control program also limits the active and reactive power as a function of the external temperature, and the temperature of the IGBTs. See section Power limiting due to heat rise in the supply module (page 39).

Control program configuration and programming

The control program is divided into two parts:

- firmware program (forms the control program alone as standard)
- application program (addition by the customer, for special cases only).



The firmware program performs the main control functions, including handling of DC voltage reference, reactive power reference, active power reference, supply unit logic (start/stop), I/O, feedback, communication and protection functions. Firmware functions are configured and programmed with parameters.

Application programming

The functions of the firmware program can be extended with application programming. (A standard delivery does not include an application program.) Application programs can be built out of function blocks based on the IEC 61131-3 standard using a PC tool available separately. Some parameters are used as firmware function block inputs and can therefore be modified also via the application program.

For more information, see Programming manual: Drive application programming (IEC 61131-3) (3AUA0000127808 [English]).

Programming via parameters

Parameters can be set via

- the control panel, as described in chapter Using the control panel
- the Drive composer PC tool, or
- the fieldbus interface, as described in chapters Fieldbus control through the embedded fieldbus interface (EFB) and Fieldbus control through a fieldbus adapter.

All parameter settings are stored automatically to the permanent memory of the supply 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 196.7 Parameter save manually before powering down the control unit after any parameter changes.

If necessary, the default parameter values can be restored by parameter 196.6 Parameter restore.

Adaptive programming

Conventionally, the user can control the operation of the supply unit by parameters. However, the standard parameters have a fixed set of choices or a setting range. To further customize the operation of the supply unit, 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 supply unit. 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 Adaptive programming application guide (3AXD50000028574 [English]).

Run enable, Start/stop and Start enable control

The user controls the operation of the IGBT supply unit with the Run enable command, Start/Stop command and Start enable command. When all commands are on in the control program, it controls the main contactor of the supply unit on with a relay output (relay output RO3 by default), and the charging contactor/relay (relay output RO1 by default). The main contactor connects the supply unit to the power line and the supply unit starts rectifying. If the Start/stop command or the Run enable command is off, the control program de-energizes the relay output and the main contactor switches off. In case of any fault, the main contactor and the charging contactor open.

Note: If all supply and inverter modules connected to the common DC link have internal charging circuits of their own, no common charging circuit in the supply unit is needed, and the supply unit can start without doing the charging first. For more information, see section Charging (page 45). If any of the commands is off, the control program de-energizes the relay output and the main contactor switches off.

There is a parameter in the control program for defining the value or source for each of the commands. By default, the parameters define the command values or sources as follows:

- Control program reads the Run enable command from digital input DI2.
- Control program reads the Start/Stop command from digital input DI2.
- Start enable is set on constantly.

Typically, DI2 is connected to the operating switch installed on the cabinet door. When the switch is on, the control program receives both the Run enable and Start/Stop commands via DI2.

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.

Note: Despite of the Local/Remote mode selection by the panel, the program reads the Run enable and Start enable from the interface defined by the appropriate parameters.

Note: 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 parameters settings and I/O wirings of the cabinet-installed unit are done at the factory according to the application requirements.

Settings and diagnostics

Control panel key: Loc/Rem

Parameters: parameter group 119 Operation mode, 120.1 Ext1 commands…120.9 Ext2 in2 source, 120.12 Run enable 1 source, 120.19 Enable start command

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

Faults: 5E06 Main contactor, 3E08 LSU charging

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 jumper or 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.

Settings and diagnostics

Parameters: parameter group 112 Standard AI

Warnings: AE27 AI parametrization

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 and diagnostics

Parameters: parameter group 113 Standard AO

Programmable digital inputs and outputs

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

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

The number of digital inputs/outputs can be increased by installing FIO-01, FIO-11 or FDIO-01 I/O extensions (see Programmable I/O extensions (page 28) below).

Note: Do not change the settings of the reserved digital inputs (or outputs, if any). See subsection Reserved digital inputs and relay outputs (page 64).

Settings and diagnostics

Parameters: parameter groups 110 Standard DI, RO and 111 Standard DIO, FI, FO

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. See subsection Reserved digital inputs and relay outputs (page 64).

Settings and diagnostics

Parameters: parameter group 110 Standard DI, RO

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

Note: Not all the FIO-xx I/O extensions are supported by the current firmware version. (FIO-11 is supported.)

Settings and diagnostics

Parameters: parameter groups 110 Standard DI, RO , 111 Standard DIO, FI, FO,

112 Standard AI, 113 Standard AO, 114 Extension I/O module 1,

115 Extension I/O module 2, 116 Extension I/O module 3

Warnings: AE2E Extension AI parameterization, AE2F Extension I/O configuration failure

Faults: 7E00 Encoder Option module comm loss

Fieldbus control

The supply unit can be connected to an overriding control system via an optional fieldbus adapter. See chapter Fieldbus control through a fieldbus adapter.

Settings and diagnostics

Parameters: parameter groups 150 FBA, 151 FBA A settings, 152 FBA A data in, 153 FBA A data out, 154 FBA B settings, 155 FBA B data in, 156 FBA B data out

Warnings:AE25 FBA A parameter conflict, AE26 FBA B Parameter conflict, AE30 FBA A communication, AE31 FBA B communication

Faults: 6E01 FBA A mapping file, 6E02 FBA B mapping file, 6E0D FBA A parameter conflict, 6E0E FBA B parameter conflict, 7E0B FBA A communication, 7E0C FBA B communication

External controller interface

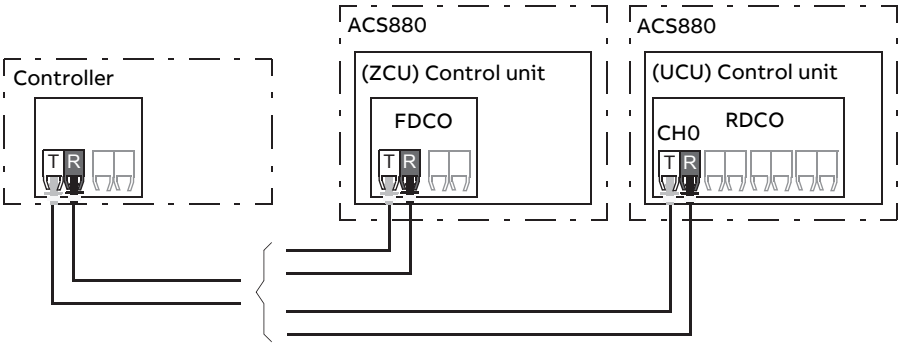
General

The supply unit can be connected to an external controller (such as the ABB AC 800M) using either fiber optic or twisted-pair cable. The ACS880 is compatible with both the ModuleBus and DriveBus connections. Note that some features of DriveBus (such as BusManager) are not supported.

Topology

An example connection with either a ZCU-based or UCU-based supply unit using fiber optic cables is shown below.

Supply units with a ZCU control unit require an additional FDCO DDCS communication module; supply units with a UCU control unit require an RDCO or FDCO module. The UCU has a dedicated slot for the RDCO – an FDCO module can also be used with a UCU control unit but it will reserve one of the three universal option module slots. Ring and star configurations are also possible much in the same way as with the master/follower link; the notable difference is that the external controller connects to channel CH0 on the RDCO module instead of CH2. The channel on the FDCO communication module can be freely selected.



T = Transmitter, R = Receiver

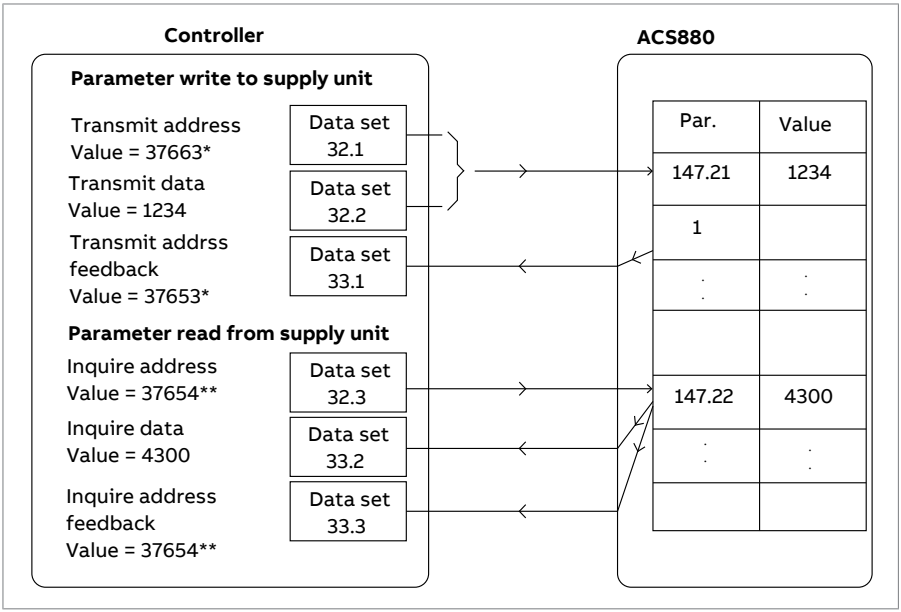
Communication

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

The communication uses data sets 10…33. The contents of the data sets are freely configurable, but data set 10 typically contains the control word, 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 logic; the coding of the bits is as presented in section Contents of the fieldbus Control word (page 269). Likewise, the coding of the status word is as shown in section Contents of the fieldbus Status word (page 271).

By default, data sets 32 and 33 are dedicated for the mailbox service, which enables the setting or inquiry of parameter values as follows:



*147.21 -> 93h.15h -> 9315h -> 37653

**147.22 -> 93h.16h -> 9316h -> 37654

By parameter 160.64 Mailbox dataset selection, data sets 24 and 25 can be selected instead of data sets 32 and 33.

The update intervals of the data sets are as follows:

- Data sets 10…11: 2 ms
- Data sets 12…13: 4 ms
- Data sets 14…17: 10 ms
- Data sets 18…25, 32, 33: 100 ms.

Settings

Parameter groups 160 DDCS communication, 161 DDCS transmit and 162 DDCS receive.

Reference chains

Reference chains of the control program are

- DC voltage reference chain,
- active power reference chain, and
- reactive power reference chain.

Tasks of the reference chains are reference source and type selection, limitation and ramping. The active power, DC voltage and reactive power reference chains are controlled by reference chain control. All of the reference chains are controlled by the bits of limit word (130.1).

DC voltage control

DC voltage is controlled by the DC voltage reference chain. DC voltage control is the default control mode of the supply unit. It is also the alternative control mode for the active power control. DC voltage control includes DC voltage reference selection, limitation and ramping. Incoming DC reference is limited between maximum and minimum of the DC limits. If the incoming reference exceeds the defined limits, the limit word is updated. DC reference is ramped according to DC ramp up and DC ramp down times.

Control chain diagram

See page 280.

Internal DC voltage reference

Lowest possible DC voltage level in IGBT supply unit is defined by AC voltage level. If DC voltage reference is lower than what the IGBT supply unit can achieve with control, reference is limited internally to the lowest possible value. Minimum DC voltage reference is filtered with 10 second time constant to prevent immediate drop in DC voltage reference while AC voltage level drops.

Settings and diagnostics

Parameters: parameter groups 123 DC voltage reference and 130 Limits

Active power control

Active power is controlled by the power reference chain. Active power control is an alternative main control mode for the IGBT supply unit with the DC voltage control (which is the default control mode of the supply unit). Power reference chain includes reference selection, limitation and ramping.

The power reference modifies the input reference to active current reference for the ramp function. 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.

Main tasks of active current ramping are:

- Active current reference limitation
- Active current reference ramping.

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 281.

Settings and diagnostics

Parameters: parameter groups 122 Power reference and 130 Limits

Reactive power control

Reactive power is controlled by the reactive power reference chain. Primarily, active power is controlled, and if there is reserve for reactive power, it can be controlled according to its reference. If a request for reactive power cannot be met, the control program indicates it with following parameters:

- 130.3 Limit word 3
  - bit 5 (Reactive current limit)
  - bit 13 (Q act pos) *
  - bit 14 (Q act neg) *
- 106.17 Drive status word 2
  - bit 7 (Internal reactive power reference)
- 130.2 Limit word 2
  - bit 0 (Q user ref max)
  - bit 1 (Q user ref min)

* According to the polarity: positive = capacitive, negative = inductive.

If the IGBT supply unit is at its current limit, reactive power is limited before active power. Reactive power reference chain includes reference selection, limitation and ramping.

The reactive power reference modifies the input reference to reactive current reference. Possible input reference types are:

- Reactive current reference in Amperes
- Reactive current reference in percent of the nominal current
- Reactive power reference in kVAr
- Reactive power reference in percent of the nominal power
- Reactive power reference angle in degrees
- Reactive power reference in cosphi
- Voltage reference for the AC voltage control in Volts
- Voltage reference for the AC voltage control in percent.

The type of the reactive power reference is selected with parameter.

Main tasks of the reactive current ramping are:

- Reactive current reference limitation
- Reactive current reference ramping
- Ramp bypass in case of AC voltage control.

In reactive current reference limiting the incoming reference is limited between maximum and minimum of the reactive current limits. If the incoming reference exceeds the defined limits, the limit word is updated. The limited output is the input signal for the ramping function.

The control program also contains a limitation feature for limiting the reactive power based on ambient temperature or the temperature of the IGBTs. The user can tune the limitation parameters.

Control chain diagram

See page 282.

Settings and diagnostics

Parameters: parameter groups 124 Reactive power reference and 130 Limits

Net lost detection

The IGBT supply unit recognizes the loss of supply AC voltage and recovers automatically when the AC voltage is connected again. The supply AC lost detection is based on fast (about 0.2 s, 10 Hz) change of the grid frequency estimate. When the frequency goes outside the frequency limits (±10 Hz of the nominal frequency), the control program activates the net lost state and generates a warning (AE78 Net lost). When the net lost is detected, there are two options:

- If the grid voltage measurements are available, the IGBT supply unit tries to resynchronize to the grid when the grid voltages are connected again, and the frequency has been estimated to be between allowed limits. If the maximum duration of the net lost is exceeded (default 5 s), the IGBT supply unit trips to a fault (8E07 Net lost).
- If the measurements are not available, the IGBT supply unit tries to resynchronize to the grid at regular time intervals (default 0.1 s). If the resynchronization is not successful and the net lost lasts too long (default 5 s), the IGBT supply unit trips to a fault (8E07 Net lost).

Settings and diagnostics

Warnings: AE78 Net lost

Faults: 3E05 DC link undervoltage, 8E07 Net lost

Reduced run function

Reduced run function is available for supply units consisting of parallel-connected supply modules of frame size R8i. The function makes it possible to continue operation with limited current even if one (or more) module is out of service, for example, because of maintenance work. In principle, reduced run is possible with only one module, but in practice, the modules in service must be able to provide enough current for running the inverter modules.

Note: Reduced run is not supported in AC control mode.

The number of removed IGBT supply modules and LCL filter modules is restricted. The following tables list the allowed configurations.

Note: When IGBT supply modules and LCL filter modules are removed, the corresponding AC fuses need to be removed too.

Air-cooled units

Original configuration	Allowed configurations when using reduced run function
2×R8i + 1×LCL	1×R8i + 1×LCL
3×R8i + 2×LCL	2×R8i + 2×LCL
4×R8i + 2×LCL	2×R8i + 1×LCL or 1×R8i + 1×LCL
6×R8i + 3×LCL	4×R8i + 2×LCL or 2×R8i + 1×LCL or 1×R8i + 1×LCL
8×R8i + 4×LCL	6×R8i + 3×LCL or 4×R8i + 2×LCL or 2×R8i + 1×LCL or 1×R8i + 1×LCL
10×R8i + 5×LCL	8×R8i + 4×LCL or 6×R8i + 3×LCL or 4×R8i + 2×LCL or 2×R8i + 1×LCL or 1×R8i + 1×LCL

Liquid-cooled units

Original configuration	Allowed configurations when using reduced run function
2×R7i + 1×LCL	1×R7i + 1×LCL
3×R7i + 1×LCL	2×R7i + 1×LCL
4×R7i + 1×LCL	3×R7i + 1×LCL or 2×R7i + 1×LCL
2×R8i + 1×LCL	1×R8i + 1×LCL
3×R8i + 2×LCL	2×R8i + 2×LCL
4×R8i + 2×LCL	3×R8i + 2×LCL or 2×R8i + 2×LCL
5×R8i + 3×LCL	4×R8i + 3×LCL or 3×R8i + 3×LCL
(2×LCL + 3×R8i) + (2×LCL + 3×R8i)	(2×LCL + 2×R8i) + (2×LCL + 2×R8i)
(2×LCL + 4×R8i) + (2×LCL + 4×R8i)	(2×LCL + 3×R8i) + (2×LCL + 3×R8i) or (2×LCL + 2×R8i) + (2×LCL + 2×R8i)

Activation of the reduced run function

Note: For cabinet-built drives, the wiring accessories and the air baffle needed during the procedure are available from ABB, and are included in the delivery.

WARNING!
Follow the safety instructions provided for the supply unit in question.

1. Disconnect the supply voltage and all other sources that can supply the DC bus (eg. DC/DC converter) from the supply unit.
2. If the control unit of the supply unit is powered from the faulty module, install an extension to the wiring and connect it to one of the remaining modules.
3. Remove the module to be serviced from its bay. See the appropriate hardware manual for instructions.
4. Install an air baffle to the top module guide to block the airflow through the empty module bay.
5. Switch on the power to the supply unit.
6. Enter the number of supply modules present into parameter 195.13 Reduced run mode.
7. Reset all faults and start the supply unit. The maximum current is now automatically limited according to the new configuration. A mismatch between the number of detected modules and the value set in 195.13 will generate a fault (5E0E Reduced run).

After all modules have been reinstalled, parameter 195.13 Reduced run mode must be reset to 0 to disable the reduced run function.

Settings and diagnostics

Parameters: 195.13 Reduced run mode, 195.14 Connected modules

Faults: 5E0E Reduced run

Programmable protection functions

Emergency stop

The emergency stop signal is connected to the input selected by parameter 121.5 Emergency stop source. An emergency stop can also be generated through fieldbus (parameter 106.1 Main control word, bits 1…2).

The way the IGBT supply unit is stopped when an emergency stop command is received, is selected with parameter 121.4 Emergency stop mode. The following selections are available:

- stop and warning,
- warning,
- fault.

Notes:

- The installer of the equipment is responsible for installing the emergency stop devices and all additional devices needed for the emergency stop function to fulfill the required emergency stop categories. For more information, contact your local ABB representative.
- After an emergency stop signal is detected, the emergency stop function cannot be canceled even though the signal is canceled.

Settings and diagnostics

Parameters: 121.4 Emergency stop mode, 121.5 Emergency stop source

Warnings: AE68 Emergency stop

Faults: 6E1C Emergency stop

External events

An external event signal can be connected to a selectable input which is not used for other purposes. When the signal is lost, an external event (fault, warning, or a mere log entry) is generated.

Settings and diagnostics

Parameters: 131.1 External event 1 source…131.10 External event 5 type

Warnings: AE51 External warning 1…AE55 External warning 5

Faults: 9E01 External fault 1…9E05 External fault 5

Earth fault detection

The earth fault detection function is based on sum current measurement. Note that

- in a grounded supply, the protection activates in 200 ms,
- in an ungrounded supply, the supply network capacitance should be 1 µF or more,
- the protection is deactivated when the supply unit is stopped.

Settings and diagnostics

Parameters: 131.20 Earth fault

Warnings: AE02 Earth leakage

Faults: 2E01 Earth leakage

External earth leakage fault source selection

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

Parameters: 131.28 Ext earth leakage signal source

Faults: 2E08 Ext earth leakage

External earth leakage action selection

The parameter selects how the supply unit reacts when an external earth leakage is detected.

Parameters: 131.29 Ext earth leakage action

Faults: 2E08 Ext earth leakage

Warnings: AE87 Ext earth leakage

Local control loss detection

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

Settings and diagnostics

Parameters: 149.5 Communication loss action

Faults: 7E01 Panel loss

Automatic fault resets

The supply unit can automatically reset itself after overcurrent, DC overvoltage, DC undervoltage, and external faults. The user can also specify a fault that is automatically reset.

By default, automatic resets are off and must be specifically activated by the user.

Settings and diagnostics

Parameters: 131.12 Autoreset selection…131.16 Delay time

Warnings: AE57 Autoreset

Thermal switch monitoring

The control program has a thermal switch monitoring function. The function monitors the status of the switch through a digital input typically. By default, digital input DI1 is used for monitoring the status of the thermal switch. Multiple switches must be connected in series. The commissioning engineer can activate the function and define the monitored input by a parameter. If the function receives an overtemperature indication (DI1 = 0), it trips the supply unit to a fault.

Settings and diagnostics

Parameters: 131.33 Cabinet temperature fault source, 131.34 Cabinet temperature supervision

Faults: 4E06 Cabinet temperature

Power limiting due to heat rise in the supply module

The control program has a supply module temperature monitoring function. The commissioning engineer can define:

- the source for the coolant temperature measurement
- active and reactive power profile vs. temperature value
- warning and fault trip limits.

The function monitors the temperature of the coolant exiting the module. When the value reaches the limit defined for the power limiting profile, the control program starts limiting the power. If the temperature keeps rising despite of the power limiting, the control program generates first a warning (at warning limit), and then trips to a fault (at fault limit). User can activate and tune limitation in parameter group 130 Limits.

Example

Set parameter 130.50 Ext Tmp1 input selection with selection Other to 114.26 AI1 actual value. Set parameter 114.77 AO1 source with selection Other to 130.54 Pt current. It is possible to use groups 115 or 116 also.

Settings and diagnostics

Parameter groups: 130 Limits, 114 Extension I/O module 1…116 Extension I/O module 3

Warnings: AE10 Ext Tmp1 warning, AE11 Ext Tmp2 warning

Counting the number of charging attempts

The control program monitors charging attempts to prevent charging circuit overheating.

Settings and diagnostics

Parameters: 120.50 Charging overload event sel

Warnings: AE85 Charging count

Faults: 3E09 Charging count

DC overvoltage and undervoltage protections

The control program defines the DC overvoltage and undervoltage limits on basis of the supply voltage range given by the user with a parameter (195.1). The program monitors the actual voltage level with an internal voltage measurement. When the measured value exceeds the overvoltage limit or falls below the undervoltage limit, the control program trips to a fault.

Trip limits

The trip limits of the intermediate DC link voltage are relative to the supply voltage range selected with parameter 195.1 Supply voltage as well as supply unit type. The DC voltage is displayed by parameter 101.1 DC voltage. The following table shows the values of selected DC voltage levels in Volts.

Fault limit type	Supply voltage range (195.1)				
	380…415 V	440…480 V	500 V	525…600 V	660…690 V
Overvoltage fault limit (R1i…R6i, xxxxA-3)	844	-	-	-	-
Overvoltage fault limit (R1i…R6i, xxxxA-5)	880	880	880	-	-
Overvoltage fault limit (R8i, xxxxA-3)	859.5	-	-	-	-
Overvoltage fault limit (R8i, xxxxA-5)	859.5	895.5	895.5	-	-
Overvoltage fault limit (R8i, xxxxA-7)	-	-	-	1293	1293
Undervoltage fault limit (all types)	308	357	405	425	535

Boost limits

Boost limit depends on the maximum voltage of the power module. Boost limits for DC voltage are given in the table below.

IGBT supply module type	DC voltage reference range	
	Minimum [V]	Maximum [V]
xxxxA-3	1)	663 2)
xxxxA-5	1)	799 2)

xxxxA-7	[1]	1102 [2]

[1] The control program limits the minimum value to sqrt(2) × U_{ac} × (1.03…1.08).

[2] The maximum value is limited by parameter 123.6 DC voltage ref max.

Settings and diagnostics

Parameters: 101.1 DC voltage, 123.6 DC voltage ref max, 195.1 Supply voltage

Warnings: AE09 DC link overvoltage, AE0A DC link undervoltage

Faults: 3E04 DC link overvoltage, 3E05 DC link undervoltage

Diagnostics

Maintenance 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 measures, by integration, the monitored parameter. A warning is given when the calculated area below the signal exceeds a user-defined limit.

Settings and diagnostics

Parameters: parameter group 133 Generic timer & counter

Load analyzer

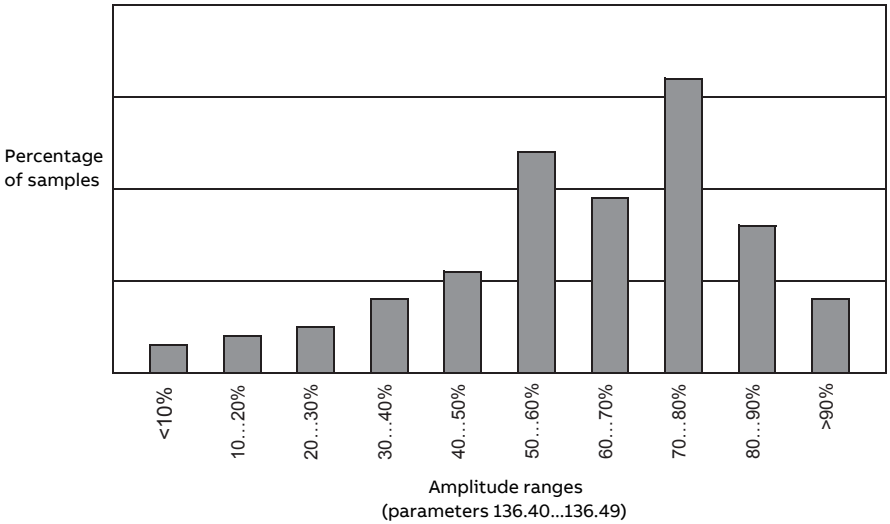
Peak value logger

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 supply unit current, DC voltage and power at the time of the peak.

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 when the IGBT supply unit is running, 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 fall within that range.



Amplitude logger 1 is fixed to monitor the converter current, and cannot be reset. With amplitude logger 1, 100% corresponds to the maximum output current (I_{max}). The distribution of samples is shown by parameters 136.20…136.29.

Settings

Parameters: parameter group 136 Load analyzer

User parameter sets

The IGBT supply unit supports four user parameter sets that can be saved to the permanent memory and recalled using parameters. It is also possible to use digital inputs to switch between user parameter sets.

A user parameter set contains all editable values in parameter groups 110…199 except

- forced I/O values such as parameters 110.3 DI force selection and 110.4 DI force data

- I/O extension module settings (groups 114…116)
- fieldbus communication enable parameters (150.1 FBA A enable and 150.31 FBA B enable)
- other fieldbus communication settings (groups 151…156)
- some hardware settings in parameter group 195 HW configuration, and
- user set selection parameters 196.11…196.13.

If no parameter sets have been saved, attempting to load a set will create all sets from the currently active parameter settings.

Switching between user parameter sets is only possible with the supply unit stopped.

Example: Generator power control between two settings: user parameter sets are used, and switching between them is done with DI5.

The parameter settings are:

- User set 1: 130.49 is set to -200% (braking power is 100%)
- User set 2: 130.49 is set to 0% (braking power is 0%)

User set 1:

- 130.49 is set to -200% (the default value)
- 196.11 is set to Save to set 1

User set 2:

- 130.49 is set to 0%
- 196.11 is set to Save to set 2

The final settings are:

- 196.11 is set to IO mode
- 196.12 is set to DI5.

Note: Switching between user parameter sets must be done with the supply unit stopped.

Settings

Parameters 196.10…196.13.

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 Cyber security disclaimer (page 13).

To activate the user lock for the first time, enter the default pass code, 10000000, into 196.2 Pass code. This will make parameters 196.100…196.102 visible. Then enter a new pass code into 196.100 Change user pass code, and confirm the code in 196.101 Confirm user pass code. 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).

To close the user lock, enter an invalid pass code into 196.2 Pass code, activate 196.8 Control board boot, or cycle the power. With the lock closed, parameters 196.100…196.102 are hidden.

To reopen the lock, enter your pass code into 196.2 Pass code. This will again make parameters 196.100…196.102 visible.

Settings

Parameters 196.2 and 196.100…196.102.

Data storage 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 and diagnostics

Parameters: parameter group 147 Data storage

Charging

The charging is always needed to power up the DC link capacitors smoothly. In other words: you may not connect the discharged capacitors to full supply voltage but you must increase the voltage gradually until the capacitors are charged and ready for normal use.

The control program has a function for controlling an additional charging circuit in the IGBT supply unit. The charging function is active as standard, since the cabinet-installed ABB drive which uses IGBT supply unit, needs the additional charging circuit typically.

Note: Some ABB supply and inverter module sizes have internal charging circuit as standard. (Check from the appropriate supply and inverter module hardware manuals.) If all supply and inverter modules connected to the common DC link of the drive have the internal charging circuit, you do not need the common, additional circuit in the supply unit. Then you can also inactivate the charging function of the supply unit (a parameter setting).

When the control program receives the start command (and Run enable and Start enable are on), the control program controls the charging contactor on by a relay output. The contactor connects the input power line to the drive DC link via charging resistors. The DC capacitor charging starts. The DC voltage level in the DC link increases as the charging continues. The charging resistors limit the charging current.

Charging is completed when:

- the actual DC voltage exceeds the predefined level (parameter 120.25 MCB closing level)
- the actual DC voltage change rate is below the predefined level (parameter 120.26 Maximum dU/dt), and
- the pre-defined delay time has passed (parameter 120.27 Start delay).

The control program monitors the charging time. If charging takes more time than defined by a parameter, the supply unit trips to a fault.

Note: If the power unit is powered from the DC link, charging can begin after 10 seconds of control unit reboot at the earliest.

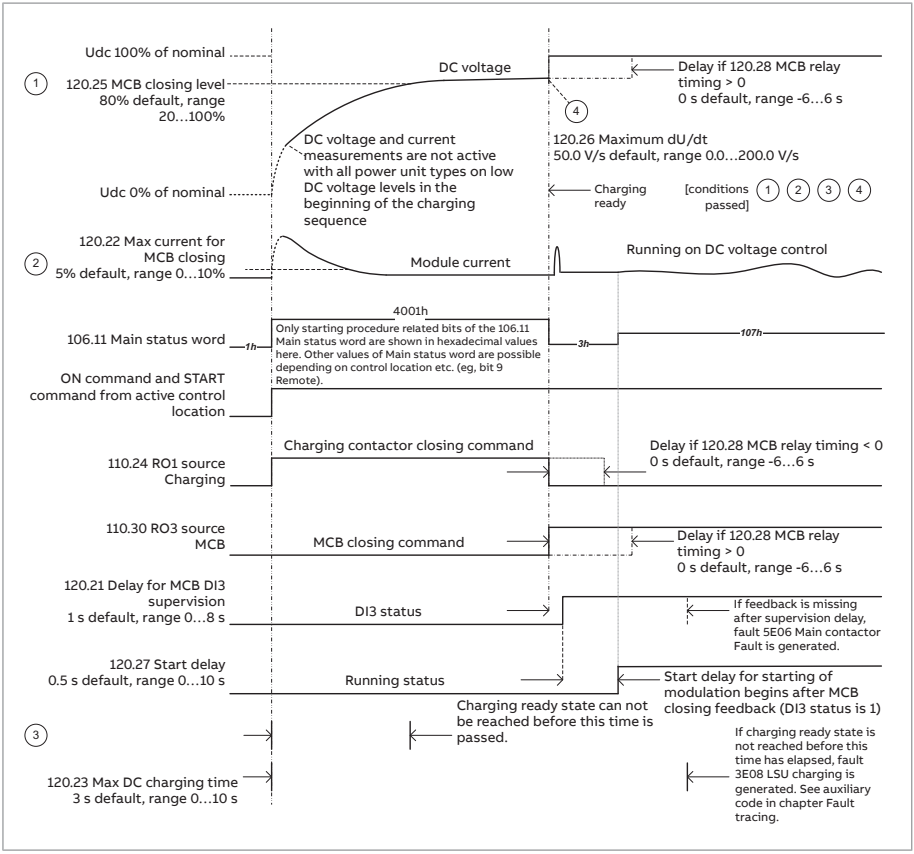
If the IGBT supply unit is used in a drive system where the charging must be done by the IGBT supply unit, you must install an additional charging circuit, and activate and tune the charging function in the IGBT supply control program. Consult ABB for more information on tuning the parameters, and the components and wirings needed.

The control program checks that voltage rises after the charging contactor is closed. If the voltage does not rise and the current stays below the level defined with parameter 120.22 Max current for MCB closing, the supply unit trips on fault

3E08 LSU charging (auxiliary code 5). If the current is higher, the supply unit trips on fault 2E09 DC short circuit.

The control program monitors charging attempts to prevent charging circuit overheating. If there are more than two attempts in five minutes to charge the DC link externally, start inhibit is set (106.18 Start inhibit status word, bit 9). After five minutes from the first charging attempt the start inhibit is removed. The supply unit also generates an event selected with parameter 120.50 Charging overload event sel.

Timing diagram



Settings and diagnostics

Signals: 101.1 DC voltage

Parameters: 106.18 Start inhibit status word, 110.24 RO1 source, 120.22 Max current for MCB closing, 120.23 Max DC charging time, 120.25 MCB closing level, 120.26

Maximum dU/dt, 120.27 Start delay, 120.28 MCB relay timing, 120.29 Diode mode, 120.30 External charge enable, 120.50 Charging overload event sel

Warnings: AE85 Charging count

Faults: 2E09 DC short circuit, 3E08 LSU charging, 3E09 Charging count, 5E06 Main contactor

DDCS communication with inverter unit

DDCS communication can be used for transferring data between supply unit and inverter unit. The DDCS communication and the related transfer media (fiber optic link) are in use in the single drives which consist of one supply unit and one inverter unit. The DDCS link is not in use in multidrives, typically.

You can use the DDCS communication for these purposes:

- You can show and adjust the supply unit parameters in the inverter control program (one interface for the control panel and commissioning engineer).
- You can show supply unit warnings and faults in the inverter control program.
- You can control both the inverter unit and the supply unit through one control interface (for example one fieldbus adapter) in the inverter unit, and transfer the supply unit control commands and references via the link to the supply unit.

For information on using DDCS communication, see section Setting up communication through inverter unit (page 275).

Settings and diagnostics

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

Warnings: AE56 INU-LSU comm loss

Faults: 7E0D INU-LSU comm loss

Default I/O diagram of the supply control unit

The diagram below shows the default I/O connections on the supply control unit (A51), and describes the use of the connections in the supply unit.

The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 … 2.5 mm^2 (22…12 AWG). The tightening torque is 0.45 N·m (4 lbf·in).

Terminal			Description	
XD2D			Drive-to-drive link	
1	1	D2D_B	Not in use by default	
2	2	D2D_A		
3	3	BGND		
4	4	SHIELD		
ON 1	XD2D TERM		Drive-to-drive link termination switch.	
X485			RS485 connection	
5	5	B	Not in use by default	
6	6	A		
7	7	BGND		
8	8	SHIELD		
ON 1	X485 BIAS		X485 bias selection switch	
ON 1	X485 TERM		X485 termination switch	
XCAN			CAN bus	
9	9	CAN_H	Not supported	
10	10	CAN_L		
11	11	CAN_CGND		
12	12	CAN_SHLD	Control cable shield	
1 ON	XCAN TERM		CANopen termination switch	
XRO1			Relay output 1	
11	11	NC1	Norm. closed	XRO1: **Charging**[1] (Energized = Closes charging contactor.) 250 V AC / 30 V DC, 2 A
12	12	COM1	Common	
13	13	NO1	Norm. open	

Terminal			Description	
XRO2			Relay output 2	
21 22 23	21	NC2	Norm. closed	XRO2: **Fault (-1)** [2] 250 V AC / 30 V DC, 2 A
	22	COM2	Common	
	23	NO2	Norm. open	
XRO3			Relay output 3	
31 32 33	31	NC3	Norm. closed	XRO3: **MCB ctrl**[1] (Energized = Closes main contactor/breaker.) 250 V AC / 30 V DC, 2 A
	32	COM3	Common	
	33	NO3	Norm. open	
XRO4			Relay output 4	
41 42 43	41	NC4	Norm. closed	XRO4: Not supported 250 V AC / 30 V DC, 2 A
	42	COM4	Common	
	43	NO4	Norm. open	
XSTO			Safe torque off [3]	
1 2 3 4	1	OUT	XSTO: Factory connection. Both circuits must be closed for the supply to start (STO1 and STO2 must be connected to OUT).	
	2	SGND		
	3	STO1		
	4	STO2		
XSTO OUT			Safe torque off connection (to inverter modules)	
5 6 7 8	5	OUT1	XSTO OUT: Not in use by default.	
	6	SGND		
	7	OUT2		
	8	SGND		

Terminal			Description
XDI			Digital inputs
	1	DI1	**Temp fault** [4] (0 = overtemperature)
	2	DI2	**Run / enable** [4] (1 = run / enable)
	3	DI3	**MCB feedback** [1] (0 = main contactor/breaker open)
	4	DI4	Not in use by default. Can be used for eg, auxiliary circuit breaker fault.
	5	DI5	Not in use by default. Can be used for eg, earth fault monitoring.
	6	DI6	**Reset** [4] (0 -> = fault reset)
	7	DIIL	Not in use by default. Can be used for eg, emergency stop.
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	DIGND	Digital input/output ground
	DICOM=DIOGND		Ground selection switch. Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
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. 0(2)…10 V, R_{in} > 200 kohm [6]
	5	AI1-	
	6	AI2+	Not in use by default. 0(4)…20 mA, R_{in} = 100 ohm [7]
	7	AI2-	

Terminal			Description
XAO			Analog outputs
1	1	AO1	**Zero** (no signal indicated)[4] 0…20 mA, R_L < 500 ohm
2	2	AGND	
3	3	AO2	**Zero** (not signal indicated)[4] 0…20 mA, R_L < 500 ohm
4	4	AGND	
XPOW			External power input
1	1	+24V	24 V DC, 2.05 A
2	2	GND	
3	3	+24V	
4	4	GND	
XFSO			Safety functions module connection. Not in use by default.
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
ON	XPAN TERM		Control panel connection termination switch
MEM			Memory unit connection

1) Use of the signal in the control program. When parameter 120.30 External charge enable has value Yes (default setting), the control program reserves this I/O terminal for external charging circuit control and monitoring, and parameters 110.24 RO1 source and 110.30 RO3 source are write-protected. If the value is No, you can use the I/O terminal for other purposes.

2) Use of the signal in the control program (fixed). See also the delivery-specific circuit diagrams.

3) This input only acts as a true Safe torque off input in inverter units. 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.

4) Use of the signal in the control program (fixed). See also the delivery-specific circuit diagrams.

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

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

Parameters that define the use of relay outputs

The table below shows the relay outputs and the parameters and that define their use by default.

Output	Parameter	Default value
RO1	110.24 RO1 source	Charging
RO2	110.27 RO2 source	Fault (-1)
RO3	110.30 RO3 source	MCB

Parameters that define the use of digital inputs

The table below shows the default use of digital inputs by parameters.

Input	Parameter	Additional information
DI1	131.33 Cabinet temperature fault source	0 = overtemperature Typically this is used for monitoring the status of cabinet temperature fault.
DI2	120.12 Run enable 1 source 120.3 Ext1 in1 source	1 = run enable 1 = on
DI6	131.11 Fault reset selection	0 -> 1 = fault reset

The table below shows the common use of the remaining digital inputs in the cabinet installed drives by ABB. Note that these are no default parameters settings in the control program.

Input	Parameter	Additional information
DI4	131.32 Aux circuit breaker fault source	0 = auxiliary circuit breaker or switch open Typically this is used for monitoring the status of auxiliary circuit breaker.
DI5	131.28 Ext earth leakage signal source	0 = earth leakage current monitoring tripped
DIIL	121.5 Emergency stop source	0 = emergency stop active

For the rest of the parameters that can use digital inputs as signal source, see chapter Parameters.

Power share with droop control

If two supply units that are fed from separate transformers are connected to the same DC link, you must make sure that the power share is controlled and the system remains stable. Always use the same DC voltage reference for all units. Use also the droop function in all units.

The droop function stabilizes the load sharing between the units. It automatically tunes the external DC voltage reference slightly as the actual load of the unit varies: it changes the reference in the generating mode and in the motoring mode. See the diagram below. When the droop is active in all units, their reference corrections help in finding the right load balance and remain it automatically.

With the droop control enabled, two supply units can control the same DC link voltage. DC voltage reference droop is implemented by modifying the DC link voltage reference depending on actual power with droop rate. The droop increases the DC link voltage in generator-side and decreases it in motoring side. Droop control is defined by parameters 123.30 Udc-ctrl droop and 123.31 Udc-ctrl drooping rate. The default drooping rate is 5% of **nominal phase peak voltage**. 5% is calculated from the maximum value of selected voltage class. For example with 380…415 V selection, 0.05 * 415/sqrt(3) * sqrt(2)=17 V. With nominal power (motoring or generating) DC voltage varies between 603…637 V when DC voltage reference is set to 620 V.

With nominal motor-side power the DC link reference is decreased:

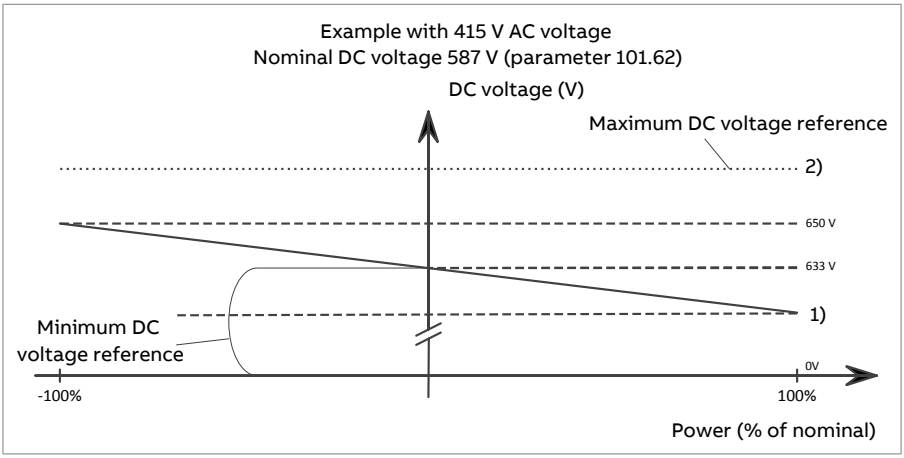
$$0.05 \cdot \sqrt{2/3} \cdot 500V \approx 20V$$

Some examples of needed marginal for DC reference with 5% drooping rate are given in the table below. See also the diagram below.

AC line voltage	DC voltage	Minimum DC voltage	Droop marginal	DC reference (see parameter 123.1)
415 V	616 V	$\sqrt{2} \cdot 415 \cdot 1.05$	17 V	616 V +17 V = 633 V
500 V	742 V	$\sqrt{2} \cdot 500 \cdot 1.05$	20 V	742 V + 20 V = 762 V
690 V	1025 V	$\sqrt{2} \cdot 690 \cdot 1.05$	28 V	1025 V + 28 V = 1053 V

If the AC grid voltage is higher, more marginal is needed since phase-to-phase peak grid voltage is the lowest DC voltage that the supply unit can produce. Producing capacitive reactive power requires DC voltage and DC voltage marginal that are higher than usual default values. See also section Reactive power control (page 32).

The following figure shows an example of drooping.



1) 616 V (calculated from nominal DC voltage with 5% modulation margin)

2) 663 V (113% of nominal DC voltage)

Difference in voltage measurements of the IGBT supply units causes error in power share between the units. This error can be corrected with parameter 123.13 DC voltage ref add. Then check with the load also. In master/follower communication the correction is done automatically when the master sends the actual value of the power to the follower.
Example: Increase the reference by 0.25 V in that IGBT supply unit that takes less power or vice versa.

See also Parallel-connected ACS880-207 IGBT supply units system description (3AXD50000032517 [English]).

Master/follower link

The supply units have a master/follower link between them. The link is built by connecting the units together with fiber optic cables. The communication on the link is based on the DDCS protocol, and there are RDCO communication modules on the control units of both supply units to organize DDCS communication.

Before start

Droop must be enabled from all supply units feeding the same DC link. See parameter 123.30 Udc-ctrl droop. When drooping is used, the user-given DC voltage reference (source 123.2 DC voltage ref selection) needs to be increased from internally calculated default value so that the droop control can decrease the DC voltage.

Settings

Parameters: 123.13 DC voltage ref add, 123.30 Udc-ctrl droop, 123.31 Udc-ctrl drooping rate

Master/follower functionality

General

The master/follower functionality can be used to link several supply units together so that the load can be evenly distributed between them.

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

The operating mode can be selected by parameter (119.12 Ext1 ctrl mode1 or 119.14 Ext2 ctrl mode1). See chapter Control locations and operating modes.

If a supply unit needs to quickly switch between master and follower statuses, one user parameter set can be saved with the master settings, another with the follower settings. The suitable settings can then be activated using eg. digital inputs. For more information on redundant system, see Parallel-connected ACS880-207 IGBT supply units system description (3AXD50000032517 [English]).

Communication

A master/follower link can be built by connecting the units together with fiber optic cables (may require additional equipment depending on existing hardware), or by wiring together the XD2D connectors of the units. The medium is selected by parameter 160.1 M/F communication port. Parameter 160.3 M/F mode defines whether the unit is the master or a follower on the communication link.

The communication on the master/follower link is based on the DDCS protocol, which employs data sets (specifically, data set 41). One data set contains three 16-bit words. The contents of the data set are freely configurable using parameters 161.1…161.3. The data set broadcast by the master typically contains the control word and the references, while the followers return a status word with two actual values.

The default setting of parameter 161.1 M/F data 1 selection is Follower CW. With this setting in the master, a word consisting of bits 0…11 of 106.1 Main control word is broadcast to the followers. However, bit 3 of the follower control word is modified so that it remains on as long as the master is modulating, and its switching to 0 causes the follower to stop modulating. This is to synchronize the stopping of both master and follower.

Three words of additional data can optionally be read from each follower. The followers from which data is read are selected by parameter 160.14 M/F follower

selection in the master. In each follower, the data to be sent is selected by parameters 161.1…161.3. The data is transferred in integer format over the link, and displayed by parameters 162.28…162.36 in the master. The data can then be forwarded to other parameters using 162.4…162.12.

To indicate faults in the followers, each follower must be configured to transmit its status word as one of the above-mentioned data words. In the master, the corresponding target parameter must be set to Follower SW. The action to be taken when a follower is faulted is selected by 160.17 Follower fault action. External events (see parameter group 131 Fault functions) can be used to indicate the status of other bits of the status word.

Construction of the master/follower link

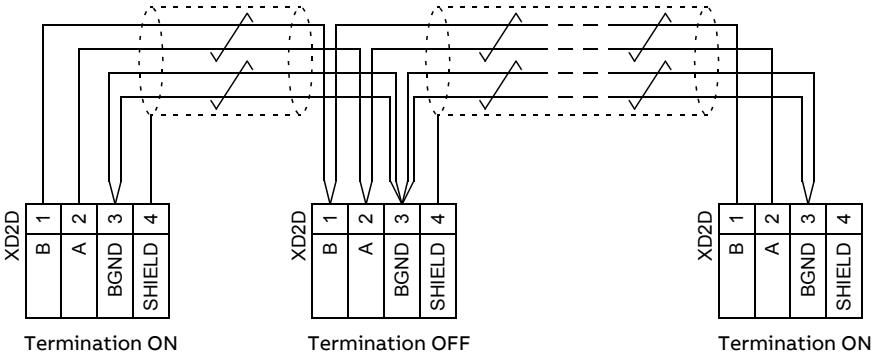
The master/follower link is formed by connecting the units together using either

- shielded twisted-pair cable between the XD2D terminals*, or
- fiber optic cables. Supply units with a ZCU control unit require an additional FDCO DDCS communication module; supply units with a UCU control unit require an RDCO or FDCO module.

*This connection cannot co-exist, and is not to be confused with drive-to-drive (D2D) communication implemented by application programming, detailed in Programming manual: Drive application programming (IEC 61131-3) (3AUA0000127808 [English]).

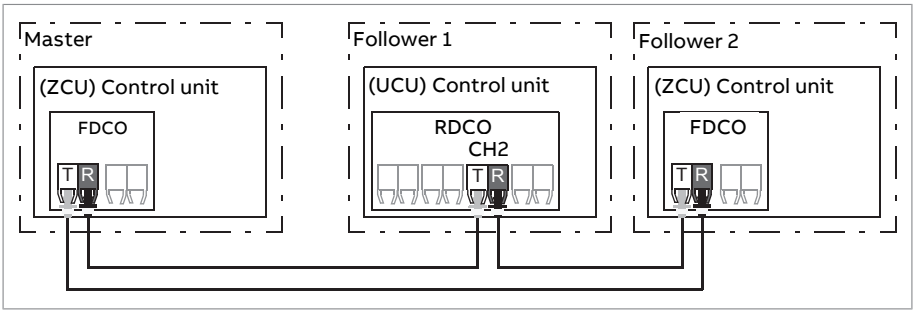
Connection examples are shown below. Note that a star configuration using fiber optic cables requires an NDBU-95C DDCS branching unit.

Master/follower wiring with electrical cable



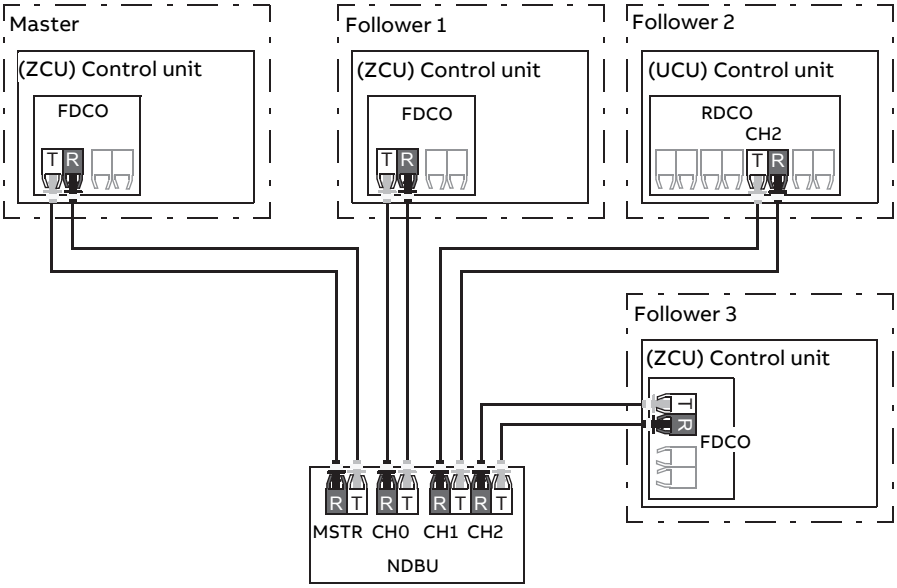
See the hardware manual of the drive for wiring and termination details.

Ring configuration with fiber optic cables



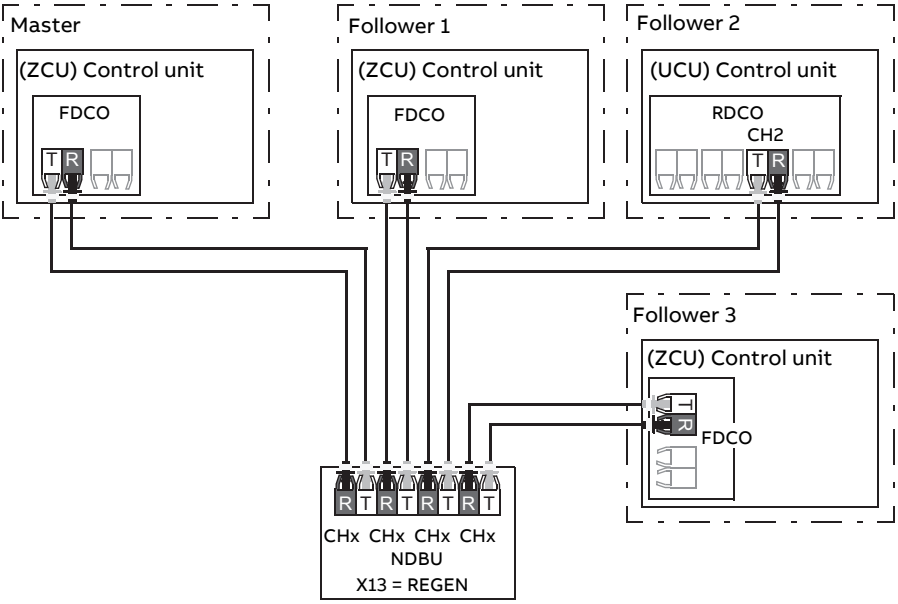
Where, T = Transmitter; R = Receiver

Star configuration with fiber optic cables (1)



Where, T = Transmitter; R = Receiver

Star configuration with fiber optic cables (2)



Where, T = Transmitter; R = Receiver

Example parameter settings

The following is a checklist of parameters that need to be set when configuring the master/follower link. In this example, the master broadcasts the Follower control word and the references. The follower returns a status word and two actual values (this is not compulsory but is shown for clarity).

Master settings:

- Master/follower link activation
  - 160.1 M/F communication port (fiber optic channel or XD2D selection)
  - (160.2 M/F node address = 1)
  - 160.3 M/F mode = DDCS master (for both fiber optic and wire connection)
  - 160.5 M/F HW connection (Ring or Star for fiber optic, Star for wire)
- Data to be broadcast to the followers
  - 161.1 M/F data 1 selection = Follower CW (Follower control word)
  - 161.2 M/F data 2 selection = Master power
- Data to be read from the followers (optional)
  - 160.14 M/F follower selection (selection of followers that data is read from)
  - 162.4 Follower node 2 data 1 sel … 162.12 Follower node 4 data 3 sel (mapping of data received from followers)

Follower settings:

- Master/follower link activation
  - 160.1 M/F communication port (fiber optic channel or XD2D selection)
  - 160.2 M/F node address = 2…60
  - 160.3 M/F mode = DDCS follower (for both fiber optic and wire connection)
  - 160.5 M/F HW connection (Ring or Star for fiber optic, Star for wire)
- Mapping of data received from master
  - 162.1 M/F data 1 selection = CW 16bit
  - 162.2 M/F data 2 selection = Ref1 16bit
  - 162.3 M/F data 3 selection = Ref2 16bit
- Selection of operating mode
  - 119.12 Ext1 ctrl mode1 = DC control
- Selection of data to be sent to master (optional)
  - 161.1 M/F data 1 selection = SW 16bit
  - 161.2 M/F data 2 selection = Act1 16bit
  - 161.3 M/F data 3 selection = Act2 16bit

Specifications of the fiber optic master/follower link

- Maximum fiber optic cable length:
  - FDCO-01/02 or RDCO-04 with POF (Plastic Optic Fiber): 30 m
  - FDCO-01/02 or RDCO-04 with HCS (Hard-clad Silica Fiber): 200 m
  - For distances up to 1000 m, use two NOCR-01 optical converter/repeaters with glass optic cable (GOF, 62.5 micrometers, Multi-Mode)
- Maximum shielded twisted-pair cable length: 50 m
- Transmission rate: 4 Mbit/s
- Total performance of the link: < 5 ms to transfer references between the master and followers
- Protocol: DDCS (Distributed Drives Communication System)

Settings and diagnostics

Parameters: parameter groups 160 DDCS communication (page 191), 161 DDCS transmit (page 198) and 162 DDCS receive (page 204)

Warnings: AE81 M/F communication loss, AE82 Follower drive failure

Faults: FE06 M/F communication loss, FE07 Follower drive failure

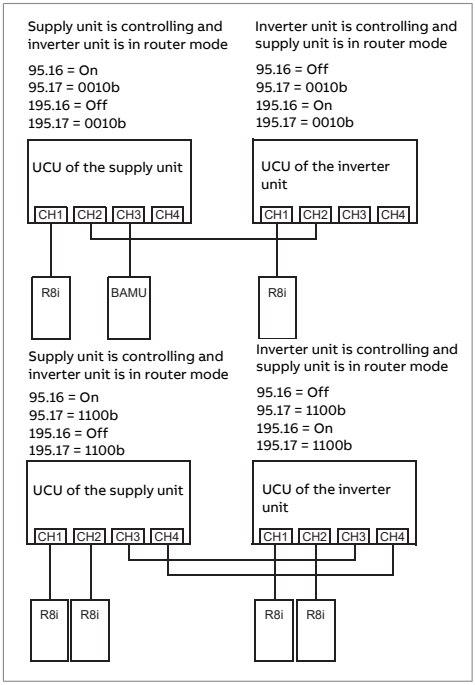
Router mode

The control unit of a supply unit can be set to a “router mode” to allow the control of locally-connected power units (for example, IGBT supply modules) by another control unit. Using the router mode and some hardware switching, it is possible to have the same modules alternate between supply and, for example, inverter use.

The router mode involves connecting the two control units together by their PSL2 channels. When router mode is active, the channels coming from the other control unit are forwarded to the local modules.

Notes:

- The local modules must be connected to successive channels starting from CH1. The immediately following channels are connected to the other control unit and routed to the local modules. The number of local modules does not have to be the same between two control units, but if BAMU board is used, equal number of power units must be connected to both control units. Example configurations are shown below.



- When BAMU board is used, it must be connected to the last channel of the control unit of the IGBT supply unit.

- The maximum number of channels is 10, and it does not increase when router mode is used.
- In PLC control, any switchovers must be done in stopped state, and so that at least one control unit is in router mode at any given time.

Settings

Parameters 195.16 Router mode and 195.17 Router channel config

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 and distributed I/O bus 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.

Similar supervisions to the ones activated from parameters 131.38 Fuse trip fault source and 131.39 Brake chopper fault source (page 165) via standard I/O can be activated also via distributed I/O.

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

BAMU measurements

BAMU auxiliary measurement unit is a multipurpose measurement unit for voltage and current measurement. Measurement settings for BAMU unit are configured with parameters of parameter group 191 BAMU configuration, and the grid signals measured by it are visible in parameter group 190 BAMU measurements.

Optimal grid control functionality is typical application that requires BAMU unit measurements. For more information, see Optimal grid control of ACS880 IGBT supply control program supplement (3AXD50000164745 [English]).

Main circuit configuration

To use BAMU unit measurements in all operation modes, user needs to define measurement locations for transformer and circuit breaker. The control program determines allowed configurations and trips the supply unit on fault in case of incorrect configuration. User can define used main circuit configuration with parameters 191.40 and 191.41.

Voltage U1 measurement is used in optimal grid control functionality to synchronize to grid and to close the main circuit breaker while converter is started. U1

measurement is also used for voltage feedback for converter. While converter is started and there is an existing grid in optimal grid converter output, voltage U2 measurement can be used for external grid synchronization between grid and external grid. User can define measurement locations for voltages U1 and U2 with parameters 191.42 and 191.43.

General rules for the settings

- If optimal grid control functionality is in use, voltage U1 measurement must be enabled with parameter 191.1 U1 measurement.
- If parameter 191.1 U1 measurement or 191.10 U2 measurement is enabled, parameters 191.40…191.43 must be set to other value than Not set.
- In optimal grid control functionality, voltage U1 measurement must be on the grid-side of the circuit breaker.
- Voltage U2 measurement cannot be on the converter-side of voltage U1 measurement.

Settings and diagnostics

Parameters: parameter groups 190 BAMU measurements and 191 BAMU configuration

Faults: 5E12 Bamu configuration

Warnings: 5E1C Bamu meas settings

Active damping

Active damping functionality improves control stability in weak grids and when the converter is supplied by a generator. When grid voltage magnitude or angle changes quickly, active damping functionality slows down DC voltage control. Active damping is used in transient situations but it does not affect normal operation in steady operating conditions.

Settings

Parameter 197.20 DC-ctrl active damping (page 228)

6

Parameters

What this chapter contains

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 drive, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset.
Def	(In the following table, shown on the same row as the parameter name) The default value of a parameter when used in the Factory macro. For information on other macro-specific parameter values, see chapter Application macros. **Note:** Certain configurations or optional equipment may require specific default values.
FbEq 16b / 32b	(In the following table, shown on the same row as the parameter range, or for each selection) The scaling between the integer used in communication and the value shown on the panel when a 16-bit value is selected for transmission to an external system. The scaling is indicated for both 16-bit and 32-bit values.
Other	The value is taken from another parameter. Choosing “Other” displays a parameter list in which the user can specify the source parameter.

Term	Definition
Other [bit]	The 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.
Parameter	Either a user-adjustable operating instruction for the drive, or an actual signal.
p.u.	Per unit
[parameter number in square brackets]	The value of the parameter.

Reserved digital inputs and relay outputs

For the cabinet-installed unit, digital inputs and relay outputs are typically defined in use and connected to the appropriate control circuits already at the factory. Do not change the settings of the reserved digital inputs or relay outputs. See the delivery-specific circuit diagrams and section Default I/O diagram of the supply control unit (page 48).

Parameter group summary

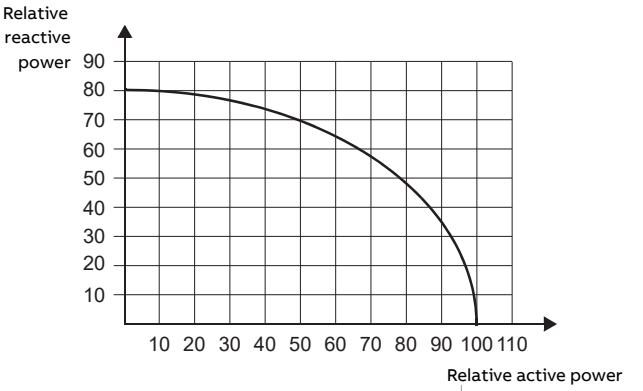
Group	Contents	Page
101 Actual values	Basic signals for monitoring of the IGBT supply unit.	*66*
103 Input references	Values of references received from various sources.	*69*
104 Warnings and faults	Information on warnings and faults that occurred last.	*70*
105 Diagnostics	Various run-time-type counters and measurements related to IGBT supply unit maintenance.	*77*
106 Control and status words	Control and status words.	*78*
107 System info	Hardware and firmware information.	*86*
110 Standard DI, RO	Configuration of digital inputs and relay outputs.	*87*
111 Standard DIO, FI, FO	Configuration of digital input/outputs and frequency inputs/outputs.	*93*
112 Standard AI	Configuration of standard analog inputs.	*96*
113 Standard AO	Configuration of analog outputs.	*100*
114 Extension I/O module 1	Configuration of I/O extension module 1.	*104*
115 Extension I/O module 2	Configuration of I/O extension module 2.	*128*
116 Extension I/O module 3	Configuration of I/O extension module 3.	*133*
119 Operation mode	Selection of external control location sources and operating modes.	*139*
120 Start/stop	Start/stop and run/start enable signal source selection; charging settings.	*140*
121 Start/stop mode	Emergency stop settings.	*146*

Group	Contents	Page
122 Power reference	Settings of the active power reference chain.	*146*
123 DC voltage reference	Settings of the DC voltage reference chain.	*149*
124 Reactive power reference	Settings of the reactive power reference chain.	*150*
130 Limits	Operation limits of the IGBT supply unit.	*154*
131 Fault functions	Settings that define the behavior of the IGBT supply unit upon fault situations.	*159*
133 Generic timer & counter	Configuration of maintenance timers/counters.	*166*
136 Load analyzer	Peak value and amplitude logger settings.	*172*
146 Monitoring settings	Scaling settings.	*176*
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.	*176*
149 Panel port communication	Communication settings for the control panel port.	*179*
150 FBA	General settings for fieldbus communication configuration.	*180*
151 FBA A settings	Fieldbus adapter A configuration.	*186*
152 FBA A data in	Selection of data to be transferred from IGBT supply unit to fieldbus controller through fieldbus adapter A.	*187*
153 FBA A data out	Selection of data to be transferred from fieldbus controller to IGBT supply unit through fieldbus adapter A.	*188*
154 FBA B settings	Fieldbus adapter B configuration.	*189*
155 FBA B data in	Selection of data to be transferred from IGBT supply unit to fieldbus controller through fieldbus adapter B.	*190*
156 FBA B data out	Selection of data to be transferred from fieldbus controller to IGBT supply unit through fieldbus adapter B.	*191*
160 DDCS communication	DDCS communication configuration.	*191*
161 DDCS transmit	Defines the data sent to the DDCS link.	*198*
162 DDCS receive	Mapping of data received through the DDCS link.	*204*
190 BAMU measurements	Grid measurement signals from BAMU measurement unit.	*213*
191 BAMU configuration	Settings for BAMU measurement unit.	*214*
195 HW configuration	Various hardware-related settings.	*216*
196 System	Language selection; parameter save and restore; control unit reboot; user lock.	*221*
197 Grid control	Configuration of the active damping functionality.	*228*
199 Off grid configuration	Configuration of the optimal grid control functionality.	*228*
206 I/O bus configuration	Distributed I/O bus settings.	*229*
207 I/O bus service	Distributed I/O bus settings.	*229*
208 I/O bus diagnostics	Distributed I/O bus settings.	*229*
209 I/O bus fan identification	Distributed I/O bus settings.	*229*

Parameter listing

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
101	**Actual values**	Basic signals for monitoring of the IGBT supply unit. All parameters in this group are read-only unless otherwise noted.	
101.1	DC voltage	Measured intermediate circuit voltage in Volts.	- / real32
	0.00 ... 2000.00 V	Measured intermediate circuit voltage. *16-bit scaling defined by parameter 146.4.	*1 = 1 V / 1 = 1 V
101.2	Line current	Estimated line current in Amperes.	- / real32
	0.00 ... 30000.00 A	Estimated line current.	1 = 1 A / 1 = 1 A
101.3	Line current %	Estimated line current in percent of the nominal value.	- / real32
	0.0 ... 1000.0%	Estimated line current in percent of the nominal value.	1 = 1% / 1 = 1%
101.4	Active current	Estimated fundamental frequency active current in Amperes.	- / real32
	-30000.00 ... 30000.00 A	Estimated fundamental frequency active current. *16-bit scaling defined by parameter 146.1.	*1 = 1 A / 1 = 1 A
101.5	Active current %	Estimated active current in percent of the nominal value.	- / real32
	-1000.0 ... 1000.0%	Estimated active current in percent of the nominal value.	1 = 1% / 1 = 1%
101.6	Reactive current	Estimated reactive current in Amperes.	- / real32
	-30000.00 ... 30000.00 A	Estimated reactive current. *16-bit scaling defined by parameter 146.2.	*1 = 1 A / 1 = 1 A
101.7	Reactive current %	Estimated reactive current in percent of the nominal value.	- / real32
	-1000.0 ... 1000.0%	Estimated reactive current in percent of the nominal value.	1 = 1% / 1 = 1%
101.8	Frequency	Estimated frequency of power supply network.	- / real32
	0.00 ... 100.00 Hz	Estimated frequency of power supply network.	100 = 1 Hz / 1 = 1 Hz
101.9	Grid voltage	Estimated voltage of power supply network in Volts.	- / real32
	0.00 ... 30000.00 V	Estimated voltage of power supply network.	1 = 1 V / 1 = 1 V
101.10	Apparent power	Estimated apparent power in kVA.	- / real32
	-30000.00 ... 30000.00 kVA	Estimated apparent power.	1 = 1 kVA / 1 = 1 kVA
101.11	Apparent power %	Estimated apparent power in percent of the nominal value.	- / real32
	-1000.0 ... 1000.0%	Estimated apparent power in percent of the nominal value.	1 = 1% / 1 = 1%
101.12	Power	Estimated IGBT supply unit fundamental frequency power in kW. Sign can be changed with parameter 130.47 Power sign change. (positive = power flow from power supply network to intermediate circuit,	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		negative = power flow from intermediate circuit to power supply network)	
	-30000.00 ... 30000.00 kW	Estimated IGBT supply unit fundamental frequency power. *16-bit scaling defined by parameter 146.1.	*1 = 1 kW / 1 = 1 kW
101.13	Power %	Estimated fundamental frequency input power in percent of the nominal value.	- / real32
	-1000.0 ... 1000.0%	Estimated fundamental frequency input power in percent of the nominal value.	1 = 1% / 1 = 1%
101.14	Reactive power	Estimated reactive power in kVAr. (positive = capacitive, negative = inductive)	- / real32
	-30000.00 ... 30000.00 kVAr	Estimated reactive power. *16-bit scaling defined by parameter 146.2.	*1 = 1 kVAr / 1 = 1 kVAr
101.15	Reactive power %	Estimated reactive power in percent.	- / real32
	-1000.0 ... 1000.0%	Estimated reactive power in percent.	1 = 1% / 1 = 1%
101.16	CosPhi	Cos phi.	- / real32
	-1.00 ... 1.00	Cos phi.	100 = 1 / 1 = 1
101.20	Converter current	Measured converter module current in Amperes.	- / real32
	0.00 ... 30000.00 A	Measured converter module current.	1 = 1 A / 1 = 1 A
101.21	Converter current %	Measured converter module current in percent.	- / real32
	0.0 ... 1000.0%	Measured converter module current in percent.	1 = 1% / 1 = 1%
101.22	kWh supply	Counts the net kWh. Motoring side minus generating side.	- / real32
	-1000 ... 1000 kWh	kWh value.	10 = 1 kWh / 1 = 1 kWh
101.23	MWh supply	Counts the net MWh. Motoring side minus generating side.	- / int16
	-1000 ... 1000 MWh	MWh value.	1 = 1 MWh / 1 = 1 MWh
101.24	GWh supply	Counts the net GWh. Motoring side minus generating side.	- / int16
	-32768 ... 32767 GWh	GWh value.	1 = 1 GWh / 1 = 1 GWh
101.25	kWh motoring	Counts kWh for motoring side.	- / real32
	0 ... 1000 kWh	kWh value.	10 = 1 kWh / 1 = 1 kWh
101.26	MWh motoring	Counts MWh for motoring side.	- / int16
	0 ... 1000 MWh	MWh value.	1 = 1 MWh / 1 = 1 MWh
101.27	GWh motoring	Counts the motoring side GWh.	- / int16
	0 ... 32767 GWh	GWh value.	1 = 1 GWh / 1 = 1 GWh
101.28	kWh generating	Counts kWh for generating side.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0 ... 1000 kWh	kWh value.	10 = 1 kWh / 1 = 1 kWh
101.29	MWh generating	Counts MWh for generating side.	- / int16
	0 ... 1000 MWh	MWh value.	1 = 1 MWh / 1 = 1 MWh
101.30	GWh generating	Counts the generating side GWh.	- / int16
	0 ... 32767 GWh	GWh value.	1 = 1 GWh / 1 = 1 GWh
101.31	Ambient temperature	Temperature of module incoming air [°C].	- / real32
	0.0 ... 100.0 C	Ambient temperature.	1 = 1 C / 1 = 1 C
101.33	Reactive power reserve	Calculates reactive power reserve based on nominal power and active power. Maximum reserve in no-load situation is 80% of nominal power. The figure below shows the capacity to produce reactive power relative to nominal power. 	- / real32
	-30000.00 ... 30000.00 kVAr	Reactive power.	1 = 1 kVAr / 1 = 1 kVAr
101.61	Nominal supply voltage	Nominal supply voltage of the converter [V].	- / real32
	0 ... 2000 V	Nominal supply voltage.	1 = 1 V / 1 = 1 V
101.62	Nominal DC voltage	Nominal DC voltage of the converter [V].	- / real32
	0 ... 2000 V	Nominal DC voltage.	1 = 1 V / 1 = 1 V
101.63	Nominal current	Nominal current from the supply modules before LCL filter [A].	- / real32
	0 ... 30000 A	Nominal current.	1 = 1 A / 1 = 1 A
101.64	Nominal power	Nominal power of the converter [V].	- / real32
	0 ... 30000 kW	Nominal power.	1 = 1 kW / 1 = 1 kW

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
101.70	Ambient temperature %	Ambient temperature of supply unit in percent. 0…100% corresponds to 0…60 °C or 32…140 °F. See also 101.31 Ambient temperature.	0.00% / real32
	-200.00 ... 200.00%	Ambient temperature in percent.	1 = 1% / 1 = 1%

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
103	**Input references**	Values of references received from various sources. All parameters in this group are read-only unless otherwise noted.	
103.1	Panel reference	Reference 1 given from the control panel.	0.00 / real32
	-100000.00 ... 100000.00	Control panel reference.	1 = 10 / 1 = 1
103.5	FB A reference 1	Scaled fieldbus A reference 1.	0.00 / real32
	-100000.00 ... 100000.00	Fieldbus A reference 1.	1 = 10 / 1 = 1
103.6	FB A reference 2	Scaled fieldbus A reference 2.	0.00 / real32
	-100000.00 ... 100000.00	Fieldbus A reference 2.	1 = 10 / 1 = 1
103.7	FB B reference 1	Scaled fieldbus B reference 1.	0.00 / real32
	-100000.00 ... 100000.00	Fieldbus B reference 1.	1 = 10 / 1 = 1
103.8	FB B reference 2	Scaled fieldbus B reference 2.	0.00 / real32
	-100000.00 ... 100000.00	Fieldbus B reference 2.	1 = 10 / 1 = 1
103.11	DDCS controller ref 1	Reference 1 received from the external (DDCS) controller. The value has been scaled according to parameter 160.60 DDCS controller ref1 type. See also section Setting up communication through inverter unit (page 275).	- / real32
	-30000.00 ... 30000.00	Scaled reference 1 received from external controller.	1 = 10 / 1 = 1
103.12	DDCS controller ref 2	Reference 2 received from the external (DDCS) controller. The value has been scaled according to parameter 160.61 DDCS controller ref2 type. See also section Setting up communication through inverter unit (page 275).	- / real32
	-30000.00 ... 30000.00	Scaled reference 2 received from external controller.	1 = 10 / 1 = 1
103.13	M/F or D2D ref1	Master/follower reference 1 received from the master. The value has been scaled according to parameter 160.10 M/F ref1 type. See also section Master/follower functionality (page 55).	- / real32
	-30000.00 ... 30000.00	Scaled reference 1 received from master.	1 = 10 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
103.14	M/F or D2D ref2	Master/follower reference 2 received from the master. The value has been scaled according to parameter 160.11 M/F ref2 type.	- / real32
	-30000.00 ... 30000.00	Scaled reference 2 received from master.	1 = 10 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
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.	
104.1	Tripping fault	Code of the 1st active fault (the fault that caused the current trip).	0 / uint16
	0000...FFFFh	1st active fault.	1 = 1
104.2	Active fault 2	Code of the 2nd active fault.	0 / uint16
	0000...FFFFh	2nd active fault.	1 = 1
104.3	Active fault 3	Code of the 3rd active fault.	0 / uint16
	0000...FFFFh	3rd active fault.	1 = 1
104.4	Active fault 4	Code of the 4th active fault.	0 / uint16
	0000...FFFFh	4th active fault.	1 = 1
104.5	Active fault 5	Code of the 5th active fault.	0 / uint16
	0000...FFFFh	5th active fault.	1 = 1
104.6	Active warning 1	Code of the 1st active warning.	0 / uint16
	0000...FFFFh	1st active warning.	1 = 1
104.7	Active warning 2	Code of the 2nd active warning.	0 / uint16
	0000...FFFFh	2nd active warning.	1 = 1
104.8	Active warning 3	Code of the 3rd active warning.	0 / uint16
	0000...FFFFh	3rd active warning.	1 = 1
104.9	Active warning 4	Code of the 4th active warning.	0 / uint16
	0000...FFFFh	4th active warning.	1 = 1
104.10	Active warning 5	Code of the 5th active warning.	0 / uint16
	0000...FFFFh	5th active warning.	1 = 1
104.11	Latest fault	Code of the 1st stored (non-active) fault.	0 / uint16
	0000...FFFFh	1st stored fault.	1 = 1
104.12	2nd latest fault	Code of the 2nd stored (non-active) fault.	0 / uint16
	0000...FFFFh	2nd stored fault.	1 = 1
104.13	3rd latest fault	Code of the 3rd stored (non-active) fault.	0 / uint16
	0000...FFFFh	3rd stored fault.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
104.14	4th latest fault	Code of the 4th stored (non-active) fault.	0 / uint16
	0000…FFFFh	4th stored fault.	1 = 1
104.15	5th latest fault	Code of the 5th stored (non-active) fault.	0 / uint16
	0000…FFFFh	5th stored fault.	1 = 1
104.16	Latest warning	Code of the 1st stored (non-active) warning.	0 / uint16
	0000…FFFFh	1st stored warning.	1 = 1
104.17	2nd latest warning	Code of the 2nd stored (non-active) warning.	0 / uint16
	0000…FFFFh	2nd stored warning.	1 = 1
104.18	3rd latest warning	Code of the 3rd stored (non-active) warning.	0 / uint16
	0000…FFFFh	3rd stored warning.	1 = 1
104.19	4th latest warning	Code of the 4th stored (non-active) warning.	0 / uint16
	0000…FFFFh	4th stored warning.	1 = 1
104.20	5th latest warning	Code of the 5th stored (non-active) warning.	0 / uint16
	0000…FFFFh	5th stored warning.	1 = 1
104.21	Fault word 1	A 16-bit unsigned data word indicating predefined events. See section Fault and warning words (page 234).	- / uint16
b0	LSU charging (3E08)	LSU charging (3E08)	
b1	Overcurrent (2E00)	Overcurrent (2E00)	
b2	External earth leakage (2E08)	External earth leakage (2E08)	
b3	Power unit temperature (CFD1)	Power unit temperature (several events, see page 234)	
b4	Auxiliary circuit Breaker (5E13)	Auxiliary circuit Breaker (5E13)	
b5	Fan failure (4E06)	Fan failure (4E06)	
b6	Main contactor (5E06)	Main contactor (5E06)	
b7	Short circuit (2E02)	Short circuit (2E02)	
b8	Internal system fault (CFD2)	Internal system fault (several events, see page 234)	
b9	Net lost (8E07)	Net lost (8E07)	
b10	Field bus comm (CFD3)	Field bus comm (several events, see page 234)	
b11	External fault 1 (9E01)	External fault 1 (9E01)	
b12	Earth leakage (2E01)	Earth leakage (2E01)	
b13	Synchronization fault (6E19)	Synchronization fault (6E19)	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b14	Undervoltage (3E05)	Undervoltage (3E05)	
b15	Overvoltage (3E04)	Overvoltage (3E04)	
	0000h…FFFFh		1 = 1
104.31	Warning word 1	A 16-bit unsigned data word indicating predefined events. See section Fault and warning words (page 234).	- / uint16
b0	Field bus comm (CFD4)	Field bus comm (several events, see page 234)	
b1	Panel loss (AE3E)	Panel loss (AE3E)	
b2	Fan (AE73)	Fan (AE73)	
b3	Reserved		
b4	Power unit temperature (CFD5)	Power unit temperature (several events, see page 234)	
b5	External warning 5 (AE55)	External warning 5 (AE55)	
b6…9	Reserved		
b10	Net lost (AE78)	Net lost (AE78)	
b11	External warning 2 (AE52)	External warning 2 (AE52)	
b12	Reserved		
b13	Earth leakage (AE02)	Earth leakage (AE02)	
b14	External warning 3 (AE53)	External warning 3 (AE53)	
b15	External warning 4 (AE54)	External warning 4 (AE54)	
	0000h…FFFFh		1 = 1
104.40	Event word 1	A 16-bit unsigned data word indicating customer-selected events. For each bit, there are two programming parameters which event code and optionally auxiliary code activates the bit. Bit value false = no fault or warning Bit value true = selected event fault or warning is active	- / uint16
b0	User bit 0	1 = Event selected by parameters 104.41 (and 104.42) is active.	
b1	User bit 1	1 = Event selected by parameters 104.43 (and 104.44) is active.	
b2	User bit 2	1 = Event selected by parameters 104.45 (and 104.46) is active.	
b3	User bit 3	1 = Event selected by parameters 104.47 (and 104.48) is active.	
b4	User bit 4	1 = Event selected by parameters 104.49 (and 104.50) is active.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b5	User bit 5	1 = Event selected by parameters 104.51 (and 104.52) is active.	
b6	User bit 6	1 = Event selected by parameters 104.53 (and 104.54) is active.	
b7	User bit 7	1 = Event selected by parameters 104.55 (and 104.56) is active.	
b8	User bit 8	1 = Event selected by parameters 104.57 (and 104.58) is active.	
b9	User bit 9	1 = Event selected by parameters 104.59 (and 104.60) is active.	
b10	User bit 10	1 = Event selected by parameters 104.61 (and 104.62) is active.	
b11	User bit 11	1 = Event selected by parameters 104.63 (and 104.64) is active.	
b12	User bit 12	1 = Event selected by parameters 104.65 (and 104.66) is active.	
b13	User bit 13	1 = Event selected by parameters 104.67 (and 104.68) is active.	
b14	User bit 14	1 = Event selected by parameters 104.69 (and 104.70) is active.	
b15	User bit 15	1 = Event selected by parameters 104.71 (and 104.72) is active.	
	0000h...FFFFh		1 = 1
104.41	Event word 1 bit 0 code	Defines a user-selected event code that activates bit 0 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.42	Event word 1 bit 0 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.41 Event word 1 bit 0 code. Parameter 104.41 Event word 1 bit 0 codeactivates bit 0 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1
104.43	Event word 1 bit 1 code	Defines a user-selected event code that activates bit 1 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.44	Event word 1 bit 1 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.43 Event word 1 bit 1 code. Parameter 104.43 Event word 1 bit 1 code activates bit 1 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
104.45	Event word 1 bit 2 code	Defines a user-selected event code that activates bit 2 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.46	Event word 1 bit 2 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.45 Event word 1 bit 2 code. Parameter 104.45 Event word 1 bit 2 code activates bit 2 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.47	Event word 1 bit 3 code	Defines a user-selected event code that activates bit 3 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.48	Event word 1 bit 3 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.47 Event word 1 bit 3 code. Parameter 104.47 Event word 1 bit 3 code activates bit 3 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.49	Event word 1 bit 4 code	Defines a user-selected event code that activates bit 4 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.50	Event word 1 bit 4 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.49 Event word 1 bit 4 code. Parameter 104.49 Event word 1 bit 4 code activates bit 4 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.51	Event word 1 bit 5 code	Defines a user-selected event code that activates bit 5 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.52	Event word 1 bit 5 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.51 Event word 1 bit 5 code. Parameter 104.51 Event word 1 bit 5 code activates bit 5 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.53	Event word 1 bit 6 code	Defines a user-selected event code that activates bit 6 in parameter 104.40 Event word 1 if the event is active.	0 / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0000...FFFFh	Event code.	1 = 1
104.54	Event word 1 bit 6 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.53 Event word 1 bit 6 code. Parameter 104.53 Event word 1 bit 6 code activates bit 6 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1
104.55	Event word 1 bit 7 code	Defines a user-selected event code that activates bit 7 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.56	Event word 1 bit 7 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.55 Event word 1 bit 7 code. Parameter 104.55 Event word 1 bit 7 code activates bit 7 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1
104.57	Event word 1 bit 8 code	Defines a user-selected event code that activates bit 8 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.58	Event word 1 bit 8 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.57 Event word 1 bit 8 code. Parameter 104.57 Event word 1 bit 8 code activates bit 8 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1
104.59	Event word 1 bit 9 code	Defines a user-selected event code that activates bit 9 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.60	Event word 1 bit 9 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.59 Event word 1 bit 9 code. Parameter 104.59 Event word 1 bit 9 code activates bit 9 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000...FFFFh	Auxiliary code.	1 = 1
104.61	Event word 1 bit 10 code	Defines a user-selected event code that activates bit 10 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000...FFFFh	Event code.	1 = 1
104.62	Event word 1 bit 10 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.61 Event word 1 bit	0 / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		10 code Parameter 104.61 Event word 1 bit 10 codeactivates bit 10 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	
	0000…FFFFh	Auxiliary code.	1 = 1
104.63	Event word 1 bit 11 code	Defines a user-selected event code that activates bit 11 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.64	Event word 1 bit 11 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.63 Event word 1 bit 11 code. Parameter 104.63 Event word 1 bit 11 code activates bit 11 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.65	Event word 1 bit 12 code	Defines a user-selected event code that activates bit 12 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.66	Event word 1 bit 12 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.65 Event word 1 bit 12 code. Parameter 104.65 Event word 1 bit 12 code activates bit 12 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.67	Event word 1 bit 13 code	Defines a user-selected event code that activates bit 13 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.68	Event word 1 bit 13 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.67 Event word 1 bit 13 code. Parameter 104.67 Event word 1 bit 13 code activates bit 13 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1
104.69	Event word 1 bit 14 code	Defines a user-selected event code that activates bit 14 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.70	Event word 1 bit 14 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.69 Event word 1 bit 14 code. Parameter 104.69 Event word 1 bit 14 code activates bit 14 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0000…FFFFh	Auxiliary code.	1 = 1
104.71	Event word 1 bit 15 code	Defines a user-selected event code that activates bit 15 in parameter 104.40 Event word 1 if the event is active.	0 / uint16
	0000…FFFFh	Event code.	1 = 1
104.72	Event word 1 bit 15 aux code	Defines a user-selected auxiliary code for the event code defined with parameter 104.71 Event word 1 bit 15 code. Parameter 104.71 Event word 1 bit 15 code activates bit 15 in parameter 104.40 Event word 1 if the event with defined auxiliary code is active. Value 0h means that the auxiliary code is not defined.	0 / uint32
	0000…FFFFh	Auxiliary code.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
105	**Diagnostics**	Various run-time-type counters and measurements related to IGBT supply unit maintenance. All parameters in this group are read-only unless otherwise noted.	
105.1	On-time counter	On-time counter. The counter runs when the IGBT supply unit is powered.	0 d / uint16
	0 ... 65535 d	On-time counter.	1 = 1 d / 1 = 1 d
105.2	Run-time counter	Run-time counter. The counter runs when the IGBT supply unit modulates.	0 d / uint16
	0 ... 65535 d	Run-time counter.	1 = 1 d / 1 = 1 d
105.4	Main fan on-time counter	Running time of the cooling fan. Can be reset on the control panel by keeping Reset depressed for over 3 seconds. After reset, a new fan ID run is performed.	0 d / uint16
	0 ... 65535 d	Cooling fan run-time counter.	1 = 1 d / 1 = 1 d
105.9	Time from power-up	500-microsecond ticks elapsed since the last boot of the control unit.	- / uint32
	0 ... 2147483647	500-microsecond ticks since last boot.	1 = 1 / 1 = 1
105.10	Control board temperature	Displays the actual temperature on the surface of the control board.	- / real32
	-50 ... 150 C	Board temperature on degrees Celsius.	1 = 1 C / 1 = 1 C
105.11	Converter temperature %	Estimated converter temperature in percent of fault limit. Actual trip temperature varies according to the type of the drive. Estimated temperature is determined as function of current and switching frequency. 0.0% = 0 °C (32 °F) 94% approx. = Warning limit 100.0% = Fault limit	- / real32
	-40.0 ... 160.0%	Converter temperature in percent.	100 = 1% / 100 = 1%
105.18	Control board humidity	Displays the actual humidity value on the surface of the control board.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0 ... 100%	Humidity on the surface of the control board in percent.	1 = 1% / 1 = 1%
105.21	MCB closing time counter	Counts the closures of the main circuit breaker (MCB). This parameter can be used for maintenance purposes. Depending on application, the maintenance interval of the main circuit breaker may vary. See the maintenance instructions of the main circuit breaker.	- / uint32
	0 ... 4294967295	Count of closures of main circuit breaker.	1 = 1 / 1 = 1
105.22	Charging relay operation counter	Counts the closures of charging relay. This parameter can be used for maintenance purposes. Depending on application, the maintenance interval of the charging relay may vary.	- / uint32
	0 ... 4294967295	Count of closures of charging relay.	1 = 1 / 1 = 1
105.70	LCL-filter capacitance estimation	Enabled/disables LCL filter capacitance estimation. When capacitance estimation is enabled, the drive periodically adds a small excitation signal to converter output voltage when running to estimate the LCL filter capacitance. The estimated capacitance is used to determine if the filter needs to be replaced. The estimation is done once an hour and each estimation takes a few seconds.	Enable without events / uint16
	Disable	LCL filter capacitance estimation disabled.	0
	Enable	LCL filter capacitance estimation enabled.	1
	Enable without events	LCL filter capacitance estimation enabled, but no events are generated.	2
105.71	LCL-filter capacitor condition	Defines the capacitor condition as minimum / maximum of estimated capacitance. The minimum and maximum are moving averages over 24h period. If the estimated capacitance decreases below limit, the supply unit generates warning A8C3 Low LCL-filter capacitance.	100.0% / real32
	0.0 ... 100.0%	Capacitor condition as minimum / maximum of estimated capacitance.	1 = 1% / 1 = 1%

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
106	**Control and status words**	Control and status words.	
106.1	Main control word	The main control word of the IGBT supply unit. This parameter shows the control signals as received from the selected sources (such as digital inputs, the fieldbus interfaces and the application program). The bit assignments are described on page 269. The related status word and state diagram are presented on pages 271 and 272 respectively. This parameter is read-only.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
106.2	Application control word	The control word received from the application program (if any). This parameter is read-only. The bit assignments of the word are as described on page 269.	- / uint16
106.3	FBA A transparent control word	Displays the unaltered control word received from the PLC through fieldbus adapter A when a transparent communication profile is selected eg. by parameter group 151 FBA A settings. See section Control word and Status word (page 265). This parameter is read-only.	0 / uint32
	00000000...FFFFFFFFh	The control word received through fieldbus adapter A.	1 = 1
106.4	FBA B transparent control word	Displays the unaltered control word received from the PLC through fieldbus adapter B when a transparent communication profile is selected eg. by parameter group 154 FBA B settings. See section Control word and Status word (page 265). This parameter is read-only.	0 / uint32
	00000000...FFFFFFFFh	Control word received through fieldbus adapter B.	1 = 1
106.11	Main status word	Main status word of the IGBT supply unit. The bit assignments are described on page 271. The related control word and state diagram are presented on pages 269 and 272 respectively. This parameter is read-only.	- / uint16
106.16	Drive status word 1	Drive status word 1. This parameter is read-only.	- / uint16
b0	Enabled	1 = Run enable and start enable signals are present	
b1	Inhibited	1 = Start inhibited	
b2	Operation allowed	1 = Drive is ready to operate	
b3	Ready to start	1 = Drive is ready to receive a start command	
b4	Running	1 = Drive is ready to follow given reference	
b5	Started	1 = Drive has been started	
b6	Modulating	1 = Drive is modulating (output stage is being controlled)	
b7	Limiting	1 = Any operating limit is active	
b8	Local control	1 = Drive is in local control	
b9	Network control	1 = Drive is in network control	
b10	Ext1 active	1 = Control location Ext1 active	
b11	Ext2 active	1 = Control location Ext2 active	
b12	Charging relay	1 = Charging contactor is energized, actual state depends on the hardware topology (NO or NC).	
b13	MCB relay	1 = MCB relay is closed	
b14...15	Reserved		
	0000h...FFFFh		1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
106.17	Drive status word 2	Drive status word 2. This parameter is read-only.	- / uint16
b0	Start req final	Start req final	
b1	Supply phase order UVW	Phase order UVW is detected and the grid is rotating on expected direction.	
b2	Supply phase order UWV	Phase order UWV is detected and the grid is rotating on unexpected direction.	
b3	Reserved		
b4	Power control	Power control.	
b5	Internal UDC reference	Not in use.	
b6	Internal power reference	When the bit is set, the drive is not able to fulfill user reference and follows its internally calculated reference. The bits are updated only when the drive is modulating.	
b7	Internal reactive power reference	When the bit is set, the drive is not able to fulfill user reference and follows its internally calculated reference. The bits are updated only when the drive is modulating.	
b8…10	Reserved		
b11	Emergency stop active	1 = An emergency stop command signal is active, or the drive is stopping after receiving an emergency stop command.	
b12	Reduced run	1 = Reduced run active (see section Reduced run function (page 34))	
b13…15	Reserved		
	0000h…FFFFh		1 = 1
106.18	Start inhibit status word	Start inhibit status word. This word specifies the source of the inhibiting condition that is preventing the unit from starting. After the condition is removed, the start command must be cycled. This parameter is read-only.	- / uint16
b0	Not ready run	In AC mode, the bit is active if the DC voltage is not at warning level.	
b1	Ctrl location changed	1 = Control location has changed	
b2	SSW inhibit	1 = Control program is keeping itself in inhibited state	
b3	Fault	1 = A fault is active	
b4	Lost start enable	1 = Start enable signal missing	
b5	Lost run enable	1 = Run enable signal missing	
b6…8	Reserved		
b9	Charging overload	This bit is active only if parameter 120.50 Charging overload event sel is set to Warning.	
b10…11	Reserved		

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b12	Em Off2	1 = Emergency stop signal (mode Off2)	
b13	Em Off3	1 = Emergency stop signal (mode Off3)	
b14	Auto reset inhibit	1 = The autoreset function is inhibiting operation	
b15	Measurement configuration	Off grid configuration	
	0000h...FFFFh		1 = 1
106.25	Drive inhibit status word 2	Drive inhibit status word 2. This word specifies the source of the inhibiting condition that is preventing the unit from starting. After the condition is removed, the start command must be cycled. See also parameter 106.18 Start inhibit status word, and 106.16 Drive status word 1, bit 1. This parameter is read-only.	- / uint16
b0	Follower drive	1 = A follower is preventing the master from starting.	
b1	Application	1 = The application program is preventing the drive from starting.	
b2	Aux. power failure	1 = A control unit auxiliary power failure is preventing the drive from starting.	
b3	Encoder feedback	Reserved	
b4	Ref source parametrization	1 = A reference source parametrization conflict is preventing the drive from starting.	
b5...15	Reserved		
	0000h...FFFFh		1 = 1
106.30	MSW bit 11 sel	Selects source for the User bit 0 of 106.11 Main status word.	False / uint32
	False	0.	0
	True	1.	1
	Ext ctrl loc	Reserved	2
	Other [bit]	See Terms and abbreviations (page 63).	
106.31	MSW bit 12 sel	Selects source for the User bit 1 of 106.11 Main status word.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
106.32	MSW bit 13 sel	Selects source for the User bit 2 of 106.11 Main status word.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
106.33	MSW bit 15 sel	Selects source for the User bit 3 of 106.11 Main status word.	False / uint32
	False	0	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	True	0	1
	Other [bit]	See Terms and abbreviations (page 63).	
106.50	User status word 1	User-defined status word 1.	- / uint16
b0	User status bit 0	See 106.60 User status word 1 bit 0 sel.	
b1	User status bit 1	See 106.61 User status word 1 bit 1 sel.	
b2	User status bit 2	See 106.62 User status word 1 bit 2 sel.	
b3	User status bit 3	See 106.63 User status word 1 bit 3 sel.	
b4	User status bit 4	See 106.64 User status word 1 bit 4 sel.	
b5	User status bit 5	See 106.65 User status word 1 bit 5 sel.	
b6	User status bit 6	See 106.66 User status word 1 bit 6 sel.	
b7	User status bit 7	See 106.67 User status word 1 bit 7 sel.	
b8	User status bit 8	See 106.68 User status word 1 bit 8 sel.	
b9	User status bit 9	See 106.69 User status word 1 bit 9 sel.	
b10	User status bit 10	See 106.70 User status word 1 bit 10 sel.	
b11	User status bit 11	See 106.71 User status word 1 bit 11 sel.	
b12	User status bit 12	See 106.72 User status word 1 bit 12 sel.	
b13	User status bit 13	See 106.73 User status word 1 bit 13 sel.	
b14	User status bit 14	See 106.74 User status word 1 bit 14 sel.	
b15	User status bit 15	See 106.75 User status word 1 bit 15 sel.	
	0000h...FFFFh		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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Run disable	-	2
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Limiting	Bit 7 of 106.16 Drive status word 1	2
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
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 word 1.	False / uint32
	False	0	0
	True	1	1
	Other [bit]	See Terms and abbreviations (page 63).	
106.100	User control word 1	User-defined control word 1.	- / uint16
b0	User control word 1 bit 0 sel	User-defined bit.	
b1	User control word 1 bit 1 sel	User-defined bit.	
b2	User control word 1 bit 2 sel	User-defined bit.	
b3	User control word 1 bit 3 sel	User-defined bit.	
b4	User control word 1 bit 4 sel	User-defined bit.	
b5	User control word 1 bit 5 sel	User-defined bit.	
b6	User control word 1 bit 6 sel	User-defined bit.	

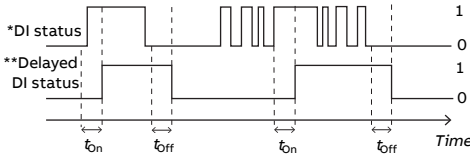
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b7	User control word 1 bit 7 sel	User-defined bit.	
b8	User control word 1 bit 8 sel	User-defined bit.	
b9	User control word 1 bit 9 sel	User-defined bit.	
b10	User control word 1 bit 10 sel	User-defined bit.	
b11	User control word 1 bit 11 sel	User-defined bit.	
b12	User control word 1 bit 12 sel	User-defined bit.	
b13	User control word 1 bit 13 sel	User-defined bit.	
b14	User control word 1 bit 14 sel	User-defined bit.	
b15	User control word 1 bit 15 sel	User-defined bit.	
	0000h…FFFFh		1 = 1
106.101	User control word 2	User-defined control word 2.	- / uint16
b0	User control word 2 bit 0 sel	User-defined bit.	
b1	User control word 2 bit 1 sel	User-defined bit.	
b2	User control word 2 bit 2 sel	User-defined bit.	
b3	User control word 2 bit 3 sel	User-defined bit.	
b4	User control word 2 bit 4 sel	User-defined bit.	
b5	User control word 2 bit 5 sel	User-defined bit.	
b6	User control word 2 bit 6 sel	User-defined bit.	
b7	User control word 2 bit 7 sel	User-defined bit.	
b8	User control word 2 bit 8 sel	User-defined bit.	
b9	User control word 2 bit 9 sel	User-defined bit.	
b10	User control word 2 bit 10 sel	User-defined bit.	
b11	User control word 2 bit 11 sel	User-defined bit.	

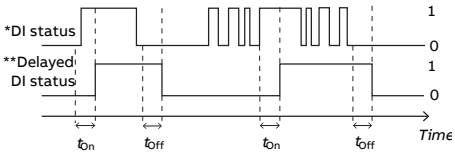
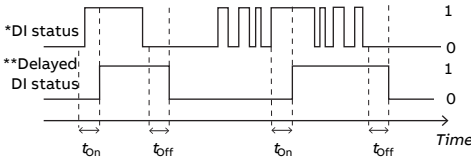
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b12	User control word 2 bit 12 sel	User-defined bit.	
b13	User control word 2 bit 13 sel	User-defined bit.	
b14	User control word 2 bit 14 sel	User-defined bit.	
b15	User control word 2 bit 15 sel	User-defined bit.	
	0000h…FFFFh		1 = 1

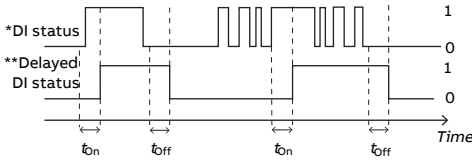
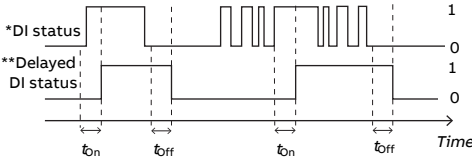
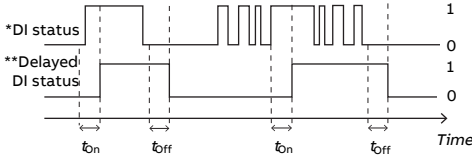
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
107	**System info**	Hardware and firmware information. All parameters in this group are read-only.	
107.3	Drive rating id	Type of the unit.	- / uint16
	0 … 65535	Type of the unit.	1 = 1 / 1 = 1
107.4	Firmware name	Firmware identification.	0 / uint32
107.5	Firmware version	Version number of the firmware.	0 / uint32
107.6	Loading package name	Name of the firmware loading package.	0 / uint32
107.7	Loading package version	Version number of the firmware loading package.	0 / uint32
107.8	Bootloader version	Version number of the firmware bootloader.	0 / uint32
107.11	Cpu usage	Microprocessor load in percent.	- / uint32
	0 … 100%	Microprocessor load.	1 = 1% / 1 = 1%
107.13	PU logic version number	The version number of the power unit FPGA logic.	- / uint16
107.14	FPGA logic version name	Version name of the FPGA logic of the control unit.	- / uint32
107.15	FPGA logic version number	Version number of the FPGA logic of the control unit.	- / uint16
107.23	Application name	First five ASCII letters of the name given to the application program in the programming tool. The full name is visible under System info on the control panel or the Drive composer PC tool. _N/A_ = None.	0 / uint32
107.24	Application version	Application program version number given to the application program in the programming tool. Also visible under System info on the control panel or the Drive composer PC tool.	0 / uint32
107.25	Customization package name	First five ASCII letters of the name given to the customization package. The full name is visible under System info on the control panel or the Drive composer PC tool. _N/A_ = None.	0 / uint32

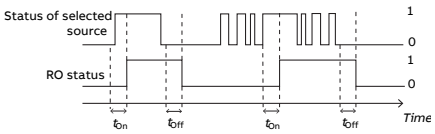
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
107.26	Customization package version	Customization package version number. Also visible under System info on the control panel or the Drive composer PC tool.	0 / uint32
107.30	Adaptive program status	Shows the status of the adaptive program. See section Adaptive programming (page 25).	- / uint16
b0	Initialized	1 = Adaptive program initialized	
b1	Editing	1 = Adaptive program is being edited	
b2	Edit done	1 = Editing of adaptive program finished	
b3	Running	1 = Adaptive program running	
b4…13	Reserved		
b14	State changing	Reserved	
b15	Faulted	1 = Error in adaptive program	
	0000h…FFFFh		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 (page 14).	0 / uint32
	0000…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 (page 14).	0 / uint32
	0000…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 (page 14).	0 / uint32
	0000…FFFFh	Device DNA bits 31…0.	1 = 1
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 (page 14).	0 / uint16
	0000…FFFFh	Removal of all active control tokens.	1 = 1

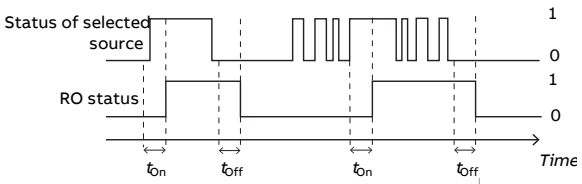
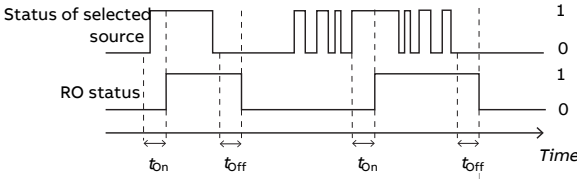
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
110	**Standard DI, RO**	Configuration of digital inputs and relay outputs.	
110.1	DI status	Displays the electrical status of digital inputs DIIL and DI6…DI1. The activation/deactivation delays of the inputs (if any are specified) are ignored. Bits 0…5 reflect the status of DI1…DI6; bit 15 reflects the status of the DIIL input. This parameter is read-only.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
110.2	DI delayed status	Displays the status of digital inputs DIIL and DI6…DI1. This word is updated only after activation/deactivation delays. Bits 0…5 reflect the delayed status of DI1…DI6; bit 15 reflects the delayed status of the DIIL input. This parameter is read-only.	- / uint16
110.3	DI force selection	Selects if the electrical statuses of digital inputs will be overridden by bits on signal 110.4 DI force data. These values overrides the electrical statuses of the digital inputs in eg. testing purposes. A bit in parameter 110.4 DI force data is provided for each digital input, and its value is applied whenever the corresponding bit in this parameter is 1.	- / uint16
b0	DI1	1 = Force DI1 to value of bit 0 of parameter 110.4 DI force data.	
b1	DI2	1 = Force DI2 to value of bit 1 of parameter 110.4 DI force data.	
b2	DI3	1 = Force DI3 to value of bit 2 of parameter 110.4 DI force data.	
b3	DI4	1 = Force DI4 to value of bit 3 of parameter 110.4 DI force data.	
b4	DI5	1 = Force DI5 to value of bit 4 of parameter 110.4 DI force data.	
b5	DI6	1 = Force DI6 to value of bit 5 of parameter 110.4 DI force data.	
b6…14	Reserved		
b15	DIIL	1 = Force DIIL to value of bit 15 of parameter 110.4 DI force data.	
	0000h…FFFFh		1 = 1
110.4	DI force data	Defines the values of digital inputs that are used instead of the electrical statuses if selected in parameter 110.3 DI force selection. Bit 0 is the forced value for DI1; bit 15 is the forced value for the DIIL input.	- / uint16
110.5	DI1 ON delay	Defines the activation delay for digital input DI1.  t_{On} = 110.5 DI1 ON delay t_{Off} = 110.6 DI1 OFF delay *Electrical status of digital input. Indicated by 110.1 DI status. **Indicated by 110.2 DI delayed status.	0.0 s / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0.0 ... 3000.0 s	Activation delay for DI1.	10 = 1 s / 1 = 1 s
110.6	DI1 OFF delay	Defines the deactivation delay for digital input DI1. See parameter 110.5 DI1 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI1.	10 = 1 s / 1 = 1 s
110.7	DI2 ON delay	Defines the activation delay for digital input DI2.  t_{On} = 110.7 DI2 ON delay t_{Off} = 110.8 DI2 OFF delay *Electrical status of digital input. Indicated by 110.1 DI status. **Indicated by 110.2 DI delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DI2.	10 = 1 s / 1 = 1 s
110.8	DI2 OFF delay	Defines the deactivation delay for digital input DI2. See parameter 110.7 DI2 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI2.	10 = 1 s / 1 = 1 s
110.9	DI3 ON delay	Defines the activation delay for digital input DI3.  t_{On} = 110.9 DI3 ON delay t_{Off} = 110.10 DI3 OFF delay *Electrical status of digital input. Indicated by 110.1 DI status. **Indicated by 110.2 DI delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DI3.	10 = 1 s / 1 = 1 s
110.10	DI3 OFF delay	Defines the deactivation delay for digital input DI3. See parameter 110.9 DI3 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI3.	10 = 1 s / 1 = 1 s

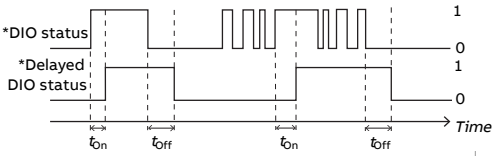
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
110.11	DI4 ON delay	Defines the activation delay for digital input DI4.  t_{On} = 110.11 DI4 ON delay t_{Off} = 110.12 DI4 OFF delay *Electrical status of digital input. Indicated by 110.1 DI status. **Indicated by 110.2 DI delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DI4.	10 = 1 s / 1 = 1 s
110.12	DI4 OFF delay	Defines the deactivation delay for digital input DI4. See parameter 110.11 DI4 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI4.	10 = 1 s / 1 = 1 s
110.13	DI5 ON delay	Defines the activation delay for digital input DI5.  t_{On} = 110.13 DI5 ON delay t_{Off} = 110.13 DI5 ON delay *Electrical status of digital input. Indicated by 110.1 DI status. **Indicated by 110.2 DI delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DI5.	10 = 1 s / 1 = 1 s
110.14	DI5 OFF delay	Defines the deactivation delay for digital input DI5. See parameter 110.13 DI5 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI5.	10 = 1 s / 1 = 1 s
110.15	DI6 ON delay	Defines the activation delay for digital input DI6.  t_{On} = 110.15 DI6 ON delay t_{Off} = 110.16 DI6 OFF delay *Electrical status of digital input. Indicated by 110.1 DI status.	0.0 s / uint32

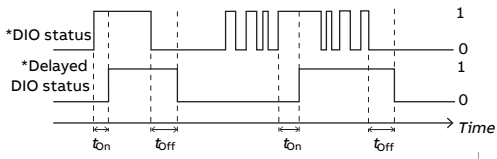
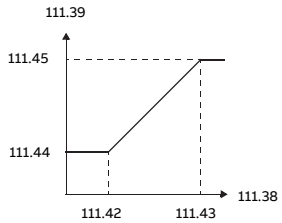
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		**Indicated by 110.2 DI delayed status.	
	0.0 ... 3000.0 s	Activation delay for DI6.	10 = 1 s / 1 = 1 s
110.16	DI6 OFF delay	Defines the deactivation delay for digital input DI6. See parameter 110.15 DI6 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DI6.	10 = 1 s / 1 = 1 s
110.21	RO status	Status of relay outputs RO3...RO1.	- / uint16
110.24	RO1 source	Selects a signal to be connected to relay output RO1. **Note:** This parameter is write-protected if parameter 120.30 External charge enable is set to Yes.	Charging / uint32
	Not energized	Relay output is not energized.	0
	Energized	Relay output is energized.	1
	Ready	Bit 0 of 106.11 Main status word. Relay is energized when the IGBT supply unit is ready.	2
	Enabled	Bit 0 of 106.16 Drive status word 1. Relay is energized when the IGBT supply unit is enabled.	4
	Started	Bit 5 of 106.16 Drive status word 1. Relay is energized when the IGBT supply unit is started.	5
	Running	Bit 4 of 106.16 Drive status word 1. Relay is energized when the IGBT supply unit is running.	6
	Warning	Bit 7 of 106.11 Main status word. Relay is energized when a warning is active.	7
	Fault	Bit 3 of 106.11 Main status word. Relay 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 Drive status word 1. Relay is energized when MCB closing command is given.	10
	Charging	Bit 12 of 106.16 Drive status word 1. Relay is energized when the external charging has charged the IGBT supply unit.	11
	Start req final	Bit 0 of 106.17 Drive status word 2.	12
	Other [bit]	See Terms and abbreviations (page 63).	
110.25	RO1 ON delay	Defines the activation delay for relay output RO1.  t_{On} = 110.25 RO1 ON delay t_{Off} = 110.26 RO1 OFF delay	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for RO1.	10 = 1 s / 1 = 1 s

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
110.26	RO1 OFF delay	Defines the deactivation delay for relay output RO1. See parameter 110.25 RO1 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for RO1.	10 = 1 s / 1 = 1 s
110.27	RO2 source	Selects a signal to be connected to relay output RO2. For the selections, see parameter 110.24 RO1 source.	Fault (-1) / uint32
110.28	RO2 ON delay	Defines the activation delay for relay output RO2.  t_{On} = 110.28 RO2 ON delay t_{Off} = 110.29 RO2 OFF delay	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for RO2.	10 = 1 s / 1 = 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 / uint32
	0.0 ... 3000.0 s	Deactivation delay for RO2.	10 = 1 s / 1 = 1 s
110.30	RO3 source	Selects a signal to be connected to relay output RO3. For the selections, see parameter 110.24 RO1 source. **Note:** This parameter is write-protected if parameter 120.30 External charge enable is set to Yes.	MCB / uint32
110.31	RO3 ON delay	Defines the activation delay for relay output RO3.  t_{On} = 110.31 RO3 ON delay t_{Off} = 110.32 RO3 OFF delay	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for RO3.	10 = 1 s / 1 = 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 / uint32
	0.0 ... 3000.0 s	Deactivation delay for RO3.	10 = 1 s / 1 = 1 s
110.51	DI filter time	Defines a filtering time for parameter 110.1 DI status. Note that this parameter has no effect on forced DI values defined by parameters 110.3 and 110.4.	10.0 ms / uint32
	0.3 ... 100.0 ms	Filtering time for 110.1.	10 = 1 ms / 1 = 1 ms

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
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.	- / uint16
b0	RO1	Source bit for relay output RO1 (see parameter 110.24).	
b1	RO2	Source bit for relay output RO2 (see parameter 110.27).	
b2	RO3	Source bit for relay output RO3 (see parameter 110.30).	
b8	DIO1	Source bit for digital input/output DIO1 (see parameter 111.6).	
b9	DIO2	Source bit for digital input/output DIO2 (see parameter 111.10).	
	0000h...FFFFh		1 = 1

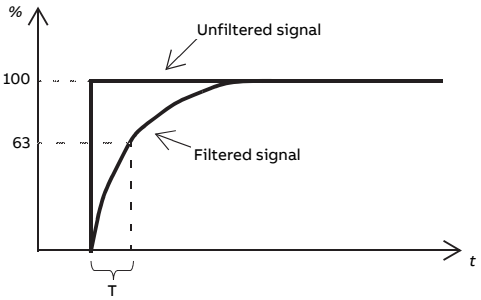
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
111	**Standard DIO, FI, FO**	Configuration of digital input/outputs and frequency inputs/outputs.	
111.1	DIO status	Displays the electrical status of digital input/outputs DIO2...DIO1. The activation/deactivation delays (if any are specified) are ignored. This parameter is read-only.	- / uint16
111.2	DIO delayed status	Displays the status of digital input/outputs DIO2...DIO1. This word is updated only after activation/deactivation (if any) delays. This parameter is read-only.	- / uint16
111.5	DIO1 function	Selects whether DIO1 is used as a digital output or input, or a frequency input.	Output / uint16
	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
111.6	DIO1 output source	Selects a signal to be connected to digital input/output DIO1 when parameter 111.5 DIO1 function is set to Output.	Charging / uint32
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready	Bit 0 of 106.11 Main status word. Output is energized when the IGBT supply unit is ready.	2
	Reserved	Reserved.	3
	Enabled	Bit 0 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is enabled.	4

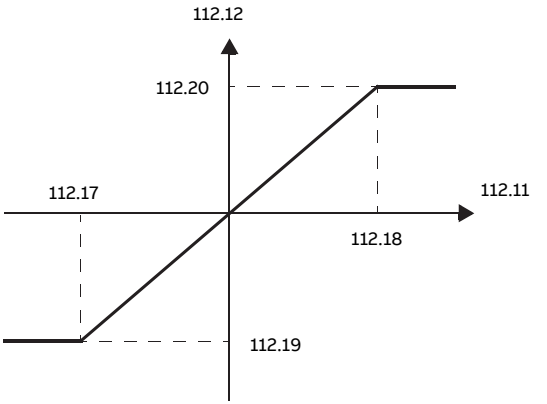
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Started	Bit 5 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is started.	5
	Running	Bit 4 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is running.	6
	Warning	Bit 7 of 106.11 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 Drive status word 1. Output is energized when MCB closing command is given.	10
	Charging	Bit 12 of 106.16 Drive status word 1. Output is energized when the external charging has charged the IGBT supply unit.	11
	Start req final	Bit 0 of 106.17 Drive status word 2	12
	Other [bit]	See Terms and abbreviations (page 63).	
111.7	DIO1 ON delay	Defines the activation delay for digital input/output DIO1 (when used as a digital output or digital input).  t_{On} = 111.7 DIO1 ON delay t_{Off} = 111.8 DIO1 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 111.1 DIO status. **Indicated by 111.2 DIO delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DIO1.	10 = 1 s / 1 = 1 s
111.8	DIO1 OFF delay	Defines the deactivation delay for digital input/output DIO1 (when used as a digital output or digital input). See parameter 111.7 DIO1 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DIO1.	10 = 1 s / 1 = 1 s
111.9	DIO2 function	Selects whether DIO2 is used as a digital output or input.	Output / uint16
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
	Frequency	DIO2 is used as a frequency output.	2
111.10	DIO2 output source	Selects a signal to be connected to digital input/output DIO2 when parameter 111.9 DIO2 function is set to Output. For selections, see parameter 111.6 DIO1 output source.	MCB / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
111.11	DIO2 ON delay	Defines the activation delay for digital input/output DIO2 (when used as a digital output or digital input).  t_{On} = 111.11 DIO2 ON delay t_{Off} = 111.12 DIO2 OFF delay *Electrical status of DIO (in input mode) or status of selected source (in output mode). Indicated by 111.1 DIO status. **Indicated by 111.2 DIO delayed status.	0.0 s / uint32
	0.0 ... 3000.0 s	Activation delay for DIO2.	10 = 1 s / 1 = 1 s
111.12	DIO2 OFF delay	Defines the deactivation delay for digital input/output DIO2 (when used as a digital output or digital input). See parameter 111.11 DIO2 ON delay.	0.0 s / uint32
	0.0 ... 3000.0 s	Deactivation delay for DIO2.	10 = 1 s / 1 = 1 s
111.38	Freq in 1 actual value	Displays the value of frequency input 1 before scaling. See parameter 111.42 Freq in 1 min. This parameter is read-only.	- / real32
	0 ... 16000 Hz	Unscaled value of frequency input 1.	1 = 1 Hz / 1 = 1 Hz
111.39	Freq in 1 scaled	Displays the value of frequency input 1 after scaling. See parameter 111.42 Freq in 1 min. This parameter is read-only.	- / real32
	-32768.000 ... 32767.000	Scaled value of frequency input 1.	1 = 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 / real32
	0 ... 16000 Hz	Minimum frequency of frequency input 1 (DIO1).	1 = 1 Hz / 1 = 1 Hz

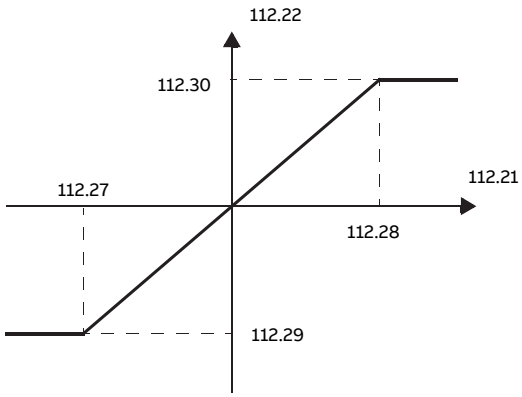
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
111.43	Freq in 1 max	Defines the maximum input frequency for frequency input 1 (DIO1 when it is used as a frequency input). See parameter 111.42 Freq in 1 min.	16000 Hz / real32
	0 ... 16000 Hz	Maximum frequency for frequency input 1 (DIO1).	1 = 1 Hz / 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 / real32
	-32768.000 ... 32767.000	Value corresponding to minimum of frequency input 1.	1 = 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.	1500.000 / real32
	-32768.000 ... 32767.000	Value corresponding to maximum of frequency input 1.	1 = 1 / 1 = 1
111.81	DIO filter time	Defines a filtering time for parameter 111.1 DIO status. The filtering time will only affect the DIOs that are in input mode.	10.0 ms / uint32
	0.3 ... 100.0 ms	Filtering time for 111.1.	10 = 1 ms / 1 = 1 ms

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
112	**Standard AI**	Configuration of standard analog inputs.	
112.1	AI tune	Triggers the analog input tuning function. Connect the signal to the input and select the appropriate tuning function.	No action / uint16
	No action	AI tune is not activated.	0
	AI1 min tune	Current analog input AI1 signal value is set as minimum value of AI1 into parameter 112.17 AI1 min. The value reverts back to No action automatically.	1
	AI1 max tune	Current analog input AI1 signal value is set as maximum value of AI1 into parameter 112.18 AI1 max. The value reverts back to No action automatically.	2
	AI2 min tune	Current analog input AI2 signal value is set as minimum value of AI2 into parameter 112.27 AI2 min. The value reverts back to No action automatically.	3
	AI2 max tune	Current analog input AI2 signal value is set as maximum value of AI2 into parameter 112.28 AI2 max. The value reverts back to No action automatically.	4
112.3	AI supervision function	Selects how the supply unit 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 112.4 AI supervision selection.	No action / uint16
	No action	No action taken.	0
	Fault	Drive trips on 8E06 AI Supervision.	1
	Warning	Drive generates an AE67 AI Supervision warning.	2

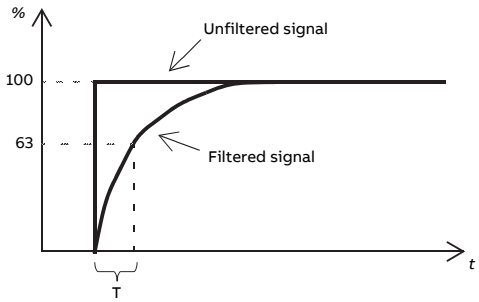
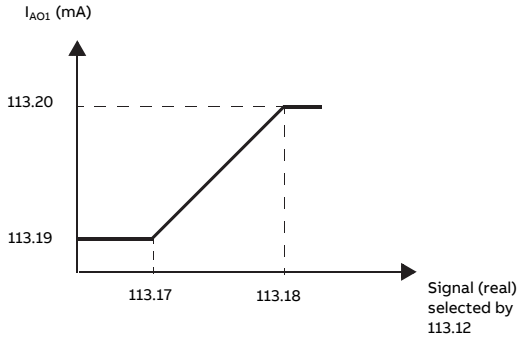
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
112.4	AI supervision selection	Specifies the analog input limits to be supervised. See parameter 112.3 AI supervision function.	- / uint16
b0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.	
b1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.	
b2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.	
b3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.	
b4…15	Reserved		
	0000h…FFFFh		1 = 1
112.11	AI1 actual value	Displays the value of analog input AI1 in mA or V (depending on whether the input is set to current or voltage by jumper J1). This parameter is read-only.	- / real32
	-22.000 ... 22.000 mA or V	Value of analog input AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
112.12	AI1 scaled value	Displays the value of analog input AI1 after scaling. See parameters 112.19 AI1 scaled at AI1 min and 112.20 AI1 scaled at AI1 max. This parameter is read-only.	- / real32
	-32768.000 ... 32767.000	Scaled value of analog input AI1.	1 = 1 / 1 = 1
112.15	AI1 unit selection	Selects the unit for readings and settings related to analog input AI1. **Note:** This setting must match the corresponding jumper setting on the control unit (see the appropriate hardware manual). Control board reboot (either by cycling the power or through parameter 196.8 Control board boot) is required to validate any changes in the jumper settings.	V / uint16
	V	Volts.	2
	mA	Milliamperes.	10
112.16	AI1 filter time	Defines the filter time constant for analog input AI1.  $O = I \times (1 - e^{-t/T})$	0.000 s / real32

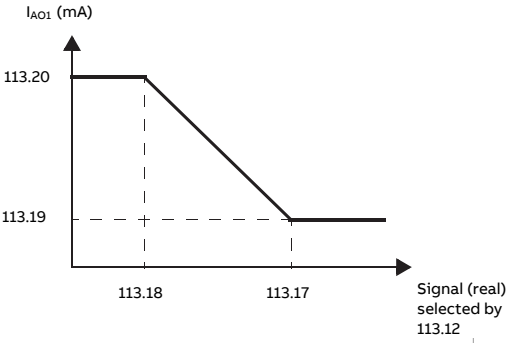
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.	
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
112.17	AI1 min	Defines the minimum value for analog input AI1.	0.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Minimum value of AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
112.18	AI1 max	Defines the maximum value for analog input AI1.	20.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Maximum value of AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
112.19	AI1 scaled at AI1 min	Defines the real value that corresponds to the minimum analog input AI1 value defined by parameter 112.17 AI1 min.  	0.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to minimum AI1 value.	1 = 1 / 1 = 1
112.20	AI1 scaled at AI1 max	Defines the real 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.	0.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to maximum AI1 value.	1 = 1 / 1 = 1

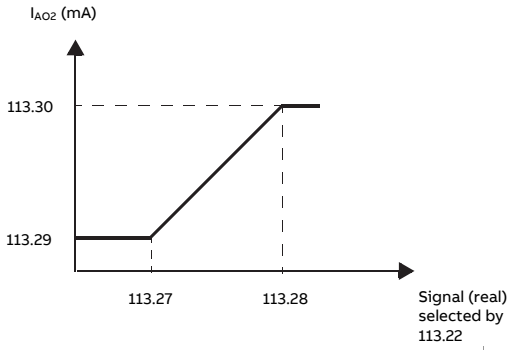
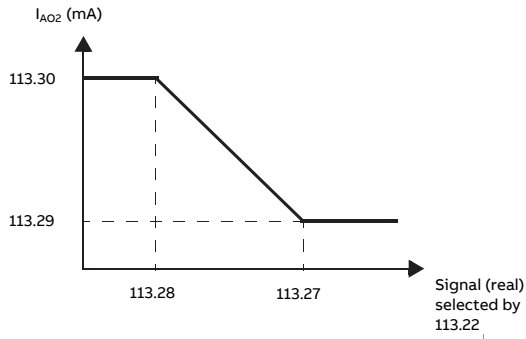
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
112.21	AI2 actual value	Displays the value of analog input AI2 in mA or V (depending on whether the input is set to current or voltage by jumper J2). This parameter is read-only.	- / real32
	-22.000 ... 22.000 mA	Value of analog input AI2.	1000 = 1 mA / 1 = 1 mA
112.22	AI2 scaled value	Displays the value of analog input AI2 after scaling. See parameters 112.29 AI2 scaled at AI2 min and 112.30 AI2 scaled at AI2 max. This parameter is read-only.	- / real32
	-32768.000 ... 32767.000	Scaled value of analog input AI2.	1 = 1 / 1 = 1
112.25	AI2 unit selection	Selects the unit for readings and settings related to analog input AI2. **Note:** This setting must match the corresponding jumper setting on the control unit (see the appropriate hardware manual). Control board reboot (either by cycling the power or through parameter 196.8 Control board boot) is required to validate any changes in the jumper settings.	mA / uint16
	V	Volts.	2
	mA	Milliamperes.	10
112.26	AI2 filter time	Defines the filter time constant for analog input AI2. See parameter 112.16 AI1 filter time.	0.000 s / real32
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
112.27	AI2 min	Defines the minimum value for analog input AI2.	0.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Minimum value of AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
112.28	AI2 max	Defines the maximum value for analog input AI2.	20.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Maximum value of AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
112.29	AI2 scaled at AI2 min	Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 112.27 AI2 min.	0.000 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
			
	-32768.000 ... 32767.000	Real value corresponding to minimum AI2 value.	1 = 1 / 1 = 1
112.30	AI2 scaled at AI2 max	Defines the real 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.	0.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to maximum AI2 value.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
113	**Standard AO**	Configuration of analog outputs.	
113.11	AO1 actual value	Displays the value of AO1 in mA. This parameter is read-only.	- / real32
	0.000 ... 22.000 mA	Value of AO1.	1000 = 1 mA / 1 = 1 mA
113.12	AO1 source	Selects a signal to be connected to analog output AO1.	Zero / uint32
	Zero	None.	0
	DC voltage	101.1 DC voltage	1
	Line current	101.2 Line current	2
	Other [value]	See Terms and abbreviations (page 63).	
113.16	AO1 filter time	Defines the filtering time constant for analog output AO1.	0.100 s / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		 $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 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 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
			
	-32768.0 ... 32767.0	Real signal value corresponding to minimum AO1 output value.	1 = 1 / 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 / real32
	-32768.0 ... 32767.0	Real signal value corresponding to maximum AO1 output value.	1 = 1 / 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 / real32
	0.000 ... 22.000 mA	Minimum AO1 output value.	1000 = 1 mA / 1 = 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 / real32
	0.000 ... 22.000 mA	Maximum AO1 output value.	1000 = 1 mA / 1 = 1 mA
113.21	AO2 actual value	Displays the value of AO2 in mA. This parameter is read-only.	- / real32
	0.000 ... 22.000 mA	Value of AO2.	1000 = 1 mA / 1 = 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 / uint32
113.26	AO2 filter time	Defines the filtering time constant for analog output AO2. See parameter 113.16 AO1 filter time.	0.100 s / real32
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 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 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		 	
	-32768.0 ... 32767.0	Real signal value corresponding to minimum AO2 output value.	1 = 1 / 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 / real32
	-32768.0 ... 32767.0	Real signal value corresponding to maximum AO2 output value.	1 = 1 / 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 / real32
	0.000 ... 22.000 mA	Minimum AO2 output value.	1000 = 1 mA / 1 = 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 / real32
	0.000 ... 22.000 mA	Maximum AO2 output value.	1000 = 1 mA / 1 = 1 mA

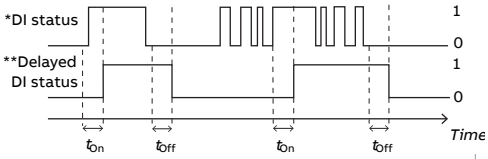
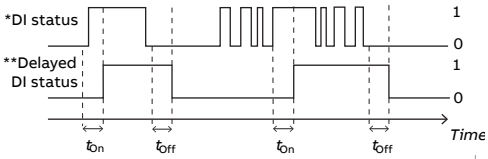
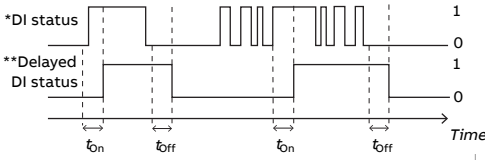
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
113.91	AO1 data storage	Storage parameter for controlling analog output AO1 eg. through fieldbus. In 113.12 AO1 source, select AO1 data storage. Then set this parameter as the target of the incoming value data.	0.00 / real32
	-327.68 ... 327.67	Storage parameter for AO1.	100 = 1 / 1 = 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 / real32
	-327.68 ... 327.67	Storage parameter for AO2.	100 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114	**Extension I/O module 1**	Configuration of I/O extension module 1. See also section Programmable I/O extensions (page 28). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
114.1	Module 1 type	Activates (and specifies the type of) I/O extension module 1.	None / uint16
	None	Inactive.	0
	FIO-01	FIO-01.	1
	FIO-11	FIO-11.	2
	FAIO-01	FAIO-01.	4
	FDIO-01	FDIO-01.	3
114.2	Module 1 location	Specifies the node number (1…3) on the control unit into which the I/O extension module is installed.	1 / uint16
	1 ... 254	1 = slot 1, 2 = slot 2, 3 = slot 3. Alternatively, specifies the node ID of the slot on an FEA-0x extension adapter.	1 = 1 / 1 = 1
114.3	Module 1 status	Displays the status of I/O extension module 1.	No option / uint16
	No option	No module detected in the specified slot.	0
	FIO-01	An FIO-01 module has been detected and is active.	15
	FIO-11	An FIO-11 module has been detected and is active.	20
	FAIO-01	An FAIO-01 module has been detected and is active.	24
	FDIO-01	An FDIO-01 module has been detected and is active.	25
114.5	DI status	(Visible when 114.1 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 114.8 DI filter time. Bit 0 indicates the status of DI1.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		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.	
114.5	DIO status	(Visible when 114.1 Module 1 type = 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: 1001b = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	- / uint16
114.5	DIO status	(Visible when 114.1 Module 1 type = FIO-01) 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: 1001b = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	- / uint16
114.6	DI delayed status	(Visible when 114.1 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.	- / uint16
114.6	DIO delayed status	(Visible when 114.1 Module 1 type = 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.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Example: 1001b = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	
114.6	DIO delayed status	(Visible when 114.1 Module 1 type = FIO-01) 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: 1001b = DIO1 and DIO4 are on, remainder are off. This parameter is read-only.	- / uint16
114.8	DI filter time	(Visible when 114.1 Module 1 type = FDIO-01) Defines a filtering time for parameter 114.5 DI status.	10.0 ms / real32
	0.8 ... 100.0 ms	Filtering time for 114.5.	10 = 1 ms / 1 = 1 ms
114.8	DIO filter time	(Visible when 114.1 Module 1 type = FIO-11) Defines a filtering time for parameter 114.5 DIO status. The filtering time will only affect the DIOs that are in input mode.	10.0 ms / real32
	0.8 ... 100.0 ms	Filtering time for 114.5.	10 = 1 ms / 1 = 1 ms
114.8	DIO filter time	(Visible when 114.1 Module 1 type = FIO-01) Defines a filtering time for parameter 114.5 DIO status. The filtering time will only affect the DIOs that are in input mode.	10.0 ms / real32
	0.8 ... 100.0 ms	Filtering time for 114.5.	10 = 1 ms / 1 = 1 ms
114.9	DIO1 function	(Visible when 114.1 Module 1 type = FIO-11) Selects whether DIO1 of the extension module is used as a digital input or output.	Input / uint16
	Output	DIO1 is used as a digital output.	0
	Input	DIO1 is used as a digital input.	1
114.9	DIO1 function	(Visible when 114.1 Module 1 type = FIO-01) Selects whether DIO1 of the extension module is used as a digital input or output.	Input / uint16
	Output	DIO1 is used as a digital output.	0
	Input	DIO1 is used as a digital input.	1
114.11	DIO1 output source	(Visible when 114.1 Module 1 type = FIO-11) Selects a signal to be connected to digital input/output DIO1 when parameter 114.9 DIO1 function is set to Output.	Not energized / uint32
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready	Bit 0 of 106.11 Main status word. Output is energized when the IGBT supply unit is ready.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Charge ready	Bit 1 of 106.11 Main status word. Output is energized when the intermediate circuit DC charging is ready.	3
	Enabled	Bit 0 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is enabled.	4
	Started	Bit 5 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is started.	5
	Running	Bit 4 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is running.	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 Drive status word 1. Output is energized when MCB closing command is given.	10
	Charging	Bit 12 of 106.16 Drive status word 1. Output is energized when the external charging has charged the IGBT supply unit.	11
	Start req final	Reserved	12
	Other [bit]	See Terms and abbreviations (page 63).	
114.11	DIO1 output source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO1 when parameter 114.9 DIO1 function is set to Output.	Not energized / uint32
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready	Bit 0 of 106.11 Main status word. Output is energized when the IGBT supply unit is ready.	2
	Charge ready	Bit 1 of 106.11 Main status word. Output is energized when the intermediate circuit DC charging is ready.	3
	Enabled	Bit 0 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is enabled.	4
	Started	Bit 5 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is started.	5
	Running	Bit 4 of 106.16 Drive status word 1. Output is energized when the IGBT supply unit is running.	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 Drive status word 1. Output is energized when MCB closing command is given.	10

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Charging	Bit 12 of 106.16 Drive status word 1. Output is energized when the external charging has charged the IGBT supply unit.	11
	Start req final	Reserved	12
	Other [bit]	See Terms and abbreviations (page 63).	
114.12	DI1 ON delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the activation delay for digital input DI1.  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 114.5 DI status. **Indicated by 114.6 DI delayed status.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DI1.	10 = 1 s / 1 = 1 s
114.12	DIO1 ON delay	(Visible when 114.1 Module 1 type = FIO-11) Defines the activation delay for digital input/output DIO1.  t_{On} = 114.12 DIO1 ON delay t_{Off} = 114.13 DIO1 OFF delay *Electrical status of DI or status of selected source (in output mode). Indicated by 114.5 DIO status. **Indicated by 114.6 DIO delayed status.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DIO1.	10 = 1 s / 1 = 1 s
114.12	DIO1 ON delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the activation delay for digital input/output DIO1.  	0.00 s / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		t_{On} = 114.12 DIO1 ON delay t_{Off} = 114.13 DIO1 OFF delay *Electrical status of DI or status of selected source (in output mode). Indicated by 114.5 DIO status. **Indicated by 114.6 DIO delayed status.	
	0.00 ... 3000.00 s	Activation delay for DIO1.	10 = 1 s / 1 = 1 s
114.13	DI1 OFF delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI1. See parameter 114.12 DI1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DI1.	10 = 1 s / 1 = 1 s
114.13	DIO1 OFF delay	(Visible when 114.1 Module 1 type = FIO-11) Defines the deactivation delay for digital input/output DIO1. See parameter 114.12 DIO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO1.	10 = 1 s / 1 = 1 s
114.13	DIO1 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO1. See parameter 114.12 DIO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO1.	10 = 1 s / 1 = 1 s
114.14	DIO2 function	(Visible when 114.1 Module 1 type = FIO-11) Selects whether DIO2 of the extension module is used as a digital input or output.	Input / uint16
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
114.14	DIO2 function	(Visible when 114.1 Module 1 type = FIO-01) Selects whether DIO2 of the extension module is used as a digital input or output.	Input / uint16
	Output	DIO2 is used as a digital output.	0
	Input	DIO2 is used as a digital input.	1
114.16	DIO2 output source	(Visible when 114.1 Module 1 type = FIO-11) Selects a signal to be connected to digital input/output DIO2 when parameter 114.14 DIO2 function is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.16	DIO2 output source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO2 when parameter 114.14 DIO2 function is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.17	DI2 ON delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the activation delay for digital input DI2. See parameter 114.12 DI1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DI2.	10 = 1 s / 1 = 1 s
114.17	DIO2 ON delay	(Visible when 114.1 Module 1 type = FIO-11) Defines the activation delay for digital input/output DIO2.	0.00 s / real32

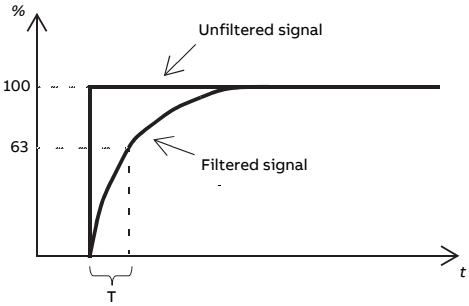
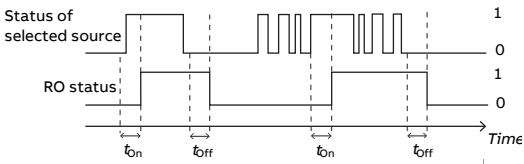
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		See parameter 114.12 DIO1 ON delay.	
	0.00 ... 3000.00 s	Activation delay for DIO2.	10 = 1 s / 1 = 1 s
114.17	DIO2 ON delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the activation delay for digital input/output DIO2. See parameter 114.12 DIO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DIO2.	10 = 1 s / 1 = 1 s
114.18	DI2 OFF delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI2. See parameter 114.12 DI1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DI2.	10 = 1 s / 1 = 1 s
114.18	DIO2 OFF delay	(Visible when 114.1 Module 1 type = FIO-11) Defines the deactivation delay for digital input/output DIO2. See parameter 114.17 DIO2 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO2.	10 = 1 s / 1 = 1 s
114.18	DIO2 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO2. See parameter 114.17 DIO2 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO2.	10 = 1 s / 1 = 1 s
114.19	AI supervision function	(Visible when 114.1 Module 1 type = FAIO-01) Selects how the IGBT supply unit 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 / uint16
	No action	No action taken.	0
	Fault	IGBT supply unit trips on 8E06 AI Supervision.	1
	Warning	IGBT supply unit generates an AE67 AI Supervision warning.	2
114.19	DIO3 function	(Visible when 114.1 Module 1 type = FIO-01) Selects whether DIO3 of the extension module is used as a digital input or output.	Input / uint16
	Output	DIO3 is used as a digital output.	0
	Input	DIO3 is used as a digital input.	1
114.20	AI supervision selection	(Visible when 114.1 Module 1 type = FAIO-01) Specifies the analog input limits to be supervised. See parameter 114.19 AI supervision function.	- / uint16
b0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.	
b1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.	
b2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.	
b3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.	
b4…15	Reserved		
	0000h…FFFFh		1 = 1

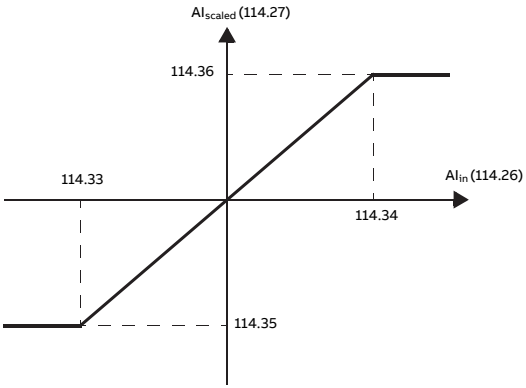
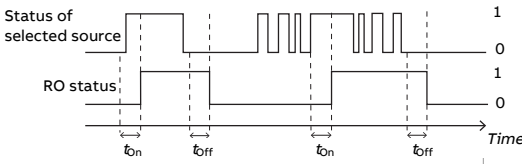
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.20	AI supervision selection	(Visible when 114.1 Module 1 type = FIO-11) Specifies the analog input limits to be supervised. See parameter 114.19 AI supervision function.	- / uint16
b0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.	
b1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.	
b2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.	
b3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.	
b4	AI3 < MIN	1 = Minimum limit supervision of AI3 active.	
b5	AI3 > MAX	1 = Maximum limit supervision of AI3 active.	
b6...15	Reserved		
	0000h...FFFFh		1 = 1
114.21	AI tune	(Visible when 114.1 Module 1 type = FAIO-01) Triggers the analog input tuning function, which enables the use of actual measurements as the minimum and maximum input values instead of potentially inaccurate estimates. Apply the minimum or maximum signal to the input and select the appropriate tuning function. See also the drawing at parameter See the drawing at parameter 114.35 AI1 scaled at AI1 min.	No action / uint16
	No action	Tuning action completed or no action has been requested. The parameter automatically reverts to this value after any tuning action.	0
	AI1 min tune	The measured value of AI1 is set as the minimum value of AI1 into parameter 114.33 AI1 min.	1
	AI1 max tune	The measured value of AI1 is set as the maximum value of AI1 into parameter 114.34 AI1 max.	2
	AI2 min tune	The measured value of AI2 is set as the minimum value of AI2 into parameter 114.48 AI2 min.	3
	AI2 max tune	The measured value of AI2 is set as the maximum value of AI2 into parameter 114.49 AI2 max.	4
114.21	AI tune	(Visible when 114.1 Module 1 type = FIO-11) Triggers the analog input tuning function, which enables the use of actual measurements as the minimum and maximum input values instead of potentially inaccurate estimates. Apply the minimum or maximum signal to the input and select the appropriate tuning function. See also the drawing at parameter 114.35 AI1 scaled at AI1 min.	No action / uint16
	No action	Tuning action completed or no action has been requested. The parameter automatically reverts to this value after any tuning action.	0
	AI1 min tune	The measured value of AI1 is set as the minimum value of AI1 into parameter 114.33 AI1 min.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	AI1 max tune	The measured value of AI1 is set as the maximum value of AI1 into parameter 114.34 AI1 max.	2
	AI2 min tune	The measured value of AI2 is set as the minimum value of AI2 into parameter 114.48 AI2 min.	3
	AI2 max tune	The measured value of AI2 is set as the maximum value of AI2 into parameter 114.49 AI2 max.	4
	AI3 min tune	The measured value of AI3 is set as the minimum value of AI3 into parameter 114.63 AI3 min.	5
	AI3 max tune	The measured value of AI3 is set as the maximum value of AI3 into parameter 114.64 AI3 max.	6
114.21	DIO3 output source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO3 when parameter 114.19 DIO3 function is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.22	AI force selection	(Visible when 114.1 Module 1 type = 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.	- / uint16
b0	AI1	1 = Force AI1 to value of parameter 114.28 AI1 force data.	
b1	AI2	1 = Force AI2 to value of parameter 114.43 AI2 force data.	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
114.22	DI3 ON delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the activation delay for digital input/output DIO3. See parameter 114.12 DI1 ON delay	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DIO3.	10 = 1 s / 1 = 1 s
114.22	AI force selection	(Visible when 114.1 Module 1 type = FIO-11) 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.	- / uint16
b0	AI1	1 = Force AI1 to value of parameter 114.28 AI1 force data.	
b1	AI2	1 = Force AI2 to value of parameter 114.43 AI2 force data.	
b2	AI3	1 = Force AI3 to value of parameter 114.58 AI3 force data.	
b3…15	Reserved		
	0000h…FFFFh		1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.22	DIO3 ON delay	(Visible when 114.1 Module 1 type = FIO-01) See parameter 114.12 DIO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DIO3.	10 = 1 s / 1 = 1 s
114.23	DI3 OFF delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the deactivation delay for digital input DI3. See parameter 114.12 DI1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DI3.	10 = 1 s / 1 = 1 s
114.23	DIO3 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO3. See parameter 114.22 DIO3 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO3.	10 = 1 s / 1 = 1 s
114.24	DIO4 function	(Visible when 114.1 Module 1 type = FIO-01) Selects whether DIO4 of the I/O extension module is used as a digital input or output.	Input / uint16
	Output	DIO4 is used as a digital output.	0
	Input	DIO4 is used as a digital input.	1
114.26	AI1 actual value	(Visible when 114.1 Module 1 type = 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.	- / real32
	-22.000 ... 22.000 mA or V	Value of analog input AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
114.26	DIO4 output source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to digital input/output DIO4 when parameter 114.24 DIO4 function is set to Output. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.27	AI1 scaled value	(Visible when 114.1 Module 1 type = 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.	- / real32
	-32768.000 ... 32767.000	Scaled value of analog input AI1.	1 = 1 / 1 = 1
114.27	DIO4 ON delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the activation delay for digital input/output DIO4. See parameter 114.12 DIO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for DIO4.	10 = 1 s / 1 = 1 s
114.28	AI1 force data	(Visible when 114.1 Module 1 type = FAIO-01) Forced value that can be used instead of the true reading of the input. See parameter 114.22 AI force selection.	- / real32
	-22.000 ... 22.000 mA or V	Forced value of analog input AI1.	1000 = 1 mA or V / 1000 = 1 mA or V

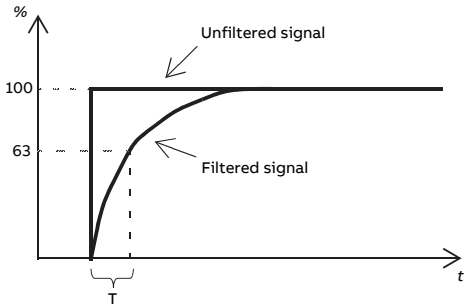
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.28	DIO4 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for digital input/output DIO4. See parameter 114.27 DIO4 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for DIO4.	10 = 1 s / 1 = 1 s
114.29	AI1 HW switch position	(Visible when 114.1 Module 1 type = 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.	mA / uint16
	mA	Milliamperes.	10
	V	Milliamperes.	2
114.30	AI1 unit selection	(Visible when 114.1 Module 1 type = 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 position.	mA / uint16
	mA	Milliamperes.	10
	V	Volts.	2
114.31	RO status	(Visible when 114.1 Module 1 type = FDIO-01) Status of relay outputs on the I/O extension module. Example: 00000001b = RO1 is energized, RO2 is de-energized.	- / uint16
114.31	AI1 filter gain	(Visible when 114.1 Module 1 type = FAIO-01) Selects a hardware filtering time for AI1. See also parameter 114.32 AI1 filter time.	1 ms / uint16
	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
114.31	RO status	(Visible when 114.1 Module 1 type = FIO-01) Status of relay outputs on the I/O extension module. Example: 00000001b = RO1 is energized, RO2 is de-energized.	- / uint16
114.32	AI1 filter time	(Visible when 114.1 Module 1 type = FAIO-01) Defines the filter time constant for analog input AI1.	0.100 s / real32

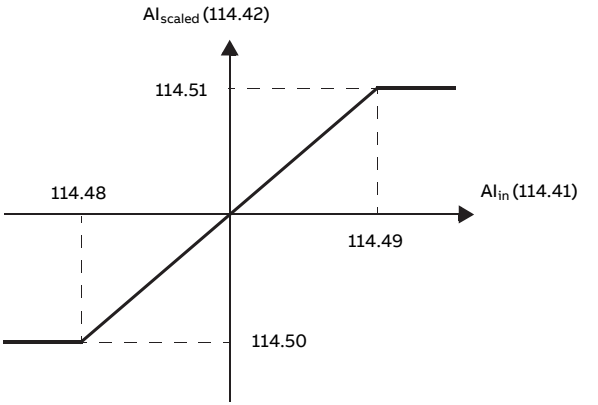
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		 $O = I \times (1 - e_{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.31 AI1 filter gain.	
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
114.33	AI1 min	(Visible when 114.1 Module 1 type = FAIO-01) Defines the minimum value for analog input AI1.	0.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Minimum value of AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
114.34	RO1 source	(Visible when 114.1 Module 1 type = 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 / uint32
114.34	AI1 max	(Visible when 114.1 Module 1 type = FAIO-01) Defines the maximum value for analog input AI1.	10.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Maximum value of AI1.	1000 = 1 mA or V / 1000 = 1 mA or V
114.34	RO1 source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to relay output RO1. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.35	RO1 ON delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the activation delay for relay output RO1.  t_{On} = 114.35 RO1 ON delay	0.00 s / real32

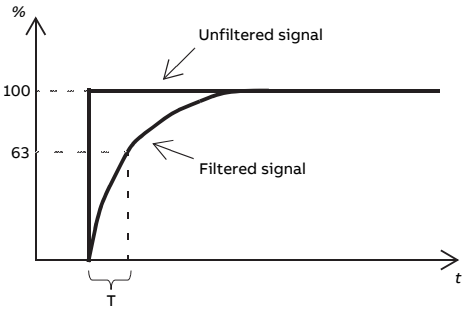
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		t_{Off} = 114.36 RO1 OFF delay	
	0.00 ... 3000.00 s	Activation delay for RO1.	10 = 1 s / 1 = 1 s
114.35	AI1 scaled at AI1 min	(Visible when 114.1 Module 1 type = FAIO-01) Defines the real value that corresponds to the minimum analog input AI1 value defined by parameter 114.33 AI1 min.  	0.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to minimum AI1 value.	1 = 1 / 1 = 1
114.35	RO1 ON delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the activation delay for relay output RO1.  t_{On} = 114.35 RO1 ON delay t_{Off} = 114.36 RO1 OFF delay	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for RO1.	10 = 1 s / 1 = 1 s
114.36	RO1 OFF delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the deactivation delay for relay output RO1. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for RO1.	10 = 1 s / 1 = 1 s
114.36	AI1 scaled at AI1 max	(Visible when 114.1 Module 1 type = 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.	100.000 / real32

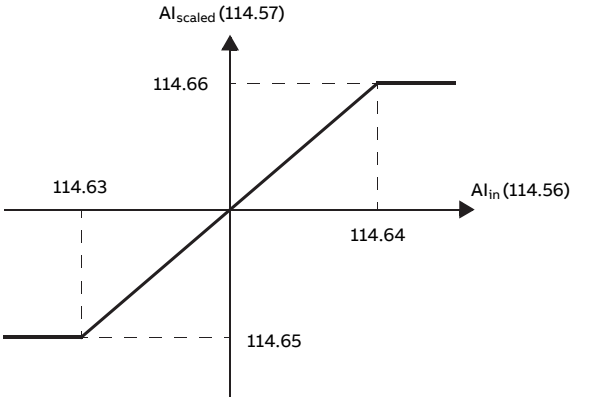
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	-32768.000 ... 32767.000	Real value corresponding to maximum AI1 value.	1 = 1 / 1 = 1
114.36	RO1 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for relay output RO1. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for RO1.	10 = 1 s / 1 = 1 s
114.37	RO2 source	(Visible when 114.1 Module 1 type = 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 / uint32
114.37	RO2 source	(Visible when 114.1 Module 1 type = FIO-01) Selects a signal to be connected to relay output RO2. For the available selections, see parameter 114.11 DIO1 output source.	Not energized / uint32
114.38	RO2 ON delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the activation delay for relay output RO2. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for RO2.	10 = 1 s / 1 = 1 s
114.38	RO2 ON delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the activation delay for relay output RO2. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Activation delay for RO2.	10 = 1 s / 1 = 1 s
114.39	RO2 OFF delay	(Visible when 114.1 Module 1 type = FDIO-01) Defines the deactivation delay for relay output RO1. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for RO2.	10 = 1 s / 1 = 1 s
114.39	RO2 OFF delay	(Visible when 114.1 Module 1 type = FIO-01) Defines the deactivation delay for relay output RO2. See parameter 114.35 RO1 ON delay.	0.00 s / real32
	0.00 ... 3000.00 s	Deactivation delay for RO2.	10 = 1 s / 1 = 1 s
114.41	AI2 actual value	(Visible when 114.1 Module 1 type = 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.	- / real32
	-22.000 ... 22.000 mA or V	Value of analog input AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
114.42	AI2 scaled value	(Visible when 114.1 Module 1 type = 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.	- / real32
	-32768.000 ... 32767.000	Scaled value of analog input AI2.	1 = 1 / 1 = 1
114.43	AI2 force data	(Visible when 114.1 Module 1 type = FAIO-01) Forced value that can be used instead of the true reading of the input. See parameter 114.22 AI force selection.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	-22.000 ... 22.000 mA or V	Forced value of analog input AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
114.44	AI2 HW switch position	(Visible when 114.1 Module 1 type = 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.	mA / uint16
	mA	Milliamperes.	10
	V	Volts.	2
114.45	AI2 unit selection	(Visible when 114.1 Module 1 type = 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 position.	mA / uint16
	mA	Milliamperes.	10
	V	Volts.	2
114.46	AI2 filter gain	(Visible when 114.1 Module 1 type = FAIO-01) Selects a hardware filtering time for AI2. See also parameter 114.47 AI2 filter time.	1 ms / uint16
	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

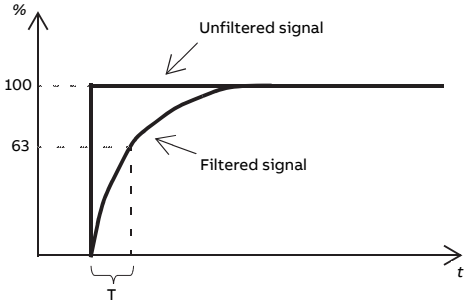
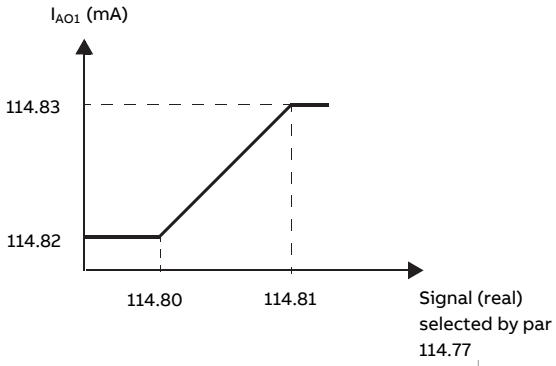
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.47	AI2 filter time	(Visible when 114.1 Module 1 type = FAIO-01)  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.46 AI2 filter gain.	0.100 s / real32
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
114.48	AI2 min	(Visible when 114.1 Module 1 type = FAIO-01) Defines the minimum value for analog input AI2.	0.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Minimum value of AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
114.49	AI2 max	(Visible when 114.1 Module 1 type = FAIO-01) Defines the maximum value for analog input AI2.	10.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Maximum value of AI2.	1000 = 1 mA or V / 1000 = 1 mA or V
114.50	AI2 scaled at AI2 min	(Visible when 114.1 Module 1 type = FAIO-01) Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 114.48 AI2 min.	0.000 / real32

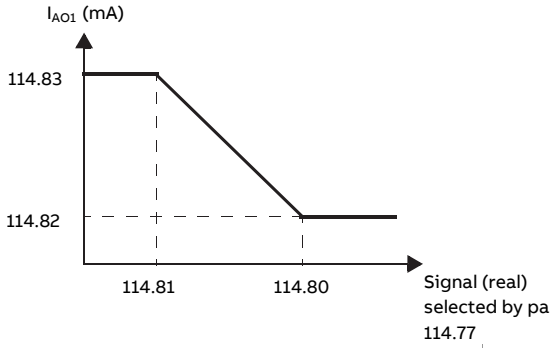
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
			
	-32768.000 ... 32767.000	Real value corresponding to minimum AI2 value.	1 = 1 / 1 = 1
114.51	AI2 scaled at AI2 max	(Visible when 114.1 Module 1 type = FAIO-01) Defines the real value that corresponds to the maximum analog input AI2 value defined by parameter 114.49 AI2 max. See the drawing at parameter 114.50 AI2 scaled at AI2 min.	100.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to maximum AI2 value.	1 = 1 / 1 = 1
114.56	AI3 actual value	(Visible when 114.1 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.	- / real32
	-22.000 ... 22.000 mA or V	Value of analog input AI3.	1000 = 1 mA or V / 1000 = 1 mA or V
114.57	AI3 scaled value	(Visible when 114.1 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.	- / real32
	-32768.000 ... 32767.000	Scaled value of analog input AI3.	1 = 1 / 1 = 1
114.58	AI3 force data	(Visible when 114.1 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 selection.	- / real32
	-22.000 ... 22.000 mA or V	Forced value of analog input AI3.	1000 = 1 mA or V / 1000 = 1 mA or V
114.59	AI3 HW switch position	(Visible when 114.1 Module 1 type = FIO-11) Shows the position of the hardware current/voltage selector on the I/O extension module.	mA / uint16

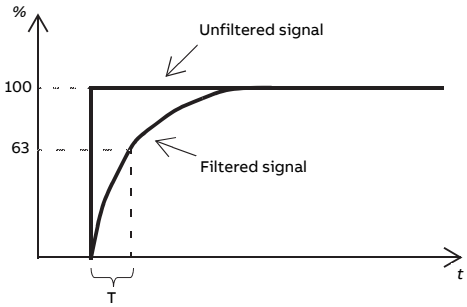
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Note: The setting of the current/voltage selector must match the unit selection made in parameter 114.60 AI3 unit selection.	
	mA	Milliamperes.	10
	V	Volts.	2
114.60	AI3 unit selection	(Visible when 114.1 Module 1 type = FIO-11) Selects 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 position.	mA / uint16
	mA	Milliamperes.	10
	V	Volts.	2
114.61	AI3 filter gain	(Visible when 114.1 Module 1 type = FIO-11) Selects a hardware filtering time for AI3. See also parameter 114.62 AI3 filter time.	1 ms / uint16
	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 114.1 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)	0.100 s / real32

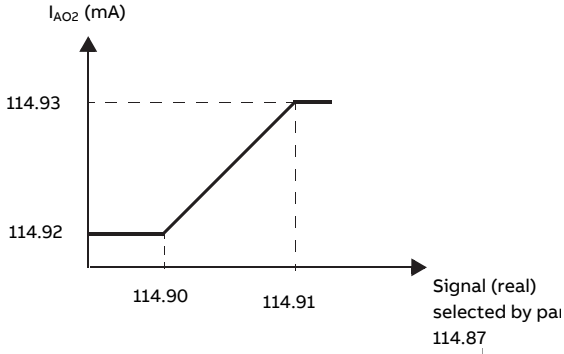
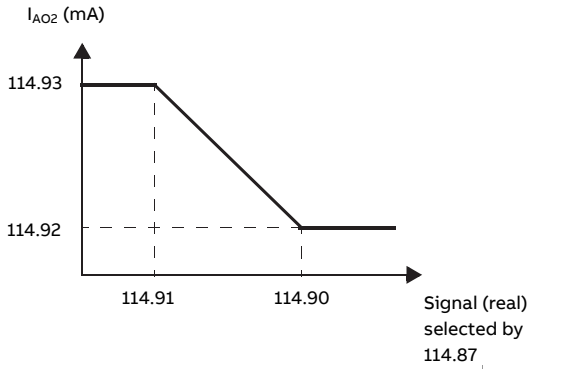
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		O = filter output *t* = time T = filter time constant **Note:** The signal is also filtered due to the signal interface hardware. See parameter 114.61 AI3 filter gain.	
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
114.63	AI3 min	(Visible when 114.1 Module 1 type = FIO-11) Defines the minimum value for analog input AI3.	0.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Minimum value of AI3.	1000 = 1 mA or V / 1000 = 1 mA or V
114.64	AI3 max	(Visible when 114.1 Module 1 type = FIO-11) Defines the maximum value for analog input AI3.	10.000 mA or V / real32
	-22.000 ... 22.000 mA or V	Maximum value of AI3.	1000 = 1 mA or V / 1000 = 1 mA or V
114.65	AI3 scaled at AI3 min	(Visible when 114.1 Module 1 type = FIO-11) Defines the real value that corresponds to the minimum analog input AI3 value defined by parameter 114.63 AI3 min.  	0.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to minimum AI3 value.	1 = 1 / 1 = 1
114.66	AI3 scaled at AI3 max	(Visible when 114.1 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.	100.000 / real32
	-32768.000 ... 32767.000	Real value corresponding to maximum AI3 value.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.71	AO force selection	(Visible when 114.1 Module 1 type = 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.	- / uint16
b0	AO1	1 = Force AO1 to value of parameter 114.78 AO1 force data.	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
114.71	AO force selection	(Visible when 114.1 Module 1 type = FIO-11) 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.	- / uint16
b0	AO1	1 = Force AO1 to value of parameter 114.78 AO1 force data.	
b1…15	Reserved		
	0000h…FFFFh		1 = 1
114.76	AO1 actual value	(Visible when 114.1 Module 1 type = FAIO-01) Displays the value of AO1 in mA. This parameter is read-only.	- / real32
	0.000 ... 22.000 mA	Value of AO1.	1000 = 1 mA / 1 = 1 mA
114.77	AO1 source	(Visible when 114.1 Module 1 type = 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.	Zero / uint32
	Zero	None.	0
	DC voltage	101.1 DC voltage	1
	Line current	101.2 Line current	2
	Other [value]	See Terms and abbreviations (page 63).	
114.78	AO1 force data	(Visible when 114.1 Module 1 type = FIO-11) Forced value that can be used instead of the selected output signal. See parameter 114.71 AO force selection.	- / real32
	0.000 ... 22.000 mA	Forced value of analog output AI1.	1000 = 1 mA / 1 = 1 mA
114.78	AO1 force data	(Visible when 114.1 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 / real32
	0.000 ... 20.000 mA	Forced value of analog output AI1.	1000 = 1 mA / 1 = 1 mA

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.79	AO1 filter time	(Visible when 114.1 Module 1 type = FAIO-01)  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	0.100 s / real32
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
114.80	AO1 source min	(Visible when 114.1 Module 1 type = 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 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
			
	-32768.0 ... 32767.0	Real signal value corresponding to minimum AO1 output value.	1 = 1 / 1 = 1
114.81	AO1 source max	(Visible when 114.1 Module 1 type = 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.	100.0 / real32
	-32768.0 ... 32767.0	Real signal value corresponding to maximum AO1 output value.	1 = 1 / 1 = 1
114.82	AO1 out at AO1 src min	(Visible when 114.1 Module 1 type = FIO-11) Defines the minimum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	0.000 mA / real32
	0.000 ... 22.000 mA	Minimum AO1 output value.	1000 = 1 mA / 1 = 1 mA
114.82	AO1 out at AO1 src min	(Visible when 114.1 Module 1 type = FAIO-01) Defines the minimum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	0.000 mA / real32
	0.000 ... 20.000 mA	Minimum AO1 output value.	1000 = 1 mA / 1 = 1 mA
114.83	AO1 out at AO1 src max	(Visible when 114.1 Module 1 type = FIO-11) Defines the maximum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	10.000 mA / real32
	0.000 ... 22.000 mA	Maximum AO1 output value.	1000 = 1 mA / 1 = 1 mA
114.83	AO1 out at AO1 src max	(Visible when 114.1 Module 1 type = FAIO-01) Defines the maximum output value for analog output AO1. See also drawing at parameter 114.80 AO1 source min.	10.000 mA / real32
	0.000 ... 20.000 mA	Maximum AO1 output value.	1000 = 1 mA / 1 = 1 mA

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.86	AO2 actual value	(Visible when 114.1 Module 1 type = FAIO-01) Displays the value of AO2 in mA. This parameter is read-only.	- / real32
	0.000 ... 22.000 mA	Value of AO2.	1000 = 1 mA / 1 = 1 mA
114.87	AO2 source	(Visible when 114.1 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 / uint32
114.88	AO2 force data	(Visible when 114.1 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 / real32
	0.000 ... 20.000 mA	Forced value of analog output AO2.	1000 = 1 mA / 1 = 1 mA
114.89	AO2 filter time	(Visible when 114.1 Module 1 type = FAIO-01)  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	0.100 s / real32
	0.000 ... 30.000 s	Filter time constant.	1000 = 1 s / 1 = 1 s
114.90	AO2 source min	(Visible when 114.1 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 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		 	
	-32768.0 ... 32767.0	Real signal value corresponding to minimum AO2 output value.	1 = 1 / 1 = 1
114.91	AO2 source max	(Visible when 114.1 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 / real32
	-32768.0 ... 32767.0	Real signal value corresponding to maximum AO2 output value.	1 = 1 / 1 = 1
114.92	AO2 out at AO2 src min	(Visible when 114.1 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 / real32
	0.000 ... 20.000 mA	Minimum AO2 output value.	1000 = 1 mA / 1 = 1 mA

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
114.93	AO2 out at AO2 src max	(Visible when 114.1 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 / real32
	0.000 ... 20.000 mA	Maximum AO2 output value.	1000 = 1 mA / 1 = 1 mA

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115	**Extension I/O module 2**	Configuration of I/O extension module 2. See also section Programmable I/O extensions (page 28). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
115.1	Module 2 type	See parameter 114.1 Module 1 type.	None / uint16
115.2	Module 2 location	See parameter 114.2 Module 1 location.	1 / uint16
115.3	Module 2 status	See parameter 114.3 Module 1 status.	No option / uint16
115.5	DI status	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.5 DI status.	- / uint16
115.5	DIO status	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.5 DIO status.	- / uint16
115.5	DIO status	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.5 DIO status.	- / uint16
115.6	DI delayed status	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.6 DI delayed status.	- / uint16
115.6	DIO delayed status	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.6 DIO delayed status.	- / uint16
115.6	DIO delayed status	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.6 DIO delayed status.	- / uint16
115.8	DI filter time	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.8 DI filter time.	10.0 ms / real32
115.8	DIO filter time	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.8 DIO filter time.	10.0 ms / real32
115.8	DIO filter time	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.8 DIO filter time.	10.0 ms / real32
115.9	DIO1 function	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.9 DIO1 function.	Input / uint16
115.9	DIO1 function	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.9 DIO1 function.	Input / uint16
115.11	DIO1 output source	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.11 DIO1 output source.	Not energized / uint32
115.11	DIO1 output source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.11 DIO1 output source.	Not energized / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115.12	DI1 ON delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.12 DI1 ON delay.	0.00 s / real32
115.12	DIO1 ON delay	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.12 DIO1 ON delay.	0.00 s / real32
115.12	DIO1 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.12 DIO1 ON delay.	0.00 s / real32
115.13	DI1 OFF delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.13 DI1 OFF delay.	0.00 s / real32
115.13	DIO1 OFF delay	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.13 DIO1 OFF delay.	0.00 s / real32
115.13	DIO1 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.13 DIO1 OFF delay.	0.00 s / real32
115.14	DIO2 function	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.14 DIO2 function.	Input / uint16
115.14	DIO2 function	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.14 DIO2 function.	Input / uint16
115.16	DIO2 output source	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.16 DIO2 output source.	Not energized / uint32
115.16	DIO2 output source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.16 DIO2 output source.	Not energized / uint32
115.17	DI2 ON delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.17 DI2 ON delay.	0.00 s / real32
115.17	DIO2 ON delay	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.17 DIO2 ON delay.	0.00 s / real32
115.17	DIO2 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.17 DIO2 ON delay.	0.00 s / real32
115.18	DI2 OFF delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.18 DI2 OFF delay.	0.00 s / real32
115.18	DIO2 OFF delay	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.18 DIO2 OFF delay.	0.00 s / real32
115.18	DIO2 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.18 DIO2 OFF delay.	0.00 s / real32
115.19	AI supervision function	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.19 AI supervision function.	No action / uint16
115.19	DIO3 function	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.19 DIO3 function.	Input / uint16
115.20	AI supervision selection	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.20 AI supervision selection.	- / uint16
115.20	AI supervision selection	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.20 AI supervision selection.	- / uint16
115.21	AI tune	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.21 AI tune.	No action / uint16
115.21	AI tune	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.21 AI tune.	No action / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115.21	DIO3 output source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.21 DIO3 output source.	Not energized / uint32
115.22	AI force selection	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.22 AI force selection.	- / uint16
115.22	DI3 ON delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.22 DI3 ON delay.	0.00 s / real32
115.22	AI force selection	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.22 AI force selection.	- / uint16
115.22	DIO3 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.22 DIO3 ON delay.	0.00 s / real32
115.23	DI3 OFF delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.23 DI3 OFF delay.	0.00 s / real32
115.23	DIO3 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.23 DIO3 OFF delay.	0.00 s / real32
115.24	DIO4 function	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.24 DIO4 function.	Input / uint16
115.26	AI1 actual value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.26 AI1 actual value.	- / real32
115.26	DIO4 output source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.26 DIO4 output source.	Not energized / uint32
115.27	AI1 scaled value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.27 AI1 scaled value.	- / real32
115.27	DIO4 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.27 DIO4 ON delay.	0.00 s / real32
115.28	AI1 force data	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.28 AI1 force data.	- / real32
115.28	DIO4 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.28 DIO4 OFF delay.	0.00 s / real32
115.29	AI1 HW switch position	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.29 AI1 HW switch position.	mA / uint16
115.30	AI1 unit selection	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.30 AI1 unit selection.	mA / uint16
115.31	RO status	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.31 RO status.	- / uint16
115.31	AI1 filter gain	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.31 AI1 filter gain.	1 ms / uint16
115.31	RO status	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.31 RO status.	- / uint16
115.32	AI1 filter time	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.32 AI1 filter time.	0.100 s / real32
115.33	AI1 min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.33 AI1 min.	0.000 mA or V / real32
115.34	RO1 source	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.34 RO1 source.	Not energized / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115.34	AI1 max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.34 AI1 max.	10.000 mA or V / real32
115.34	RO1 source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.34 RO1 source.	Not energized / uint32
115.35	RO1 ON delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.35 RO1 ON delay.	0.00 s / real32
115.35	AI1 scaled at AI1 min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.35 AI1 scaled at AI1 min.	0.000 / real32
115.35	RO1 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.35 RO1 ON delay.	0.00 s / real32
115.36	RO1 OFF delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.36 RO1 OFF delay.	0.00 s / real32
115.36	AI1 scaled at AI1 max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.36 AI1 scaled at AI1 max.	100.000 / real32
115.36	RO1 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.36 RO1 OFF delay.	0.00 s / real32
115.37	RO2 source	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.37 RO2 source.	Not energized / uint32
115.37	RO2 source	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.37 RO2 source.	Not energized / uint32
115.38	RO2 ON delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.38 RO2 ON delay.	0.00 s / real32
115.38	RO2 ON delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.38 RO2 ON delay.	0.00 s / real32
115.39	RO2 OFF delay	(Visible when 115.1 Module 2 type = FDIO-01) See parameter 114.39 RO2 OFF delay.	0.00 s / real32
115.39	RO2 OFF delay	(Visible when 115.1 Module 2 type = FIO-01) See parameter 114.39 RO2 OFF delay.	0.00 s / real32
115.41	AI2 actual value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.41 AI2 actual value.	- / real32
115.42	AI2 scaled value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.42 AI2 scaled value.	- / real32
115.43	AI2 force data	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.43 AI2 force data.	- / real32
115.44	AI2 HW switch position	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.44 AI2 HW switch position.	mA / uint16
115.45	AI2 unit selection	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.45 AI2 unit selection.	mA / uint16
115.46	AI2 filter gain	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.46 AI2 filter gain.	1 ms / uint16
115.47	AI2 filter time	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.47 AI2 filter time.	0.100 s / real32
115.48	AI2 min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.48 AI2 min.	0.000 mA or V / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115.49	AI2 max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.49 AI2 max.	10.000 mA or V / real32
115.50	AI2 scaled at AI2 min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.50 AI2 scaled at AI2 min.	0.000 / real32
115.51	AI2 scaled at AI2 max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.51 AI2 scaled at AI2 max.	100.000 / real32
115.56	AI3 actual value	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.56 AI3 actual value.	- / real32
115.57	AI3 scaled value	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.57 AI3 scaled value.	- / real32
115.58	AI3 force data	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.58 AI3 force data.	- / real32
115.59	AI3 HW switch position	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.59 AI3 HW switch position.	mA / uint16
115.60	AI3 unit selection	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.60 AI3 unit selection.	mA / uint16
115.61	AI3 filter gain	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.61 AI3 filter gain.	1 ms / uint16
115.62	AI3 filter time	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.62 AI3 filter time.	0.100 s / real32
115.63	AI3 min	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.63 AI3 min.	0.000 mA or V / real32
115.64	AI3 max	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.64 AI3 max.	10.000 mA or V / real32
115.65	AI3 scaled at AI3 min	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.65 AI3 scaled at AI3 min.	0.000 / real32
115.66	AI3 scaled at AI3 max	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.66 AI3 scaled at AI3 max.	100.000 / real32
115.71	AO force selection	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.71 AO force selection.	- / uint16
115.71	AO force selection	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.71 AO force selection.	- / uint16
115.76	AO1 actual value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.76 AO1 actual value.	- / real32
115.77	AO1 source	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.77 AO1 source.	Zero / uint32
115.78	AO1 force data	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.78 AO1 force data.	- / real32
115.78	AO1 force data	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.78 AO1 force data.	0.000 mA / real32
115.79	AO1 filter time	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.79 AO1 filter time.	0.100 s / real32
115.80	AO1 source min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.80 AO1 source min.	0.0 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
115.81	AO1 source max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.81 AO1 source max.	100.0 / real32
115.82	AO1 out at AO1 src min	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA / real32
115.82	AO1 out at AO1 src min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA / real32
115.83	AO1 out at AO1 src max	(Visible when 115.1 Module 2 type = FIO-11) See parameter 114.83 AO1 out at AO1 src max.	10.000 mA / real32
115.83	AO1 out at AO1 src max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.83 AO1 out at AO1 src max.	10.000 mA / real32
115.86	AO2 actual value	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.86 AO2 actual value.	- / real32
115.87	AO2 source	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.87 AO2 source.	Zero / uint32
115.88	AO2 force data	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.88 AO2 force data.	0.000 mA / real32
115.89	AO2 filter time	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.89 AO2 filter time.	0.100 s / real32
115.90	AO2 source min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.90 AO2 source min.	0.0 / real32
115.91	AO2 source max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.91 AO2 source max.	100.0 / real32
115.92	AO2 out at AO2 src min	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.92 AO2 out at AO2 src min.	0.000 mA / real32
115.93	AO2 out at AO2 src max	(Visible when 115.1 Module 2 type = FAIO-01) See parameter 114.93 AO2 out at AO2 src max.	10.000 mA / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116	**Extension I/O module 3**	Configuration of I/O extension module 3. See also section Programmable I/O extensions (page 28). **Note:** The contents of the parameter group vary according to the selected I/O extension module type.	
116.1	Module 3 type	See parameter 114.1 Module 1 type.	None / uint16
116.2	Module 3 location	See parameter 114.2 Module 1 location.	1 / uint16
116.3	Module 3 status	See parameter 114.3 Module 1 status.	No option / uint16
116.5	DI status	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.5 DI status.	- / uint16
116.5	DIO status	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.5 DIO status.	- / uint16
116.5	DIO status	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.5 DIO status.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.6	DI delayed status	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.6 DI delayed status.	- / uint16
116.6	DIO delayed status	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.6 DIO delayed status.	- / uint16
116.6	DIO delayed status	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.6 DIO delayed status.	- / uint16
116.8	DI filter time	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.8 DI filter time.	10.0 ms / real32
116.8	DIO filter time	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.8 DIO filter time.	10.0 ms / real32
116.8	DIO filter time	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.8 DIO filter time.	10.0 ms / real32
116.9	DIO1 function	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.9 DIO1 function.	Input / uint16
116.9	DIO1 function	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.9 DIO1 function.	Input / uint16
116.11	DIO1 output source	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.11 DIO1 output source.	Not energized / uint32
116.11	DIO1 output source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.11 DIO1 output source.	Not energized / uint32
116.12	DI1 ON delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.12 DI1 ON delay.	0.00 s / real32
116.12	DIO1 ON delay	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.12 DIO1 ON delay.	0.00 s / real32
116.12	DIO1 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.12 DIO1 ON delay.	0.00 s / real32
116.13	DI1 OFF delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.13 DI1 OFF delay.	0.00 s / real32
116.13	DIO1 OFF delay	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.13 DIO1 OFF delay.	0.00 s / real32
116.13	DIO1 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.13 DIO1 OFF delay.	0.00 s / real32
116.14	DIO2 function	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.14 DIO2 function.	Input / uint16
116.14	DIO2 function	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.14 DIO2 function.	Input / uint16
116.16	DIO2 output source	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.16 DIO2 output source.	Not energized / uint32
116.16	DIO2 output source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.16 DIO2 output source.	Not energized / uint32
116.17	DI2 ON delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.17 DI2 ON delay.	0.00 s / real32
116.17	DIO2 ON delay	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.17 DIO2 ON delay.	0.00 s / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.17	DIO2 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.17 DIO2 ON delay.	0.00 s / real32
116.18	DI2 OFF delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.18 DI2 OFF delay.	0.00 s / real32
116.18	DIO2 OFF delay	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.18 DIO2 OFF delay.	0.00 s / real32
116.18	DIO2 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.18 DIO2 OFF delay.	0.00 s / real32
116.19	AI supervision function	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.19 AI supervision function.	No action / uint16
116.19	DIO3 function	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.19 DIO3 function.	Input / uint16
116.20	AI supervision selection	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.20 AI supervision selection.	- / uint16
116.20	AI supervision selection	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.20 AI supervision selection.	- / uint16
116.21	AI tune	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.21 AI tune.	No action / uint16
116.21	AI tune	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.21 AI tune.	No action / uint16
116.21	DIO3 output source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.21 DIO3 output source.	Not energized / uint32
116.22	AI force selection	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.22 AI force selection.	- / uint16
116.22	DI3 ON delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.22 DI3 ON delay.	0.00 s / real32
116.22	AI force selection	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.22 AI force selection.	- / uint16
116.22	DIO3 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.22 DIO3 ON delay.	0.00 s / real32
116.23	DI3 OFF delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.23 DI3 OFF delay.	0.00 s / real32
116.23	DIO3 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.23 DIO3 OFF delay.	0.00 s / real32
116.24	DIO4 function	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.24 DIO4 function.	Input / uint16
116.26	AI1 actual value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.26 AI1 actual value.	- / real32
116.26	DIO4 output source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.26 DIO4 output source.	Not energized / uint32
116.27	AI1 scaled value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.27 AI1 scaled value.	- / real32
116.27	DIO4 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.27 DIO4 ON delay.	0.00 s / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.28	AI1 force data	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.28 AI1 force data.	- / real32
116.28	DIO4 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.28 DIO4 OFF delay.	0.00 s / real32
116.29	AI1 HW switch position	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.29 AI1 HW switch position.	mA / uint16
116.30	AI1 unit selection	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.30 AI1 unit selection.	mA / uint16
116.31	RO status	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.31 RO status.	- / uint16
116.31	AI1 filter gain	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.31 AI1 filter gain.	1 ms / uint16
116.31	RO status	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.31 RO status.	- / uint16
116.32	AI1 filter time	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.32 AI1 filter time.	0.100 s / real32
116.33	AI1 min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.33 AI1 min.	0.000 mA or V / real32
116.34	RO1 source	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.34 RO1 source.	Not energized / uint32
116.34	AI1 max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.34 AI1 max.	10.000 mA or V / real32
116.34	RO1 source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.34 RO1 source.	Not energized / uint32
116.35	RO1 ON delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.35 RO1 ON delay.	0.00 s / real32
116.35	AI1 scaled at AI1 min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.35 AI1 scaled at AI1 min.	0.000 / real32
116.35	RO1 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.35 RO1 ON delay.	0.00 s / real32
116.36	RO1 OFF delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.36 RO1 OFF delay.	0.00 s / real32
116.36	AI1 scaled at AI1 max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.36 AI1 scaled at AI1 max.	100.000 / real32
116.36	RO1 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.36 RO1 OFF delay.	0.00 s / real32
116.37	RO2 source	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.37 RO2 source.	Not energized / uint32
116.37	RO2 source	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.37 RO2 source.	Not energized / uint32
116.38	RO2 ON delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.38 RO2 ON delay.	0.00 s / real32
116.38	RO2 ON delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.38 RO2 ON delay.	0.00 s / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.39	RO2 OFF delay	(Visible when 116.1 Module 3 type = FDIO-01) See parameter 114.39 RO2 OFF delay.	0.00 s / real32
116.39	RO2 OFF delay	(Visible when 116.1 Module 3 type = FIO-01) See parameter 114.39 RO2 OFF delay.	0.00 s / real32
116.41	AI2 actual value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.41 AI2 actual value.	- / real32
116.42	AI2 scaled value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.42 AI2 scaled value.	- / real32
116.43	AI2 force data	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.43 AI2 force data.	- / real32
116.44	AI2 HW switch position	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.44 AI2 HW switch position.	mA / uint16
116.45	AI2 unit selection	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.45 AI2 unit selection.	mA / uint16
116.46	AI2 filter gain	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.46 AI2 filter gain.	1 ms / uint16
116.47	AI2 filter time	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.47 AI2 filter time.	0.100 s / real32
116.48	AI2 min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.48 AI2 min.	0.000 mA or V / real32
116.49	AI2 max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.49 AI2 max.	10.000 mA or V / real32
116.50	AI2 scaled at AI2 min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.50 AI2 scaled at AI2 min.	0.000 / real32
116.51	AI2 scaled at AI2 max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.51 AI2 scaled at AI2 max.	100.000 / real32
116.56	AI3 actual value	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.56 AI3 actual value.	- / real32
116.57	AI3 scaled value	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.57 AI3 scaled value.	- / real32
116.58	AI3 force data	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.58 AI3 force data.	- / real32
116.59	AI3 HW switch position	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.59 AI3 HW switch position.	mA / uint16
116.60	AI3 unit selection	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.60 AI3 unit selection.	mA / uint16
116.61	AI3 filter gain	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.61 AI3 filter gain.	1 ms / uint16
116.62	AI3 filter time	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.62 AI3 filter time.	0.100 s / real32
116.63	AI3 min	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.63 AI3 min.	0.000 mA or V / real32
116.64	AI3 max	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.64 AI3 max.	10.000 mA or V / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.65	AI3 scaled at AI3 min	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.65 AI3 scaled at AI3 min.	0.000 / real32
116.66	AI3 scaled at AI3 max	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.66 AI3 scaled at AI3 max.	100.000 / real32
116.71	AO force selection	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.71 AO force selection.	- / uint16
116.71	AO force selection	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.71 AO force selection.	- / uint16
116.76	AO1 actual value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.76 AO1 actual value.	- / real32
116.77	AO1 source	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.77 AO1 source.	Zero / uint32
116.78	AO1 force data	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.78 AO1 force data.	- / real32
116.78	AO1 force data	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.78 AO1 force data.	0.000 mA / real32
116.79	AO1 filter time	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.79 AO1 filter time.	0.100 s / real32
116.80	AO1 source min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.80 AO1 source min.	0.0 / real32
116.81	AO1 source max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.81 AO1 source max.	100.0 / real32
116.82	AO1 out at AO1 src min	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA / real32
116.82	AO1 out at AO1 src min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.82 AO1 out at AO1 src min.	0.000 mA / real32
116.83	AO1 out at AO1 src max	(Visible when 116.1 Module 3 type = FIO-11) See parameter 114.83 AO1 out at AO1 src max.	10.000 mA / real32
116.83	AO1 out at AO1 src max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.83 AO1 out at AO1 src max.	10.000 mA / real32
116.86	AO2 actual value	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.86 AO2 actual value.	- / real32
116.87	AO2 source	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.87 AO2 source.	Zero / uint32
116.88	AO2 force data	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.88 AO2 force data.	0.000 mA / real32
116.89	AO2 filter time	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.89 AO2 filter time.	0.100 s / real32
116.90	AO2 source min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.90 AO2 source min.	0.0 / real32
116.91	AO2 source max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.91 AO2 source max.	100.0 / real32
116.92	AO2 out at AO2 src min	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.92 AO2 out at AO2 src min.	0.000 mA / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
116.93	AO2 out at AO2 src max	(Visible when 116.1 Module 3 type = FAIO-01) See parameter 114.93 AO2 out at AO2 src max.	10.000 mA / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
119	**Operation mode**	Selection of external control location sources and operating modes.	
119.1	Actual operation mode	Displays the operation mode currently in use. This parameter is read-only.	DC control / uint16
	DC control	DC control.	1
	Power control	Active power control.	2
	AC control	AC voltage control.	3
119.11	Ext1/Ext2 selection	Selects the source for external control location EXT1/EXT2 selection. 0 = EXT1 1 = EXT2	EXT1 / uint32
	EXT1	EXT1.	0
	EXT2	EXT2.	1
	FBA A MCW bit 11	106.1 Main control word, bit 11.	2
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	11
	Other [bit]	See Terms and abbreviations (page 63).	
119.12	Ext1 ctrl mode1	Selects the operating mode 1 for external control location EXT1.	DC control / uint16
	DC control	DC control.	1
	Power control	Active power control.	2
	AC control	AC voltage control.	3
119.14	Ext2 ctrl mode1	Selects the operating mode 1 for external control location EXT2. For the selections, see parameter 119.12 Ext1 ctrl mode1.	DC control / uint16
119.16	Local ctrl mode	Selects the control mode for local control. **Note:** This parameter cannot be changed while the IGBT supply unit is running.	DC control / uint16
	DC control	DC control.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Power control	Active power control.	2
	AC control	AC voltage control.	3
119.17	Local control disable	Enables/disables local control. If you disable the local control, you can not use the Loc/Rem key of the panel for changing to local control. **WARNING!** Before disabling local control, ensure that the control panel is not needed for stopping the IGBT supply unit.	No / uint16
	No	Local control enabled.	0
	Yes	Local control disabled.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
120	**Start/stop**	Start/stop and run/start enable signal source selection; charging settings. For information on control locations, see section Local control vs. external control (page 19).	
120.1	Ext1 commands	Selects the source of start and stop commands for external control location 1 (EXT1). **Note:** This parameter can not be changed while the IGBT supply unit is running. See also parameters 120.2…120.4.	In1 Start / uint16
	Not sel	No start or stop command sources selected.	0
	In1 Start	The source of the start and stop commands is selected by parameter 120.3 Ext1 in1 source. The state transitions of the source bits are interpreted as follows: **State of source 1 (120.3)** — **Command** 0- > 1 (120.2 = Edge) 1 (120.2 = Level) — Start 0 — Stop	1
	In1P Start; In2 Stop	The sources of the start and stop commands are selected by parameters 120.3 Ext1 in1 source and 120.4 Ext1 in2 source. The state transitions of the source bits are interpreted as follows: **State of source 1 (120.3)** — **State of source 2 (120.4)** — **Command** 0 -> 1 — 1 — Start Any — 0 — Stop **Notes:**	4

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		• Parameter 120.2 Ext1 start trigger type has no effect with this setting. • When source 2 is 0, the Start and Stop keys on the control panel are disabled.	
	Fieldbus A	The start and stop commands are taken from fieldbus adapter A.	12
	D2D link	The start and stop commands are taken from another drive through the D2D (Drive-to-drive) link.	15
	DDCS controller	The start and stop commands are taken from an external (DDCS) controller.	16
	Application Program	The start and stop commands are taken from the application program control word.	21
	ATF	Reserved.	22
120.2	Ext1 start trigger type	Defines whether the start signal for external control location EXT1 is edge-triggered or level-triggered. **Note:** This parameter is not effective if a pulse-type start signal is selected. See the descriptions of the selections of parameter 120.1 Ext1 commands.	Edge / uint16
	Edge	The start signal is edge-triggered.	0
	Level	The start signal is level-triggered.	1
120.3	Ext1 in1 source	Selects source 1 for parameter 120.1 Ext1 commands.	DI2 / uint32
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	11
	Other [bit]	See Terms and abbreviations (page 63).	
120.4	Ext1 in2 source	Selects source 2 for parameter 120.1 Ext1 commands. For the available selections, see parameter 120.3 Ext1 in1 source.	Off / uint32
120.6	Ext2 commands	Selects the source of start and stop commands for external control location 2 (EXT2). See also parameters 120.7…120.9.	Not sel / uint16
	Not sel	No start or stop command sources selected.	0

<table>
<tr><th>No.</th><th>Name / Range / Selection</th><th>Description</th><th>Def / Type FbEq 16b / 32b</th></tr>
<tr><td></td><td>In1 Start</td><td>The source of the start and stop commands is selected by parameter 120.8 Ext2 in1 source. The state transitions of the source bits are interpreted as follows:<table><tr><th>State of source 1 (120.8)</th><th>Command</th></tr><tr><td>0- > 1 (120.7 = Edge)
1 (120.7 = Level)</td><td>Start</td></tr><tr><td>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 120.8 Ext2 in1 source and 120.9 Ext2 in2 source. The state transitions of the source bits are interpreted as follows:<table><tr><th>State of source 1 (120.8)</th><th>State of source 2 (120.9)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table>Notes:
• Parameter 120.7 Ext2 start trigger type has no effect with this setting.
• When source 2 is 0, the Start and Stop keys on the control panel are disabled.</td><td>4</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>D2D link</td><td>The start and stop commands are taken from another drive through the D2D (Drive-to-drive) link.</td><td>15</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></td><td>Application Program</td><td>The start and stop commands are taken from the application program control word.</td><td>21</td></tr>
<tr><td></td><td>ATF</td><td>Reserved.</td><td>22</td></tr>
<tr><td>120.7</td><td>Ext2 start trigger type</td><td>Defines whether the start signal for external control location EXT2 is edge-triggered or level-triggered.
Note: In case the settings of parameters 120.6 and 120.7 are in conflict, the setting of parameter 120.6 takes preference.</td><td>Edge / uint16</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>
<tr><td>120.8</td><td>Ext2 in1 source</td><td>Selects source 1 for parameter 120.6 Ext2 commands. For the available selections, see parameter 120.3 Ext1 in1 source.</td><td>Off / uint32</td></tr>
</table>

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
120.9	Ext2 in2 source	Selects source 2 for parameter 120.6 Ext2 commands. For the available selections, see parameter 120.3 Ext1 in1 source.	Off / uint32
120.12	Run enable 1 source	Selects the source of the external run enable signal. If the run enable signal is switched off, the IGBT supply unit will not start, or stops if running. 1 = Run enable. **Note:** This parameter cannot be changed while the IGBT supply unit is running.	DI2 / uint32
	Off	0 (off).	0
	On	1 (on).	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	11
	DIIL	DIIL	33
	Other [bit]	See Terms and abbreviations (page 63).	
120.19	Enable start command	Selects the source for the start enable signal. 1 = Start enable. With the signal switched off, the IGBT supply unit will not start. (Switching the signal off while the IGBT supply unit is running will not stop the IGBT supply unit.)	On / uint32
	Off	0 (off).	0
	On	1 (on).	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	11
	DIIL	DIIL	30

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Other [bit]	See Terms and abbreviations (page 63).	
120.21	Delay for MCB DI3 supervision	Start and stop delay for supervision of main circuit breaker DI3 feedback in external charging. After the delay a fault is given in start and stop states if the command and the feedback do not match.	1.00 s / uint32
	0.00 ... 8.00 s	Start and stop delay for supervision of main circuit breaker DI3 feedback.	100 = 1 s / 1 = 1 s
120.22	Max current for MCB closing	Defines the maximum charging current for the charging function. When the charging current is below the value defined with this parameter, the main circuit breaker can be closed. (It will be closed only if also the remaining criteria is met.) The limit is given as a percent value of the nominal current of the supply unit. See also section Charging (page 45). 10% = 10% of the nominal current.	5% / real32
	0 ... 10%	Current value in percent.	1 = 1% / 100 = 1%
120.23	Max DC charging time	Defines the maximum charging time for the charging function. See section Charging (page 45).	6.00 s / uint32
	0.00 ... 10.00 s	Maximum charging time.	100 = 1 s / 1 = 1 s
120.24	Initial DC charging time	Defines the minimum charging time through a charging resistor before entering the dU/dt, or fault checking when the charging is started from zero.	1.00 s / uint32
	0.00 ... 10.00 s	Initial DC charging time.	100 = 1 s / 1 = 1 s
120.25	MCB closing level	Defines the DC link voltage level for the charging function. When the measured DC link voltage exceeds the level, the main contactor/breaker can be closed. 100% equals to the value of parameter 101.62 Nominal DC voltage. See section Charging (page 45).	80% / real32
	20 ... 100%	Intermediate circuit DC voltage level in percent of the nominal	1 = 1% / 100 = 1%
120.26	Maximum dU/dt	Defines the maximum DC link voltage change rate (dU/dt) for the charging function. When the change rate falls below this maximum change rate limit, the control program can close the main contactor/breaker. The change rate is measured in 10 ms sample interval. See section Charging (page 45).	50 V/s / uint16
	0 ... 200 V/s	Maximum dU/dt change.	1 = 1 V/s / 1 = 1 V/s
120.27	Start delay	Defines the start delay that delay the setting of the charged state after the main circuit breaker has closed. Without charged state the start command is blocked from the modulator.	0.65 s / uint32
	0.00 ... 10.00 s	Start delay.	100 = 1 s / 1 = 1 s
120.28	MCB relay timing	Defines the time for how long the MCB relay is closed/open in parallel with the charging relay. Positive time means that both relays are kept opened that time. Negative time means that both relays are kept closed at the same time. See picture in section Charging (page 45).	-0.20 s / int32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	-6.00 ... 6.00 s	Time between charging contactor opening and main circuit contactor closing.	100 = 1 s / 1 = 1 s
120.29	Diode mode	Enables diode mode, when additional charging circuit is in use and the unit acts as a pure diode bridge. Do not use diode mode with R8, R8iLC, R7i, R7iLC power units with LCL filter to prevent possible oscillation with grid supply. Diode mode blocks the start command for modulator after charging. In diode mode, the modulation is stopped and the main contactor is closed. Using diode mode reduces the number of main contactor operations.	Off / uint32
	Off	Diode mode is disabled.	0
	On	Diode mode is enabled.	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	11
	MCW bit 14	106.1 Main control word, bit 14 (User bit 2).	12
	Other [bit]	See Terms and abbreviations (page 63).	
120.30	External charge enable	Enables the charging function. See section Charging (page 45).	Yes / uint16
	No	External charging disabled.	0
	Yes	External charging enabled.	1
120.50	Charging overload event sel	Selects the event type for charging overload event. See section Charging (page 45). Charging overload is indicated in 106.18 Start inhibit status word bit 9 (Charging overload) if Warning or No action is selected.	Fault / uint16
	Fault	The supply unit trips on fault 3E09 Charging count when started and stopped three times within 5 minutes.	0
	Warning	The supply unit generates a warning AE85 Charging count when started and stopped two times within 5 minutes. When the warning appears, it is not possible to run the drive anymore.	1
	No action	No action taken.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
121	**Start/stop mode**	Emergency stop settings.	
121.4	Emergency stop mode	Selects the way the IGBT supply unit is stopped when an emergency stop command is received. The source of the emergency stop signal is selected with parameter 121.5 Emergency stop source.	Stop and warning / uint16
	Stop and warning	Stop IGBT supply unit and show emergency stop warning. Note that OFF2 and OFF3 warnings are disabled for 60 seconds from the startup of the control unit.	0
	Warning	Show emergency stop warning but do not stop IGBT supply unit. Note that OFF2 and OFF3 warnings are disabled for 60 seconds from the startup of the control unit.	1
	Fault	Stop IGBT supply unit and create an emergency stop fault.	2
121.5	Emergency stop source	Selects the source of the emergency stop signal. 0 = Emergency stop active 1 = Emergency stop command is off, normal operation **Note:** This parameter cannot be changed while the IGBT supply unit is running.	Inactive (true) / uint32
	Active (false)	0 (emergency stop command is on).	0
	Inactive (true)	1 (emergency stop command is off).	1
	DIIL	DIIL input (110.2 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2). **Note:** DI3 is reserved for main breaker/contactor fault in the control program. Do not select it for any other use.	5
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	12
	Other [bit]	See Terms and abbreviations (page 63).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
122	**Power reference**	Settings of the active power reference chain. See the control chain diagrams in chapter Control chain diagrams (page 279).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
122.1	User Power ref	Defines the active power reference value for selection User ref of the parameter 122.2 Power ref sel. The unit is selected with parameter 122.6 Power ref type. See the diagram Power reference chain (page 281).	- / real32
122.2	Power ref sel	Selects the source for active power reference. See the diagram Power reference chain (page 281).	FB A ref1 / uint32
	User ref	122.1 User Power ref.	0
	AI1 scaled	112.12 AI1 scaled value.	1
	AI2 scaled	112.22 AI2 scaled value.	2
	FB A ref1	Fieldbus adapter A reference 1.	3
	FB A ref2	Fieldbus adapter A reference 2.	4
	DDCS ctrl ref1	103.11 DDCS controller ref 1.	5
	DDCS ctrl ref2	103.12 DDCS controller ref 2.	6
	M/F ref1	103.13 M/F or D2D ref1.	7
	M/F ref2	103.14 M/F or D2D ref2.	8
	Other [value]	See Terms and abbreviations (page 63).	
122.3	Power ref 1	Shows the unscaled power reference value selected by 122.2 Power ref sel. See the diagram Power reference chain (page 281).	- / real32
122.4	Power ref scale	Defines the scaling factor for 122.3 Power ref 1. See the diagram Power reference chain (page 281).	1.00 / real32
	-1000.00 ... 1000.00	The scaling factor.	1 = 1 / 1 = 1
122.5	Power ref 2	Shows the scaled power reference value: the value selected by parameter 122.2 Power ref sel and multiplied by parameter 122.4 Power ref scale. See the diagram Power reference chain (page 281).	- / real32
122.6	Power ref type	Selects the active power reference type for the scaled reference value (parameter 122.5 Power ref 2). See the diagram Power reference chain (page 281).	Pow ref kW / uint32
	Ipow ref [A]	Active current reference in Amperes.	0
	Ipow ref [%]	Active current reference in percent of the nominal current.	1
	Pow ref kW	Active power reference in kW.	2
	Pow ref %	Active power reference in percent of the nominal power.	3
122.7	Ipower ref %	Shows the active current reference in percent of the nominal current of the converter. See the diagram Power reference chain (page 281).	- / real32
	-1000.0 ... 1000.0%	Power reference in percent.	1 = 1% / 1 = 1%
122.8	Ipower ref	Shows the active current reference in Amperes. See the diagram Power reference chain (page 281).	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
122.9	Power ref %	Shows the power reference in percent of the nominal power. See the diagram Power reference chain (page 281).	- / real32
	-1000.0 ... 1000.0%	Power reference in percent.	1 = 1% / 1 = 1%
122.10	Power ref	Shows the power reference in kW. See the diagram Power reference chain (page 281).	- / real32
122.11	Ipower ref max %	Defines the maximum limit for the active current reference in percent. See the diagram Power reference chain (page 281).	100.0% / real32
	0.0 ... 200.0%	Maximum active current reference in percent.	1 = 1% / 100 = 1%
122.12	Ipower ref min %	Defines the minimum limit for the active current reference in percent. See the diagram Power reference chain (page 281).	-100.0% / real32
	-200.0 ... 0.0%	Minimum active current reference in percent.	1 = 1% / 100 = 1%
122.13	Ipower ref lim %	Shows the limited active current reference. Limitation is based on 122.11 Ipower ref max % and 122.12 Ipower ref min %. See the diagram Power reference chain (page 281).	- / real32
	-200.0 ... 200.0%	Output value of active power reference limitation.	1 = 1% / 1 = 1%
122.14	Ipower ref ramp up	Defines the active current ramp up time (time from zero to nominal) in ms. See the diagram Power reference chain (page 281).	1000 ms / real32
	0 ... 30000 ms	Active current ramp up time.	1 = 1 ms / 1 = 1 ms
122.15	Ipower ref ramp down	Defines the active current ramp down time (time from nominal to zero) in ms. See the diagram Power reference chain (page 281).	1000 ms / real32
	0 ... 30000 ms	Active current ramp down time.	1 = 1 ms / 1 = 1 ms
122.16	Ipower ref out %	Shows the output value of active current reference in percent for the controller. See the diagram Power reference chain (page 281).	- / real32
	-200.0 ... 200.0%	Output value of active current reference.	1 = 1% / 1 = 1%
122.17	Ipower ref out	Shows the output value of active current reference in Amperes 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 Power reference chain (page 281).	- / real32
122.18	Power ref out %	Shows the output value of active power reference in percent of the nominal power for the controller. See the diagram Power reference chain (page 281).	- / real32
	-200.0 ... 200.0%	Output value of active power reference.	1 = 1% / 1 = 1%
122.19	Power ref out	Shows the output value of active power reference in kW for the controller. See the diagram Power reference chain (page 281).	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
123	**DC voltage reference**	Settings of the DC voltage reference chain. See the control chain diagrams in chapter Control chain diagrams (page 279).	
123.1	User DC voltage ref	Defines the DC voltage reference value for selection User ref of the parameter 123.2 DC voltage ref selection. See the diagram DC voltage reference chain (page 280).	- / real32
	0.00 ... 2000.00 V	DC voltage reference value. *16-bit scaling defined by parameter 146.4.	*1 = 1 V / 1 = 1 V
123.2	DC voltage ref selection	Selects the control location for DC voltage reference. See the diagram DC voltage reference chain (page 280).	FB A ref1 / uint32
	User ref	123.1 User DC voltage ref.	0
	AI1 scaled	112.12 AI1 scaled value.	1
	AI2 scaled	112.22 AI2 scaled value.	2
	FB A ref1	Fieldbus adapter A reference 1.	3
	FB A ref2	Fieldbus adapter A reference 2.	4
	DDCS ctrl ref1	103.11 DDCS controller ref 1.	5
	DDCS ctrl ref2	103.12 DDCS controller ref 2.	6
	Other [value]	See Terms and abbreviations (page 63).	
123.3	DC voltage ref 1	Shows the unscaled DC voltage reference value selected by 123.2 DC voltage ref selection. See the diagram DC voltage reference chain (page 280).	- / real32
	0.00 ... 2000.00 V	Value of the DC voltage reference.	1 = 1 V / 1 = 1 V
123.5	DC voltage ref 2	Shows the scaled DC reference value (123.3 DC voltage ref 1 × 123.12 DC voltage ref scale). See the diagram DC voltage reference chain (page 280).	- / real32
	0.00 ... 2000.00 V	Limitation of DC voltage reference.	1 = 1 V / 1 = 1 V
123.6	DC voltage ref max	Maximum value of DC voltage reference in Volts. The maximum DC voltage reference is approximately 113% × sqrt(2) × 195.1 Supply voltage (the high value). See the diagram DC voltage reference chain (page 280), and section Boost limits (page 40).	1200 V / uint32
	0 ... 2000 V	Maximum DC voltage reference.	1 = 1 V / 1 = 1 V
123.7	DC voltage ref min	Minimum value of DC voltage reference in Volts. This parameter is an undervoltage controller activation limit in power control mode. See the diagram DC voltage reference chain (page 280).	200 V / real32
	0 ... 1100 V	Minimum DC voltage reference.	1 = 1 V / 1 = 1 V
123.8	DC voltage ref lim	Output value of DC voltage reference limitation. Limitation is based on 123.6 DC voltage ref max and 123.7 DC voltage ref min values. If the reference and minimum limit cannot be met (diodes keep the DC voltage level higher), an actual value is used in the signal instead of minimum limit value. See the diagram DC voltage reference chain (page 280).	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0.00 ... 2000.00 V	Output value of DC voltage reference limitation.	1 = 1 V / 1 = 1 V
123.9	DC voltage ref ramp up	DC voltage reference ramp up time in milliseconds per 100 V. See the diagram DC voltage reference chain (page 280).	1000 ms / real32
	0 ... 10000 ms	DC voltage reference ramp up time.	1 = 1 ms / 1 = 1 ms
123.10	DC voltage ref ramp down	DC voltage reference ramp down time in milliseconds per 100 V. See the diagram DC voltage reference chain (page 280).	1000 ms / real32
	0 ... 10000 ms	DC voltage reference ramp down time.	1 = 1 ms / 1 = 1 ms
123.11	DC voltage ref out	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 280).	- / real32
	0.00 ... 2000.00 V	Output value of DC voltage reference ramping.	1 = 1 V / 1 = 1 V
123.12	DC voltage ref scale	DC voltage reference scaling factor. See the diagram DC voltage reference chain (page 280).	1.00 / real32
	-100.00 ... 100.00	DC voltage reference scaling factor.	1 = 1 / 1 = 1
123.13	DC voltage ref add	Defines the addition value to DC voltage reference (parameter 123.3 DC voltage ref 1). See the diagram DC voltage reference chain (page 280).	0.000 V / real32
	-30.000 ... 30.000 V	Addition value.	1000 = 1 V / 1 = 1 V
123.30	Udc-ctrl droop	Disables/enables the power share between two supply units that are fed from separate transformers but are connected to same DC bus. See section Power share with droop control (page 53).	Disabled / uint32
	Disabled	Disabled.	0
	Enabled	Enabled.	1
123.31	Udc-ctrl drooping rate	Defines the drooping rate in percent. See parameter 123.30 Udc-ctrl droop, and section Power share with droop control (page 53).	5.0% / real32
	0.0 ... 100.0%	Drooping rate.	1 = 1% / 1 = 1%
123.32	Master power	Defines the power of the master unit in master/follower set-up.	0.00 / real32
	-2000.00 ... 2000.00	Power of the master unit.	10 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
124	**Reactive power reference**	Settings of the reactive power reference chain. See the control chain diagrams in chapter Control chain diagrams (page 279).	
124.1	User Qref	Defines the reactive power reference value for the selection User ref of parameter 124.2 Q power ref selection. The unit is selected with parameter 124.6 Q	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		power ref type. See the diagram Reactive power reference chain (page 282).	
124.2	Q power ref selection	Selects the control location for reactive power reference. See the diagram Reactive power reference chain (page 282).	FB A ref2 / uint32
	User ref	Value of parameter 124.1 User Qref.	0
	AI1 scaled	112.12 AI1 scaled value.	1
	AI2 scaled	112.22 AI2 scaled value.	2
	FB A ref1	Fieldbus adapter A reference 1.	3
	FB A ref2	Fieldbus adapter A reference 2.	4
	DDCS ctrl ref1	Reserved.	5
	DDCS ctrl ref2	Reserved.	6
	M/F ref1	Reserved.	7
	M/F ref2	Reserved.	8
	Other [value]	See Terms and abbreviations (page 63).	
124.3	Qref 1	Shows the reference value selected by 124.1 User Qref or 124.2 Q power ref selection. See the diagram Reactive power reference chain (page 282).	- / real32
124.4	Q ref scale	Defines the scaling factor for 124.3 Qref 1. See the diagram Reactive power reference chain (page 282).	1.00 / real32
	-1000.00 ... 1000.00	The scaling factor.	1 = 1 / 1 = 1
124.5	Qref 2	Shows the reference value (124.3 Qref 1) after scaling. See the diagram Reactive power reference chain (page 282).	- / real32
124.6	Q power ref type	Selects the reactive power reference type and unit. See the diagram Reactive power reference chain (page 282).	Qref [kVAr] / uint32
	Ireact ref [A]	Reactive current reference in Amperes.	0
	Ireact ref [%]	Reactive current reference in % of the nominal current.	1
	Qref [kVAr]	Reactive power reference in kVAr.	2
	Qref [%]	Reactive power reference in % of nominal power.	3
	Phi	Reactive power reference angle in degrees 1 = 1degree. The range is limited to -30° … 30°.	4
	CosPhi	Reactive power reference in cosphi 0.9 = 0.9 capacitive. The range is limited to -0.866 … -1 and 0.866 … 1.	5
	Q(x) regulation curve	Q(x) regulation curve.	8
124.7	Ireact ref %	Shows the reactive current reference in percent. See the diagram Reactive power reference chain (page 282).	- / real32
	-1000.0 ... 1000.0%	Reactive current reference in percent.	1 = 1% / 1 = 1%
124.8	Ireact ref	Shows the reactive current reference in Amperes.	- / real32

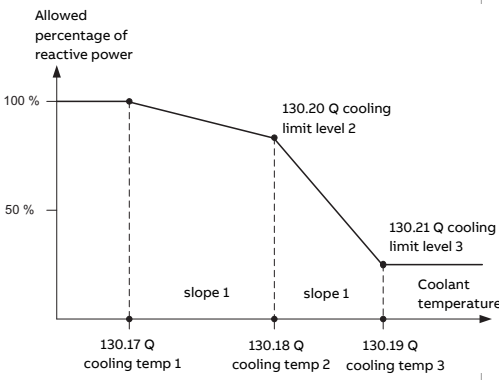
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
124.9	Q power ref %	Shows the reactive power reference in percent of the nominal power.	- / real32
	-1000.0 ... 1000.0%	Reactive power reference in percent.	1 = 1% / 1 = 1%
124.10	Q power ref	Shows the reactive power reference in kVAr.	- / real32
124.11	Ireact ref max %	Defines the maximum limit for the reactive power reference in percent. See the diagram Reactive power reference chain (page 282).	80.0% / real32
	0.0 ... 200.0%	Maximum reactive current reference in percent.	1 = 1% / 100 = 1%
124.12	Ireact ref min %	Defines the minimum limit for the reactive power reference in percent. See the diagram Reactive power reference chain (page 282).	-80.0% / real32
	-200.0 ... 0.0%	Minimum reactive current reference in percent.	1 = 1% / 100 = 1%
124.13	Ireact ref lim %	Output value of reactive power reference limitation. Limitation is based on 124.11 Ireact ref max % and 124.12 Ireact ref min % values.	- / real32
	-200.0 ... 200.0%	Output value of reactive power reference limitation.	1 = 1% / 1 = 1%
124.14	Ireact ref ramp up	Defines the reactive current ramp up time (time from zero to nominal current) in ms.	1000 ms / real32
	0 ... 30000 ms	Reactive current ramp up time.	1 = 1 ms / 1 = 1 ms
124.15	Ireact ref ramp down	Defines the reactive current ramp down time (time from nominal current to zero) in ms.	1000 ms / real32
	0 ... 30000 ms	Reactive current ramp down time.	1 = 1 ms / 1 = 1 ms
124.16	Ireact ref out %	Shows the output value of reactive current reference in percent for the controller.	- / real32
	-200.0 ... 200.0%	Output value of reactive current reference.	1 = 1% / 1 = 1%
124.17	Ireact ref out	Shows the output value of reactive current reference in Amperes 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 Reactive power reference chain (page 282).	- / real32
124.18	Q power ref out %	Shows the output value of reactive power reference in percent of the nominal power for the controller.	- / real32
	-200.0 ... 200.0%	Output value of reactive power reference.	1 = 1% / 1 = 1%
124.19	Q power ref out	Shows the output value of reactive power reference in kVAr for the controller.	- / real32
124.20	AC control gain	Defines the relative gain of the AC voltage controller used in the reactive power reference chain. See the diagram Reactive power reference chain (page 282).	10.0 / real32
	0.0 ... 100.0	Relative gain of the AC voltage controller.	10 = 1 / 1 = 1
124.21	AC control integ time	Defines the integration time of the AC voltage controller used in the reactive power reference chain. See the diagram Reactive power reference chain (page 282).	100 ms / real32
	0 ... 30000 ms	Integration time of the AC voltage controller.	1 = 1 ms / 1 = 1 ms

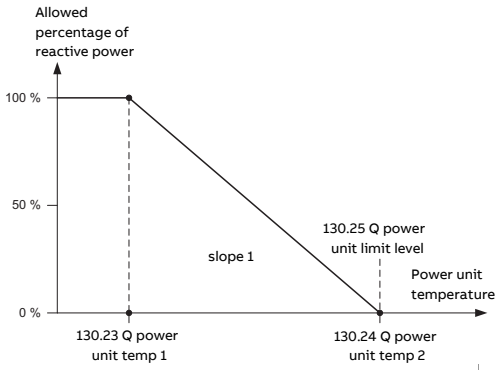
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
124.22	AC diff max %	Defines the maximum limit for AC voltage difference (reference - actual) used in the reactive power reference chain. See the diagram Reactive power reference chain (page 282).	10.0% / real32
	0.0 ... 30.0%	Maximum limit of AC control input.	1 = 1% / 100 = 1%
124.23	AC diff min %	Defines the minimum limit for the AC voltage difference (reference - actual) used in the reactive power reference chain. See the diagram Reactive power reference chain (page 282).	-10.0% / real32
	-30.0 ... 0.0%	Minimum limit of AC control input.	1 = 1% / 100 = 1%
124.30	Q(x) input signal	Selects the input signal used in Q(x) regulation curve.	Uac voltage / uint32
	Uac voltage	Input: grid AC voltage; output: reactive power reference	0
	Power	Input: actual power; output: reactive power reference	1
	Power to cos phi	Input: actual power; output: cos phi	2
124.31	Lock-in level	Defines the lock-in level above which the Q(x) regulation curve is activated.	20.0% / real32
	0.0 ... 200.0%	Lock-in level.	1 = 1% / 1 = 1%
124.32	Lock-out level	Defines the lock-out level. In case below the lock-out level, the reactive power reference is reset to zero until the lock-in level is exceeded.	5.0% / real32
	0.0 ... 200.0%	Lock-out level.	1 = 1% / 1 = 1%
124.33	Q(x) input level 1	Defines the first input value for the Q(x) regulation curve. When the selected input signal reaches this value, the reactive power reference is set to the value defined by parameter 124.39 Q(x) output level 1.	0.0% / real32
124.34	Q(x) input level 2	Defines the 2nd input value for the Q(x) regulation curve.	0.0% / real32
124.35	Q(x) input level 3	Defines the 3rd input value for the Q(x) regulation curve.	0.0% / real32
124.36	Q(x) input level 4	Defines the 4th input value for the Q(x) regulation curve.	0.0% / real32
124.37	Q(x) input level 5	Defines the 5th input value for the Q(x) regulation curve.	0.0% / real32
124.38	Q(x) input level 6	Defines the 6th input value for the Q(x) regulation curve.	0.0% / real32
124.39	Q(x) output level 1	Defines the first reference output value for the Q(x) regulation curve. When the selected input signal reaches the value defined by parameter 124.33 Q(x) input level 1, the reactive power reference is set to the value defined by this parameter.	0.00 / real32
124.40	Q(x) output level 2	Defines the 2nd reference output value for the Q(x) regulation curve.	0.00 / real32
124.41	Q(x) output level 3	Defines the 3rd reference output value for the Q(x) regulation curve.	0.00 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
124.42	Q(x) output level 4	Defines the 4th reference output value for the Q(x) regulation curve.	0.00 / real32
124.43	Q(x) output level 5	Defines the 5th reference output value for the Q(x) regulation curve.	0.00 / real32
124.44	Q(x) output level 6	Defines the 6th reference output value for the Q(x) regulation curve.	0.00 / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
130	**Limits**	Operation limits of the IGBT supply unit.	
130.1	Limit word 1	Shows limit word 1. This parameter is read-only.	- / uint16
b0	P user ref max	1 = Power reference is being limited by 122.11 Ipower ref max %.	
b1	P user ref min	1 = Power reference is being limited by 122.12 Ipower ref min %.	
b2	P user max	1 = 130.48 User power limit max % is limiting.	
b3	P user min	1 = 130.49 User power limit min % is limiting.	
b4	P cooling overtemp	1 = Power reference is limited if coolant temperature exceeds given limits.	
b5	P power unit overtemp	1 = Power reference is limited if power unit temperature exceeds given limits.	
b6	Reserved		
b7	P/f limitation	Not in use.	
b8	Grid fault limitation	Not in use.	
b9	Connect limitation	Not in use.	
b10	External limit	Not in use.	
b11…15	Reserved		
	0000h…FFFFh		1 = 1
130.2	Limit word 2	Shows limit word 2. This parameter is read-only.	- / uint16
b0	Q user ref max	1 = Reactive power reference is limited by 124.11 Ireact ref max %.	
b1	Q user ref min	1 = Reactive power reference is limited by 124.12 Ireact ref min %.	
b2	Q cooling overtemp	1 = Reactive power reference is limited if coolant temperature exceeds given limits. See parameter 130.16 Q cooling overtemp limit.	
b3	Q power unit overtemp	1 = Reactive power reference is limited if power unit temperature exceeds given limits. See parameter 130.22 Q power unit overtemp limit.	
b4	AC overvoltage	1 = AC overvoltage protection.	
b5…6	Reserved		

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b7	AC diff max	The input of AC control is limited to maximum value by parameter 124.22 AC diff max %.	
b8	AC diff min	The input of AC control is limited to minimum value by parameter 124.23 AC diff min %.	
b9…15	Reserved		
	0000h…FFFFh		1 = 1
130.3	Limit word 3	Shows limit word 3. This parameter is read-only. See the diagram Current limitation chain (page 284).	- / uint16
b0	Undervoltage limit	Undervoltage controller limits the power.	
b1	Overvoltage limit	Overvoltage controller limits the power.	
b2	Motoring power	Power is limited by user limit or temperature limit. See parameters 130.47…130.49.	
b3	Generating power	Power is limited by user limit or temperature limit. See parameters 130.47…130.49.	
b4	Active current limit	Active current is limited. For details, see bits 6…9 and 14…15.	
b5	Reactive current limit	Reactive current is limited. For details, see bits 12…13.	
b6	Thermal limit	Current is limited by main circuit thermal limit (this internal limit can not be changed by the user).	
b7	SOA limit	Current is limited by the safe operation area (SOA) limit (this internal limit can not be changed by the user).	
b8	User current limit	Current is limited by 130.46 Current limit %.	
b9	Thermal IGBT	Current is limited by maximum thermal IGBT stress (this internal limit can not be changed by the user).	
b10…11	Reserved		
b12	Q act neg	Total current limitation limits negative reactive current.	
b13	Q act pos	Total current limitation limits positive reactive current.	
b14	P act neg	Total current limitation limits negative active current.	
b15	P act pos	Total current limitation limits positive active current.	
	0000h…FFFFh		1 = 1
130.4	Limit word 4	Shows limit word 4. This parameter is read-only.	- / uint16
b0	Udc ref max	1 = U_{dc} reference is being limited by 123.6 DC voltage ref max.	
b1	Udc ref min	1 = U_{dc} reference is being limited by 123.7 DC voltage ref min.	
b2	User I max	Current is limited by 130.46 Current limit %.	
b3	Temp I max	Current is limited by temperature-based current limit.	
b4…15	Reserved		

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0000h...FFFFh		1 = 1
130.16	Q cooling overtemp limit	Enables the reactive power limitation based on measured coolant temperature 130.52 Ext Tmp1 or 130.53 Ext Tmp2. Parameters 130.52 Ext Tmp1 and 130.53 Ext Tmp2 define the measured external temperature. The coolant temperature can also be set by using the selection Other. Example: Set parameter 130.50 Ext Tmp1 input selection with selection Other to 114.26 AI1 actual value. Set parameter 114.77 AO1 source with selection Other to 130.54 Pt current. It is possible to use groups 115 or 116 also. If the coolant temperature exceeds the given limit, the reactive power is limited according to the figure below.  	No / uint16
	No	Limitation disabled.	0
	Yes	Limitation enabled.	1
130.17	Q cooling temp 1	Defines the temperature level where limitation of reactive power starts.	53.0 C / real32
	0.0 ... 200.0 C	Temperature level.	1 = 1 C / 1 = 1 C
130.18	Q cooling temp 2	Defines the temperature level where reactive power is limited to 130.20 Q cooling limit level 2.	55.0 C / real32
	0.0 ... 200.0 C	Temperature level.	1 = 1 C / 1 = 1 C
130.19	Q cooling temp 3	Defines the temperature level where reactive power is limited to 130.21 Q cooling limit level 3.	56.0 C / real32
	0.0 ... 200.0 C	Temperature level.	1 = 1 C / 1 = 1 C
130.20	Q cooling limit level 2	Defines the allowed percentage of reactive power reference at temperature 130.18 Q cooling temp 2. 100% equals to nominal power.	0% / real32
	0 ... 100%	Percentage value.	1 = 1% / 100 = 1%

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
130.21	Q cooling limit level 3	Defines the allowed percentage of reactive power reference at temperature 130.19 Q cooling temp 3. 100% equals to nominal power.	0% / real32
	0 ... 100%	Percentage value.	1 = 1% / 100 = 1%
130.22	Q power unit overtemp limit	Enables reactive power limitation based on parameter 105.11 Converter temperature %. If the power unit temperature exceeds the given limit, the reactive power is limited according to the figure below. 	No / uint16
	No	Limitation disabled.	0
	Yes	Limitation enabled.	1
130.23	Q power unit temp 1	Defines the temperature level where limitation of reactive power starts.	95.0% / real32
	0.0 ... 100.0%	Temperature level.	1 = 1% / 100 = 1%
130.24	Q power unit temp 2	Defines the temperature level where reactive power is limited to 130.25 Q power unit limit level.	99.0% / real32
	0.0 ... 100.0%	Temperature level.	1 = 1% / 100 = 1%
130.25	Q power unit limit level	Defines the allowed percentage of reactive power reference at temperature 130.24 Q power unit temp 2. 100% equals to nominal power.	0% / real32
	0 ... 100%	Percentage value.	1 = 1% / 100 = 1%
130.30	Ireact limit %	Shows the output value of reactive power limitation in percent of the nominal.	- / real32
	-200.0 ... 200.0%	Percentage value.	1 = 1% / 100 = 1%
130.31	Ireact limit	Shows the output value of limited reactive current in Amperes.	- / real32
130.32	Q power limit %	Shows the output value of limited reactive power in percent of the nominal.	- / real32
	-200.0 ... 200.0%	Percentage value.	1 = 1% / 100 = 1%

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
130.33	Q power limit	Shows the output value of limited reactive power in kVAr.	- / real32
130.46	Current limit %	Defines a customer limit for maximum line current in percent. Limits reactive current if line current exceeds the limit.	200% / real32
	0 ... 200%	Customer limit for maximum line current.	100 = 1% / 100 = 1%
130.47	Power sign change	(Only visible with control program AISLX) Changes the sign of power signals. No = positive (motoring) power flows from AC to DC Yes = positive (generating) power flows from DC to AC	No / uint16
	No	Positive (motoring) power flow from AC to DC.	0
	Yes	Positive (generating) power flow from DC to AC.	1
130.48	User power limit max %	Defines a customer limit for maximum power in percent. Power sign is selected with parameter 130.47 Power sign change. With default setting of parameter 130.47 Power sign change, this means maximum power from AC to DC.	200.0% / real32
	0.0 ... 200.0%	Customer limit for maximum power.	1 = 1% / 100 = 1%
130.49	User power limit min %	Defines a customer limit for minimum power in percent. Power sign is selected with parameter 130.47 Power sign change. With default setting of parameter 130.47 Power sign change, this means minimum power from DC to AC. The range and the default value apply for control program AISLX. In control program ALHLX, the range is -10.0 … 1.0%, and the default value is 0.0%.	-200.0% / real32
	-200.0 ... 0.0%	Customer limit for minimum power.	1 = 1% / 100 = 1%
130.50	Ext Tmp1 input selection	Defines the source for external temperature 1 measurement.	Disabled / uint32
	Disabled	No source.	0
	Other [value]	See Terms and abbreviations (page 63).	
130.51	Ext Tmp2 input selection	Defines the source for external temperature 1 measurement.	Disabled / uint32
	Disabled	No source.	0
	Other [value]	See Terms and abbreviations (page 63).	
130.52	Ext Tmp1	Defines the measured external temperature 1.	- / real32
130.53	Ext Tmp2	Defines the measured external temperature 2.	- / real32
130.54	Pt current	Defines the PT100 excitation current.	10.0 mA / real32
	0.0 ... 10.0 mA	PT100 excitation current.	1 = 1 mA / 1 = 1 mA
130.55	Cyclic Pt current	Defines the cyclic PT100 excitation current.	- / real32
130.58	Cooling temp source	Selects the source for coolant temperature.	Ext Tmp1 / uint32
	Disabled	Disabled.	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Ext Tmp1	Measured external temperature 1.	1
	Ext Tmp2	Measured external temperature 2.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
131	**Fault functions**	Settings that define the behavior of the IGBT supply unit upon fault situations.	
131.1	External event 1 source	Selects the source of external event 1. See also parameter 131.2 External event 1 type. 0 = Trigger event 1 = Normal operation	Inactive (true) / uint32
	Active (false)	0.	0
	Inactive (true)	1.	1
	DIIL	DIIL input (110.2 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2). **Note:** DI3 is reserved for main breaker/contactor fault in the control program. Do not select it for any other use.	5
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	12
	Other [value]	See Terms and abbreviations (page 63).	
131.2	External event 1 type	Selects the type of external event 1.	Fault / uint16
	Fault	The external event generates a fault.	0
	Warning	The external event generates a warning.	1
	Warning/Fault	If the supply unit is modulating, the external event generates a fault. Otherwise, the event generates a warning.	3
131.3	External event 2 source	Defines the source of external event 2. See also parameter 131.4 External event 2 type. For selections, see parameter 131.1 External event 1 source.	Inactive (true) / uint32
131.4	External event 2 type	Selects the type of external event 2. For selections, see parameter 131.2 External event 1 type.	Fault / uint16
131.5	External event 3 source	Defines the source of external event 3. See also parameter 131.6 External event 3 type. For selections, see parameter 131.1 External event 1 source.	Inactive (true) / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
131.6	External event 3 type	Selects the type of external event 3. For selections, see parameter 131.2 External event 1 type.	Fault / uint16
131.7	External event 4 source	Defines the source of external event 4. See also parameter 131.8 External event 4 type. For selections, see parameter 131.1 External event 1 source.	Inactive (true) / uint32
131.8	External event 4 type	Selects the type of external event 4. For selections, see parameter 131.2 External event 1 type.	Fault / uint16
131.9	External event 5 source	Defines the source of external event 5. See also parameter 131.10 External event 5 type. For selections, see parameter 131.1 External event 1 source.	Inactive (true) / uint32
131.10	External event 5 type	Selects the type of external event 5. For selections, see parameter 131.2 External event 1 type.	Fault / uint16
131.11	Fault reset selection	Selects the source of an external fault reset signal. The signal resets the IGBT supply 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.	DI6 / uint32
	Not selected	Fault reset is off (0).	0
	Selected	Fault reset when you change the parameter from value Off to On (0->1).	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	11
	Other [bit]	See Terms and abbreviations (page 63).	
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 only available in external control; see section Local control vs. external control (page 19).	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		WARNING! The supply 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 supply unit automatically and continues operation after a fault. If you select an external source for the start command and it is on, the supply unit will start immediately after fault reset. The bits of the binary number correspond to the following faults:	
b0	Overcurrent	Overcurrent	
b1	Overvoltage	DC overvoltage	
b2	Undervoltage	DC undervoltage	
b3…9	Reserved		
b10	User fault	User fault (from source selected by parameter 131.13 User selectable fault)	
b11	External fault 1	External fault 1 (from source selected by parameter 131.1 External event 1 source)	
b12	External fault 2	External fault 2 (from source selected by parameter 131.3 External event 2 source)	
b13	External fault 3	External fault 3 (from source selected by parameter 131.5 External event 3 source)	
b14	External fault 4	External fault 4 (from source selected by parameter 131.7 External event 4 source)	
b15	External fault 5	External fault 5 (from source selected by parameter 131.9 External event 5 source)	
	0000h…FFFFh		1 = 1
131.13	User selectable fault	Defines the fault that can be automatically reset using parameter 131.12 Autoreset selection, bit 10 User fault. Give the fault code of the selected fault. The code is given in integer. The faults are listed in chapter Fault tracing.	0 / uint32
	0000…FFFFh	Fault code.	1 = 1
131.14	Number of trials	Defines the number of automatic fault resets the supply unit performs within the time defined by parameter 131.15 Total trials time.	0 / uint32
	0 … 5	Number of automatic resets.	1 = 1 / 1 = 1
131.15	Total trials time	Defines the time for the automatic reset function. See parameter 131.14 Number of trials.	30.0 s / real32
	1.0 … 600.0 s	Time for automatic resets.	10 = 1 s / 1 = 1 s

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
131.16	Delay time	Defines the time that the supply unit will wait after each fault before attempting an automatic reset. See parameter 131.12 Autoreset selection.	0.0 s / real32
	0.0 ... 120.0 s	Autoreset delay.	10 = 1 s / 1 = 1 s
131.20	Earth fault	Selects how the supply unit reacts when an earth fault or current unbalance is detected.	Fault / uint16
	No	No action taken.	0
	Warning	The supply unit generates an AE02 Earth leakage warning.	1
	Fault	The supply unit trips on fault 2E01 Earth leakage.	2
131.28	Ext earth leakage signal source	Defines the input for external earth fault (2E08 Ext earth leakage). 1= no fault 0 = external earth fault	Inactive (true) / uint32
	Active (false)	External earth fault.	0
	Inactive (true)	No fault.	1
	DIIL	Digital input DIIL (110.2 DI delayed status, bit 15).	2
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2). **Note:** DI3 is reserved for main breaker/contactor fault in the control program. Do not select it for any other use.	5
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	12
	Other [bit]	See Terms and abbreviations (page 63).	
131.29	Ext earth leakage action	Selects how the IGBT supply unit reacts when an external earth leakage is detected.	Fault / uint16
	Warning	The IGBT supply unit generates a warning AE87 Ext earth leakage.	0
	Fault	The IGBT supply unit trips on a fault 2E08 Ext earth leakage.	1
131.32	Aux circuit breaker fault source	Activates/inactivates the status monitoring function of the auxiliary circuit switch/breaker(s), and defines the source for the monitored signal. If the function detects that the breaker(s) is open, it trips the supply unit to fault 5E13 Auxiliary Circuit breaker. Status of the monitored signal and implication:	Inactive (true) / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		1 = Breaker is closed -> no fault 0 = Breaker is open -> fault trip **Note:** This parameter is not for main circuit breaker.	
	Active (false)	Auxiliary circuit breaker fault.	0
	Inactive (true)	No fault.	1
	DIIL	Monitoring is active. DIIL is the source for the breaker status indication (110.2 DI delayed status, bit 15).	2
	DI1	Monitoring is active. DI1 is the source for the breaker status indication (110.2 DI delayed status, bit 0).	3
	DI2	Monitoring is active. DI2 is the source for the breaker status indication (110.2 DI delayed status, bit 1).	4
	DI3	Monitoring is active. DI3 is the source for the breaker status indication (110.2 DI delayed status, bit 2). **Note:** DI3 is reserved for main breaker/contactor fault in the control program. Do not select it for any other use.	5
	DI4	Monitoring is active. DI4 is the source for the breaker status indication (110.2 DI delayed status, bit 3).	6
	DI5	Monitoring is active. DI5 is the source for the breaker status indication (110.2 DI delayed status, bit 4).	7
	DI6	Monitoring is active. DI6 is the source for the breaker status indication (110.2 DI delayed status, bit 5).	8
	DIO1	Monitoring is active. DIO1 is the source for the breaker status indication (111.2 DIO delayed status, bit 0).	11
	DIO2	Monitoring is active. DIO2 is the source for the breaker status indication (111.2 DIO delayed status, bit 1).	12
	Other [bit]	See Terms and abbreviations (page 63).	
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 supply unit to fault 4E06 Cabinet temperature. Status of the monitored signal and implication: 1 = Temperature is normal -> no fault 0 = Overtemperature -> fault trip	DI1 / uint32
	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 (110.2 DI delayed status, bit 15).	2
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.2 DI delayed status, bit 1).	4

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.2 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (111.2 DIO delayed status, bit 1).	12
	Other [bit]	See Terms and abbreviations (page 63).	
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 When modulating, the monitoring is started after the modulation has started. Otherwise there is no delay for the monitoring.	When modulating / uint16
	Always	There is no delay for the monitoring.	0
	When modulating	Cabinet temperature monitoring is started after the modulation has started.	1
131.35	Main fan fault function	Selects how the supply unit reacts when a main fan fault is detected.	Warning / uint16
	Fault	The supply unit trips on a fault 5E00 Fan.	0
	Warning	The supply unit generates a warning AE73 Fan.	1
	No action	No action taken.	2
131.36	Aux fan fault bypass	Selects how the supply unit reacts when a modules internal auxiliary fan fault is detected.	Fault / uint16
	Fault	The supply unit trips on fault 5E01 Auxiliary fan not running. **Note:** The fault is suppressed for two minutes after power-up. During this time, the supply unit only generates a warning, AE80 Auxiliary fan not running.	0
	Warning	The drive generates a warning, AE80 Auxiliary fan not running.	1
131.38	Fuse trip fault source	Activates/inactivates the monitoring for the fuse trip, and defines the source for the monitored signal.	Inactive (true) / uint32
	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 (110.2 DI delayed status, bit 15).	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.2 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (111.2 DIO delayed status, bit 1).	12
	Other [bit]	See Terms and abbreviations (page 63).	
131.39	Brake chopper fault source	Activates/inactivates the monitoring for the brake chopper, and defines the source for the monitored signal.	Inactive (true) / uint32
	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 (110.2 DI delayed status, bit 15).	2
	DI1	Monitoring function is active and it reads the status indication through DI1 (110.2 DI delayed status, bit 0).	3
	DI2	Monitoring function is active and it reads the status indication through DI2 (110.2 DI delayed status, bit 1).	4
	DI3	Monitoring function is active and it reads the status indication through DI3 (110.2 DI delayed status, bit 2).	5
	DI4	Monitoring function is active and it reads the status indication through DI4 (110.2 DI delayed status, bit 3).	6
	DI5	Monitoring function is active and it reads the status indication through DI5 (110.2 DI delayed status, bit 4).	7
	DI6	Monitoring function is active and it reads the status indication through DI6 (110.2 DI delayed status, bit 5).	8
	DIO1	Monitoring function is active and it reads the status indication through DIO1 (111.2 DIO delayed status, bit 0).	11
	DIO2	Monitoring function is active and it reads the status indication through DIO2 (111.2 DIO delayed status, bit 1).	12

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Other [bit]	See Terms and abbreviations (page 63).	
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:	- / uint16
b0	Overvoltage	Overvoltage	
b1	Phase order	Phase order	
b2	Encoder 1	Encoder 1	
b3	Encoder 2	Encoder 2	
b4	CU Battery	CU (Control unit) battery	
b5…15	Reserved		
	0000h…FFFFh		1 = 1
131.55	Ext I/O comm loss event	Selects how the supply unit reacts when the communication to an I/O extension module fails.	Fault / uint16
	No action	No action taken.	0
	Warning	The supply unit generates a warning A799 Ext I/O comm loss.	1
	Fault	The supply unit trips on a fault 7E10 Ext I/O comm loss.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
133	**Generic timer & counter**	Configuration of maintenance timers/counters. See also section Maintenance timers and counters (page 41).	
133.1	Counter status	Displays the maintenance timer/counter status word, indicating which maintenance timers/counters have exceeded their limits. This parameter is read-only.	- / uint16
b0	Ontime1	1 = On-time timer 1 has reached its preset limit.	
b1	Ontime2	1 = On-time timer 2 has reached its preset limit.	
b2	Edge1	1 = Signal edge counter 1 has reached its preset limit.	
b3	Edge2	1 = Signal edge counter 2 has reached its preset limit.	
b4	Value1	1 = Value counter 1 has reached its preset limit.	
b5	Value2	1 = Value counter 2 has reached its preset limit.	
b6…15	Reserved		
	0000h…FFFFh		1 = 1
133.10	On-time 1 act	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.	- / uint32
	0 … 2147483647 s	Reading of on-time timer 1.	1 = 1 s / 1 = 1 s

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
133.11	On-time 1 limit	Sets the warning limit for on-time timer 1.	- / uint32
	0 ... 2147483647 s	Warning limit for on-time counter 1.	1 = 1 s / 1 = 1 s
133.12	On-time 1 func	Configures on-time timer 1. This timer runs whenever the signal selected by parameter 133.13 On-time 1 src is on. After the limit set by 133.11 On-time 1 limit is reached, the warning specified by 133.14 On-time 1 warn sel is given (if enabled by this parameter), and the timer reset. The current value of the timer is readable from parameter 133.10 On-time 1 act. Bit 0 of 133.1 Counter status indicates that the time has exceeded the limit.	- / uint16
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
133.13	On-time 1 src	Selects the signal to be monitored by on-time timer 1.	FALSE / uint32
	FALSE	Constant 0.	0
	TRUE	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status.	2
	Other [bit]	See Terms and abbreviations (page 63).	
133.14	On-time 1 warn sel	Selects the warning message for on-time timer 1.	On-time 1 / uint32
	On-time 1	AE45 On-Time 1 warning	0
	Device clean	AE4B Device clean warning	6
	Add cool fan	AE4F Additional cooling fan warning	7
	Cabinet fan	AE4D Cabinet fan warning	8
	DC-capacitor	AE4C DC capacitor warning	9
133.20	On-time 2 act	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.	- / uint32
	0 ... 2147483647 s	Reading of on-time timer 2.	1 = 1 s / 1 = 1 s
133.21	On-time 2 limit	Sets the warning limit for on-time timer 2.	- / uint32
	0 ... 2147483647 s	Warning limit for on-time counter 2.	1 = 1 s / 1 = 1 s
133.22	On-time 2 func	Configures on-time timer 2. This timer runs whenever the signal selected by parameter 133.23 On-time 2 src is on. After the limit set by 133.21 On-time 2 limit is reached, the warning specified by 133.24 On-time 2 warn sel is given (if enabled by this parameter), and the timer reset.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		The current value of the timer is readable from parameter 133.20 On-time 2 act. Bit 1 of 133.1 Counter status indicates that the time has exceeded the limit.	
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
133.23	On-time 2 src	Selects the signal to be monitored by on-time timer 2.	FALSE / uint32
	FALSE	Constant 0.	0
	TRUE	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status.	2
	Other [bit]	See Terms and abbreviations (page 63).	
133.24	On-time 2 warn sel	Selects the warning message for on-time timer 2.	On-time 2 / uint32
	On-time 2	AE46 On-Time 2 warning	1
	Device clean	AE4B Device clean warning	6
	Add cool fan	AE4F Additional cooling fan warning	7
	Cabinet fan	AE4D Cabinet fan warning	8
	DC-capacitor	AE4C DC capacitor warning	9
133.30	Edge count 1 act	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.	- / uint32
	0 ... 2147483647	Reading of signal edge counter 1.	1 = 1 / 1 = 1
133.31	Edge count 1 limit	Sets the warning limit for signal edge counter 1.	- / uint32
	0 ... 2147483647	Warning limit for signal edge counter 1.	1 = 1 / 1 = 1
133.32	Edge count 1 func	Configures signal edge counter 1. This counter is incremented every time the signal selected by parameter 133.33 Edge count 1 src 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 count 1 div). After the limit set by 133.31 Edge count 1 limit is reached, the warning specified by 133.35 Edge count 1 warn sel is given (if enabled by this parameter), and the counter reset. The current value of the counter is readable from parameter 133.30 Edge count 1 act. Bit 2 of 133.1 Counter status indicates that the count has exceeded the limit.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2	Count rising edge	0 = Disable: Rising edges are not counted 1 = Enable: Rising edges are counted	
b3	Count falling edge	0 = Disable: Falling edges are not counted 1 = Enable: Falling edges are counted	
b4…15	Reserved		
	0000h…FFFFh		1 = 1
133.33	Edge count 1 src	Selects the signal to be monitored by signal edge counter 1.	FALSE / uint32
	FALSE	Constant 0.	0
	TRUE	Constant 1.	1
	RO1	Bit 0 of 110.21 RO status.	2
	Other [bit]	See Terms and abbreviations (page 63).	
133.34	Edge count 1 div	Divisor for signal edge counter 1. Determines how many signal edges increment the counter by 1.	1 / uint32
	1 ... 2147483647	Divisor for signal edge counter 1.	1 = 1 / 1 = 1
133.35	Edge count 1 warn sel	Selects the warning message for signal edge counter 1.	Edge count 1 / uint32
	Edge count 1	AE47 Edge counter 1 warning	2
	Main contactor	AE43 Main contactor warning	11
	Output relay	AE40 Output relay warning	12
	Supply unit starts	AE41 Supply unit starts warning	13
	Power ups	AE42 Power ups warning	14
	DC-charge	AE44 DC charge warning	15
133.40	Edge count 2 act	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.	- / uint32
	0 ... 2147483647	Reading of signal edge counter 2.	1 = 1 / 1 = 1
133.41	Edge count 2 limit	Sets the warning limit for signal edge counter 2.	- / uint32
	0 ... 2147483647	Warning limit for signal edge counter 2.	1 = 1 / 1 = 1
133.42	Edge count 2 func	Configures signal edge counter 2. This counter is incremented every time the signal selected by parameter 133.43 Edge count 2 src 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 count 2 div).	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		After the limit set by 133.41 Edge count 2 limit is reached, the warning specified by 133.45 Edge count 2 warn sel is given (if enabled by this parameter), and the counter reset. The current value of the counter is readable from parameter 133.40 Edge count 2 act. Bit 3 of 133.1 Counter status indicates that the count has exceeded the limit.	
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2	Count rising edge	0 = Disable: Rising edges are not counted 1 = Enable: Rising edges are counted	
b3	Count falling edge	0 = Disable: Falling edges are not counted 1 = Enable: Falling edges are counted	
b4…15	Reserved		
	0000h…FFFFh		1 = 1
133.43	Edge count 2 src	Selects the signal to be monitored by signal edge counter 2.	FALSE / uint32
	FALSE	0.	0
	TRUE	1.	1
	RO1	Bit 0 of 110.21 RO status.	2
	Other [bit]	See Terms and abbreviations (page 63).	
133.44	Edge count 2 div	Divisor for signal edge counter 2. Determines how many signal edges increment the counter by 1.	1 / uint32
	1 ... 2147483647	Divisor for signal edge counter 2.	1 = 1 / 1 = 1
133.45	Edge count 2 warn sel	Selects the warning message for signal edge counter 2.	Edge count 2 / uint32
	Edge count 2	AE48 Edge counter 2 warning	3
	Main contactor	AE43 Main contactor warning	11
	Output relay	AE40 Output relay warning	12
	Supply unit starts	AE41 Supply unit starts warning	13
	Power ups	AE42 Power ups warning	14
	DC-charge	AE44 DC charge warning	15
133.50	Value count 1 act	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.	0 / real32
	-2147483000 ... 2147483000	Reading of value counter 1.	1 = 1 / 1 = 1
133.51	Value count 1 limit	Sets the warning limit for value counter 1.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	-2147483000 ... 2147483000	Warning limit for value counter 1.	1 = 1 / 1 = 1
133.52	Value count 1 func	Configures value counter 1. This counter measures, by integration, the area below the signal selected by parameter 133.53 Value count 1 src. A divisor may be applied to the count (see 133.54 Value count 1 div). When the total area exceeds the limit set by parameter 133.51 Value count 1 limit, the warning specified by 133.55 Value count 1 warn sel 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 count 1 act. Bit 4 of 133.1 Counter status indicates that the count has exceeded the limit.	- / uint16
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
133.53	Value count 1 src	Selects the signal to be monitored by value counter 1.	Not selected / uint32
	Not selected	None.	0
	Other [bit]	See Terms and abbreviations (page 63).	
133.54	Value count 1 div	Divisor for value counter 1. The value of the monitored signal is divided by this value before integration.	1.000 / real32
	0.001 ... 2147483.000	Divisor for value counter 1.	1 = 1 / 1 = 1
133.55	Value count 1 warn sel	Selects the warning message for value counter 1.	Value 1 / uint32
	Value 1	AE49 Value integrator 1 warning	4
133.60	Value count 2 act	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.	0 / real32
	-2147483000 ... 2147483000	Reading of value counter 2.	1 = 1 / 1 = 1
133.61	Value count 2 limit	Sets the warning limit for value counter 2.	- / real32
	-2147483000 ... 2147483000	Warning limit for value counter 2.	1 = 1 / 1 = 1
133.62	Value count 2 func	Configures value counter 2. This counter measures, by integration, the area below the signal selected by	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		parameter 133.63 Value count 2 src. A divisor may be applied to the count (see 133.64 Value count 2 div). When the total area exceeds the limit set by parameter 133.61 Value count 2 limit, the warning specified by 133.65 Value count 2 warn sel 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 count 2 act. Bit 5 of 133.1 Counter status indicates that the count has exceeded the limit.	
b0	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	
b1	Warning enable	0 = Disable: No warning is given when the limit is reached 1 = Enable: A warning is given when the limit is reached	
b2…15	Reserved		
	0000h…FFFFh		1 = 1
133.63	Value count 2 src	Selects the signal to be monitored by value counter 2.	Not selected / uint32
	Not selected	None.	0
	Other [value]	See Terms and abbreviations (page 63).	
133.64	Value count 2 div	Divisor for value counter 2. The value of the monitored signal is divided by this value before integration.	1.000 / real32
	0.001 … 2147483.000	Divisor for value counter 1.	1 = 1 / 1 = 1
133.65	Value count 2 warn sel	Selects the warning message for value counter 2.	Value 2 / uint32
	Value 2	AE4A Value integrator 2 warning	5

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
136	**Load analyzer**	Peak value and amplitude logger settings. See also section Load analyzer (page 41).	
136.1	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 136.2 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 136.9 Reset loggers. The date and time of the last reset are stored into parameters 136.16 and 136.17 respectively.	Converter current / uint32
	Not selected	None (peak value logger disabled).	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	DC voltage	101.1 DC voltage	1
	Frequency	101.8 Frequency	2
	Grid voltage	101.9 Grid voltage	3
	Power	101.12 Power	4
	Reactive power	101.14 Reactive power	5
	Converter current	101.20 Converter current	6
	Converter current %	101.21 Converter current %	7
	Apparent power	101.10 Apparent power	8
	Apparent power %	101.11 Apparent power %	9
	Power %	101.13 Power %	10
	Converter temperature %	105.11 Converter temperature %	11
	CosPhi	101.16 CosPhi	12
	Reactive power %	101.15 Reactive power %	13
	Other [value]	See Terms and abbreviations (page 63).	
136.2	PVL filter time	Peak value logger filtering time. See parameter 136.1 PVL signal source.	2.00 s / real32
	0.00 ... 120.00 s	Peak value logger filtering time.	100 = 1 s / 1 = 1 s
136.6	AL2 signal source	Selects the signal to be monitored by amplitude logger 2. The signal is sampled at 200-millisecond intervals when the IGBT supply unit is running. 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 136.7 AL2 signal scaling. Amplitude logger 2 can be reset using parameter 136.9 Reset loggers. The date and time of the last reset are stored into parameters 136.50 and 136.51 respectively. For the selections, see parameter 136.1 PVL signal source.	Ambient temperature / uint32
136.7	AL2 signal scaling	Defines the signal value that corresponds to 100% amplitude.	100.00 / real32
	0.00 ... 32767.00	Signal value corresponding to 100%	1 = 1 / 1 = 1
136.9	Reset loggers	Resets the peak value logger and/or amplitude logger 2. (Amplitude logger 1 cannot be reset.)	Done / uint16
	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.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	-32768.00 ... 32767.00	Peak value.	1 = 1 / 1 = 1
136.11	PVL peak date	The date on which the peak value was recorded.	0 / uint16
136.12	PVL peak time	The time at which the peak value was recorded.	0 / uint32
	00:00:00…23:59:59	Peak occurrence time.	1 = 1
136.13	PVL current at peak	Line current at the moment the peak value was recorded.	- / real32
	-32768.00 ... 32767.00 A	Line current at peak.	1 = 1 A / 1 = 1 A
136.14	PVL DC voltage at peak	Voltage in the intermediate DC circuit at the moment the peak value was recorded.	- / real32
	0.00 ... 2000.00 V	DC voltage at peak.	10 = 1 V / 1 = 1 V
136.15	PVL power at peak	Power at the moment the peak value was recorded.	- / real32
	-32768.0 ... 32767.0 kW	Power at peak.	1 = 1 kW / 1 = 1 kW
136.16	PVL reset date	The date on which the peak value logger was last reset.	0 / uint16
136.17	PVL reset time	The time at which the peak value logger was last reset.	0 / uint32
	00:00:00…23:59:59	Last reset time of the peak value logger.	1 = 1
136.20	AL1 below 10%	Percentage of samples recorded by amplitude logger 1 that fall between 0 and 10%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 0 and 10%.	1 = 1% / 1 = 1%
136.21	AL1 10 to 20%	Percentage of samples recorded by amplitude logger 1 that fall between 10 and 20%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 10 and 20%.	1 = 1% / 1 = 1%
136.22	AL1 20 to 30%	Percentage of samples recorded by amplitude logger 1 that fall between 20 and 30%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 20 and 30%.	1 = 1% / 1 = 1%
136.23	AL1 30 to 40%	Percentage of samples recorded by amplitude logger 1 that fall between 30 and 40%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 30 and 40%.	1 = 1% / 1 = 1%
136.24	AL1 40 to 50%	Percentage of samples recorded by amplitude logger 1 that fall between 40 and 50%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 40 and 50%.	1 = 1% / 1 = 1%
136.25	AL1 50 to 60%	Percentage of samples recorded by amplitude logger 1 that fall between 50 and 60%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 50 and 60%.	1 = 1% / 1 = 1%
136.26	AL1 60 to 70%	Percentage of samples recorded by amplitude logger 1 that fall between 60 and 70%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 60 and 70%.	1 = 1% / 1 = 1%
136.27	AL1 70 to 80%	Percentage of samples recorded by amplitude logger 1 that fall between 70 and 80%.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0.00 ... 100.00%	Amplitude logger 1 samples between 70 and 80%.	1 = 1% / 1 = 1%
136.28	AL1 80 to 90%	Percentage of samples recorded by amplitude logger 1 that fall between 80 and 90%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples between 80 and 90%.	1 = 1% / 1 = 1%
136.29	AL1 over 90%	Percentage of samples recorded by amplitude logger 1 that exceed 90%.	- / real32
	0.00 ... 100.00%	Amplitude logger 1 samples over 90%.	1 = 1% / 1 = 1%
136.40	AL2 below 10%	Percentage of samples recorded by amplitude logger 2 that fall between 0 and 10%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 0 and 10%.	1 = 1% / 1 = 1%
136.41	AL2 10 to 20%	Percentage of samples recorded by amplitude logger 2 that fall between 10 and 20%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 10 and 20%.	1 = 1% / 1 = 1%
136.42	AL2 20 to 30%	Percentage of samples recorded by amplitude logger 2 that fall between 20 and 30%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 20 and 30%.	1 = 1% / 1 = 1%
136.43	AL2 30 to 40%	Percentage of samples recorded by amplitude logger 2 that fall between 30 and 40%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 30 and 40%.	1 = 1% / 1 = 1%
136.44	AL2 40 to 50%	Percentage of samples recorded by amplitude logger 2 that fall between 40 and 50%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 40 and 50%.	1 = 1% / 1 = 1%
136.45	AL2 50 to 60%	Percentage of samples recorded by amplitude logger 2 that fall between 50 and 60%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 50 and 60%.	1 = 1% / 1 = 1%
136.46	AL2 60 to 70%	Percentage of samples recorded by amplitude logger 2 that fall between 60 and 70%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 60 and 70%.	1 = 1% / 1 = 1%
136.47	AL2 70 to 80%	Percentage of samples recorded by amplitude logger 2 that fall between 70 and 80%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 70 and 80%.	1 = 1% / 1 = 1%
136.48	AL2 80 to 90%	Percentage of samples recorded by amplitude logger 2 that fall between 80 and 90%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples between 80 and 90%.	1 = 1% / 1 = 1%
136.49	AL2 over 90%	Percentage of samples recorded by amplitude logger 2 that exceed 90%.	- / real32
	0.00 ... 100.00%	Amplitude logger 2 samples over 90%.	1 = 1% / 1 = 1%
136.50	AL2 reset date	The date on which amplitude logger 2 was last reset.	0 / uint16
136.51	AL2 reset time	The time at which amplitude logger 2 was last reset.	0 / uint32
	00:00:00…23:59:59	Last reset time of amplitude logger 2.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
146	**Monitoring settings**	Scaling settings.	
146.1	Power scaling	Defines the power and also active current and percent reference depending on parameter 122.6 Power ref type, that corresponds to 10000 for fieldbus communication with Transparent 16 profile. Also defines the 16-bit scaling of 101.4 Active current, 101.12 Power, 122.1 User Power ref, 122.3 Power ref 1, 122.5 Power ref 2 and 122.10 Power ref.	10000.0 / real32
	0.1 ... 30000.0	Power, active current and percent reference.	1 = 1 / 1 = 1
146.2	Reactive power scaling	Defines the reactive power and also reactive current and percent reference depending on parameter 124.6 Q power ref type, that corresponds to 10000 for fieldbus communication with Transparent 16 profile. Also defines the 16-bit scaling of 101.6 Reactive current, 101.14 Reactive power, 124.1 User Qref, 124.3 Qref 1, 124.5 Qref 2 and 124.10 Q power ref.	10000.0 / real32
	0.1 ... 30000.0	Reactive power, reactive current and percent reference.	1 = 1 / 1 = 1
146.3	Current scaling	Defines the 16-bit scaling of signals 101.2 Line current and 101.20 Converter current. The value is scaled by dividing the value of this parameter by 10000.	10000 A / real32
	0 ... 30000 A	Current scaling.	1 = 1 A / 1 = 1 A
146.4	DC voltage scaling	Defines the DC voltage that corresponds to 10000 for fieldbus communication with Transparent 16 profile. Also defines the 16-bit scaling of 123.1 User DC voltage ref, 123.3 DC voltage ref 1, 123.5 DC voltage ref 2, 123.8 DC voltage ref lim and 123.11 DC voltage ref out.	100.00 V / real32
	0.10 ... 30000.00 V	DC voltage.	1 = 1 V / 1 = 1 V
146.15	Filter time grid current	Defines the filter time for signals 101.2 Line current , 101.3 Line current %, 101.4 Active current, 101.5 Active current %, 101.6 Reactive current and 101.7 Reactive current %.	40 ms / real32
	20 ... 20000 ms	Filter time.	1 = 1 ms / 1 = 1 ms
146.16	Filter time grid voltage	Defines the filter time for signal 101.9 Grid voltage.	40 ms / real32
	20 ... 20000 ms	Filter time.	1 = 1 ms / 1 = 1 ms
146.17	Filter time grid power	Defines the filter time for signals 101.10 Apparent power, 101.11 Apparent power %, 101.12 Power, 101.13 Power %, 101.14 Reactive power and 101.15 Reactive power %.	40 ms / real32
	20 ... 20000 ms	Filter time.	1 = 1 ms / 1 = 1 ms

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
147	**Data storage**	Parameters that can be written to and read from by using source and target settings of other parameters.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Note that there are different storage parameters for different data types. See also section Data storage parameters (page 44).	
147.1	Data storage 1 real32	Data storage parameter 1.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.2	Data storage 2 real32	Data storage parameter 2.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.3	Data storage 3 real32	Data storage parameter 3.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.4	Data storage 4 real32	Data storage parameter 4.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.5	Data storage 5 real32	Data storage parameter 5.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.6	Data storage 6 real32	Data storage parameter 6.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.7	Data storage 7 real32	Data storage parameter 7.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.8	Data storage 8 real32	Data storage parameter 8.	- / real32
	-32768.000 ... 32767.000	32-bit real type data.	1 = 1 / 1 = 1
147.11	Data storage 1 int32	Data storage parameter 9.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.12	Data storage 2 int32	Data storage parameter 10.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.13	Data storage 3 int32	Data storage parameter 11.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
147.14	Data storage 4 int32	Data storage parameter 12.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.15	Data storage 5 int32	Data storage parameter 13.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.16	Data storage 6 int32	Data storage parameter 14.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.17	Data storage 7 int32	Data storage parameter 15.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.18	Data storage 8 int32	Data storage parameter 16.	- / int32
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1 / 1 = 1
147.21	Data storage 1 int16	Data storage parameter 17.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.22	Data storage 2 int16	Data storage parameter 18.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.23	Data storage 3 int16	Data storage parameter 19.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.24	Data storage 4 int16	Data storage parameter 20.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.25	Data storage 5 int16	Data storage parameter 21.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.26	Data storage 6 int16	Data storage parameter 22.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.27	Data storage 7 int16	Data storage parameter 23.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.28	Data storage 8 int16	Data storage parameter 24.	- / int16
	-32768 ... 32767	16-bit integer type data.	1 = 1 / 1 = 1
147.31	Data storage 1 real32 type	Defines the scaling of parameter 147.1 Data storage 1 real32 to and from 16-bit integer format. This scaling is used when the data storage parameter is the target of received 16-bit data (defined in parameter group	Unscaled / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		162 DDCS receive), or when the data storage parameter is the source of transmitted 16-bit data (defined in parameter group 161 DDCS transmit). The setting also defines the visible range of the storage parameter.	
	Unscaled	Data storage only. Range: -2147483.264 … 2147473.264.	0
	Transparent	Scaling: 1 = 1. Range: -32768 … 32767.	1
	General	Scaling: 1 = 100. Range: -327.68 … 327.67.	2
147.32	Data storage 2 real32 type	Defines the 16-bit scaling of parameter 147.2 Data storage 2 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.33	Data storage 3 real32 type	Defines the 16-bit scaling of parameter 147.3 Data storage 3 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.34	Data storage 4 real32 type	Defines the 16-bit scaling of parameter 147.4 Data storage 4 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.35	Data storage 5 real32 type	Defines the 16-bit scaling of parameter 147.5 Data storage 5 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.36	Data storage 6 real32 type	Defines the 16-bit scaling of parameter 147.6 Data storage 6 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.37	Data storage 7 real32 type	Defines the 16-bit scaling of parameter 147.7 Data storage 7 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16
147.38	Data storage 8 real32 type	Defines the 16-bit scaling of parameter 147.8 Data storage 8 real32. See parameter 147.31 Data storage 1 real32 type.	Unscaled / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
149	**Panel port communication**	Communication settings for the control panel port.	
149.1	Node ID number	Defines the node ID of the supply unit. All devices connected to the network must have a unique node ID. **Note:** After setting this parameter, validate the change by setting the parameter 149.6 Refresh settings to Refresh. **Note:** For networked converters, it is advisable to reserve ID 1 for spare/replacement converters.	1 / uint32
	1 ... 32	Node ID.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
149.3	Baud rate	Selects the maximum transfer rate of the link. **Note:** Reliability of the communication may require lower setting, depending of the electrical characteristics of the wiring.	921.6 kbps / uint32
	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
149.4	Communication loss time	Sets a timeout for control panel (or PC tool) communication. If a communication break lasts longer than the timeout, the action specified by parameter 149.5 Communication loss action is taken.	10.0 s / uint32
	0.3 ... 3000.0 s	Panel/PC tool communication timeout.	10 = 1 s / 1 = 1 s
149.5	Communication loss action	Selects how the supply unit reacts to a control panel (or PC tool) communication break.	Fault / uint16
	No action	No action taken.	0
	Fault	Supply unit trips on 7E01 Panel loss.	1
149.6	Refresh settings	Applies the settings of parameters 149.1…149.5. **Note:** Refreshing may cause a communication break, so reconnecting may be required.	Done / uint16
	Done	Refresh done or not requested.	0
	Refresh	Refresh parameters 149.1…149.5. The value reverts automatically to Done.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
150	**FBA**	General settings for fieldbus communication configuration.	
150.1	FBA A enable	Enables/disables communication between the IGBT supply unit and fieldbus adapter A, and specifies the slot the adapter is installed into.	Disable / uint16
	Disable	Communication between IGBT supply unit and fieldbus adapter A disabled.	0
	Option slot 1	Communication between IGBT supply unit and fieldbus adapter A enabled. The adapter is in slot 1.	1
	Option slot 2	Communication between IGBT supply unit and fieldbus adapter A enabled. The adapter is in slot 2.	2
	Option slot 3	Communication between IGBT supply unit and fieldbus adapter A enabled. The adapter is in slot 3.	3

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
150.2	FBA A comm loss func	Selects how the IGBT supply unit reacts upon a fieldbus communication loss. The time delay is defined by parameter 150.3 FBA A comm loss t out.	No action / uint16
	No action	No action taken.	0
	Fault	Communication loss detection active. Upon a communication loss, the IGBT supply unit trips on a 7E0B FBA A communication fault and stops.	1
	Fault always	IGBT supply unit trips on 7E0B FBA A communication. This occurs even though no control is expected from the fieldbus.	4
	Warning	IGBT supply unit generates an AE30 FBA A communication warning. This occurs even though no control is expected from the fieldbus. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	5
150.3	FBA A comm loss t out	Defines the time delay before the action defined by parameter 150.2 FBA A comm loss func is taken. Time count starts when the communication link fails to update the message.	0.3 s / uint16
	0.1 ... 6553.5 s	Time delay.	10 = 1 s / 10 = 1 s
150.4	FBA A ref1 type	Selects the type and scaling of reference 1 received from fieldbus adapter A.	Auto / uint16
	Auto	Type and scaling is chosen automatically according to the currently active operation mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2
	DC Voltage	The scaling is defined by parameter 146.4 DC voltage scaling.	8
	Active power	The scaling is defined by parameter 146.1 Power scaling.	9
	Reactive power	The scaling is defined by parameter 146.2 Reactive power scaling.	10
	Frequency	Reserved.	5
	AC Voltage	Reserved.	13
150.5	FBA A ref2 type	Selects the type and scaling of reference 2 received from fieldbus adapter A. For the selections, see parameter 150.4 FBA A ref1 type. To prevent sudden reference value changes , use General selection.	Auto / uint16
150.7	FBA A actual 1 type	Selects the type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A. For the selections, see parameter 150.4 FBA A ref1 type.	Auto / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
150.8	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 150.4 FBA A ref1 type.	Auto / uint16
150.10	FBA A act1 transparent source	Selects the type of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Not selected / uint32
	Not selected	No source selected.	0
	Other [value]	See Terms and abbreviations (page 63).	
150.11	FBA A act2 transparent source	Selects the type of actual value 2 transmitted to the fieldbus network through fieldbus adapter A.	Not selected / uint32
	Not selected	No source selected.	0
	Other [value]	See Terms and abbreviations (page 63).	
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 / uint16
	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 IGBT supply unit.	1
150.13	FBA A control word	Displays the control word sent by the master (PLC) to fieldbus adapter A. For details of the contents, see page 269. This parameter is read-only.	0 / uint32
	00000000…FFFFFFFFh	Control word sent by master to fieldbus adapter A.	1 = 1
150.14	FBA A reference 1	Displays raw reference REF1 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	- / int32
150.15	FBA A reference 2	Displays raw reference REF2 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	- / int32
150.16	FBA A status word	Displays the status word sent by fieldbus adapter A to the master (PLC). For details of the contents, see page 271. This parameter is read-only.	0 / uint32
	00000000…FFFFFFFFh	Status word sent by fieldbus adapter A to master.	1 = 1
150.17	FBA A actual value 1	Displays raw actual value ACT1 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	- / int32
150.18	FBA A actual value 2	Displays raw actual value ACT2 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	- / int32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
150.21	FBA A timelevel sel	Selects the communication speed. In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting. **Selection** / **Cyclic*** / **Acyclic**** Monitoring: 10 ms / 10 ms Normal: 2 ms / 10 ms Fast: 500 µs / 2 ms Very fast: 250 µs / 500 µs *Cyclic data consists of fieldbus Control and Status words, Ref1, Ref2, 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.	Normal / uint16
	Monitoring	Low speed. Optimized for PC tool communication and monitoring usage.	3
	Normal	Normal speed.	0
	Fast	Fast speed.	1
	Very fast	Very fast speed.	2
150.31	FBA B enable	Enables/disables communication between the IGBT supply unit and fieldbus adapter B, and specifies the slot the adapter is installed into.	Disable / uint16
	Disable	Communication between IGBT supply unit and fieldbus adapter B disabled.	0
	Option slot 1	Communication between IGBT supply unit and fieldbus adapter B enabled. The adapter is in slot 1.	1
	Option slot 2	Communication between IGBT supply unit and fieldbus adapter B enabled. The adapter is in slot 2.	2
	Option slot 3	Communication between IGBT supply unit and fieldbus adapter B enabled. The adapter is in slot 3.	3
150.32	FBA B comm loss func	Selects how the IGBT supply unit reacts upon a fieldbus communication break. The time delay is defined by parameter 150.33 FBA B comm loss timeout.	No action / uint16
	No action	No action taken.	0
	Fault	Communication loss detection active. Upon a communication loss, the IGBT supply unit trips on a 7E0C FBA B communication fault and stops.	1
	Fault always	IGBT supply unit trips on 7E0C FBA B communication. This occurs even though no control is expected from the fieldbus.	4
	Warning	IGBT supply unit generates an AE31 FBA B communication warning. This occurs even though no control is expected from the fieldbus.	5

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		WARNING! Make sure that it is safe to continue operation in case of a communication break.	
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 / uint16
	0.1 ... 6553.5 s	Time delay.	10 = 1 s / 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 150.4 FBA A ref1 type.	Auto / uint16
150.35	FBA B ref2 type	Selects the type and scaling of reference 2 received from fieldbus adapter B. For the selections, see parameter 150.5 FBA A ref2 type.	Auto / uint16
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 150.7 FBA A actual 1 type.	Auto / uint16
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 150.8 FBA A actual 2 type.	Auto / uint16
150.39	FBA B SW transparent source	Selects the source of the fieldbus status word when parameter 150.36 FBA B SW sel is set to Transparent mode.	Not selected / uint32
	Not selected	No source selected.	0
	Other [value]	See Terms and abbreviations (page 63).	
150.40	FBA B act1 transparent source	When parameter 150.37 FBA B actual 1 type is set to Transparent mode, this parameter selects the type of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Not selected / uint32
	Not selected	No source selected.	0
	Other [value]	See Terms and abbreviations (page 63).	
150.41	FBA B act2 transparent source	Selects the type of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Not selected / uint32
	Not selected	No source selected.	0
	Other [value]	See Terms and abbreviations (page 63).	
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.	Disable / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		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	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 IGBT supply unit.	1
150.43	FBA B control word	Displays the raw (unmodified) control word 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.	0 / uint32
	00000000...FFFFFFFFh	Control word sent by master to fieldbus adapter B.	1 = 1
150.44	FBA B reference 1	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.	- / int32
150.45	FBA B reference 2	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.	- / int32
150.46	FBA B status word	Displays the raw (unmodified) status word sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 150.42 FBA B debug mode. This parameter is read-only.	0 / uint32
	00000000...FFFFFFFFh	Status word sent by fieldbus adapter B to master.	1 = 1
150.47	FBA B actual value 1	Displays the raw (unmodified) actual value ACT1 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 150.42 FBA B debug mode. This parameter is read-only.	- / int32
150.48	FBA B actual value 2	Displays the raw (unmodified) actual value ACT2 sent by fieldbus adapter B to the master (PLC) if debugging is enabled by parameter 150.42 FBA B debug mode. This parameter is read-only.	- / int32
150.51	FBA B timelevel sel	Selects the communication speed. In general, lower speeds reduce CPU load. The table below shows the read/write intervals for cyclic and acyclic data with each parameter setting. **Selection** / **Cyclic*** / **Acyclic**** Monitoring: 10 ms / 10 ms Normal: 2 ms / 10 ms Fast: 500 µs / 2 ms Very fast: 250 µs / 500 µs *Cyclic data consists of fieldbus Control and Status words, Ref1, Ref2, Act1 and Act2.	Normal / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		**Acyclic data consists of the parameter data mapped to parameter groups 155 FBA B data in and 156 FBA B data out.	
	Monitoring	Low speed. Optimized for PC tool communication and monitoring usage.	3
	Normal	Normal speed.	0
	Fast	Fast speed.	1
	Very fast	Very fast speed.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
151	**FBA A settings**	Fieldbus adapter A configuration.	
151.1	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 150.1 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.	None / uint16
151.2	FBA A Par2	Parameters 151.2…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.	- / uint16
…	…	…	…
151.26	FBA A Par26	See parameter 151.2 FBA A Par2.	- / uint16
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 IGBT supply unit is running.	Done / uint16
	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 of the IGBT supply unit. In format axyz, where a = major revision number; xy = minor revision number; z = correction number. This parameter is read-only.	0 / uint16
	0000…FFFFh	Parameter table revision of adapter module.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
151.29	FBA A drive type code	Displays the IGBT supply unit type code of the fieldbus adapter module mapping file stored in the memory of the IGBT supply unit. This parameter is read-only.	- / uint16
151.30	FBA A mapping file ver	Displays the fieldbus adapter module mapping file revision stored in the memory of the IGBT supply unit in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	- / uint16
151.31	D2FBA A comm status	Displays the status of the fieldbus adapter module communication.	Idle / uint16
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1
	Time out	A timeout has occurred in the communication between the adapter and the IGBT supply 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. Check also parameter 150.3 FBA A comm loss t out.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5
	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.	0 / uint16
	0000…FFFFh	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 or letter. Example: 190A = revision 1.90A.	0 / uint16
	0000…FFFFh	Application program version of adapter module.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
152	**FBA A data in**	Selection of data to be transferred from IGBT supply 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.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
152.1	FBA A data in1	Parameters 152.1…152.12 select data to be transferred from the IGBT supply unit to the fieldbus controller through fieldbus adapter A.	None / uint32
	None	None.	0
	CW 16bit	Control Word (16 bits)	1
	Ref1 16bit	Reference 1 (16 bits)	2
	Ref2 16bit	Reference 2 (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
	Ref1 32bit	Reference 1 (32 bits)	12
	Ref2 32bit	Reference 2 (32 bits)	13
	SW 32bit	Status Word (32 bits)	14
	Act1 32bit	Actual value ACT1 (32 bits)	15
	Act2 32bit	Actual value ACT2 (32 bits)	16
…	…	…	…
152.12	FBA A data in12	See parameter 152.1 FBA A data in1.	None / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
153	**FBA A data out**	Selection of data to be transferred from fieldbus controller to IGBT supply 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.	
153.1	FBA data out1	Parameters 153.1…153.12 select data to be transferred from the fieldbus controller to the IGBT supply unit through fieldbus adapter A. Transfer speed can be set with parameter 150.21 FBA A timelevel sel.	None / uint32
	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
	Ref1 32bit	Reference Ref1 (32 bits)	12
	Ref2 32bit	Reference Ref2 (32 bits)	13
…	…	…	…

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
153.12	FBA data out12	See parameter 153.1 FBA data out1.	None / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
154	**FBA B settings**	Fieldbus adapter B configuration.	
154.1	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.	None / uint16
154.2	FBA B Par2	Parameters 154.2…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 in use.	- / uint16
…	…	…	…
154.26	FBA B Par26	See parameter 154.2 FBA B Par2.	- / uint16
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 IGBT supply unit is running.	Done / uint16
	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 of the IGBT supply unit. In format axyz, where a = major revision number; xy = minor revision number; z = correction number. This parameter is read-only.	0 / uint16
	0000…FFFFh	Parameter table revision of adapter module.	1 = 1
154.29	FBA B drive type code	Displays the IGBT supply unit type code of the fieldbus adapter module mapping file stored in the memory of the IGBT supply unit. This parameter is read-only.	- / uint16
154.30	FBA B mapping file ver	Displays the fieldbus adapter module mapping file revision stored in the memory of the IGBT supply unit in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	- / uint16
154.31	D2FBA B comm status	Displays the status of the fieldbus adapter module communication.	Idle / uint16
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Time out	A timeout has occurred in the communication between the adapter and the IGBT supply 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. Check also parameter 150.33 FBA B comm loss timeout.	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.	0 / uint16
	0000…FFFFh	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.	0 / uint16
	0000…FFFFh	Application program version of adapter module.	1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
155	**FBA B data in**	Selection of data to be transferred from IGBT supply 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.	
155.1	FBA B data in1	Parameters 155.1…155.12 select data to be transferred from the IGBT supply unit to the fieldbus controller through fieldbus adapter B.	None / uint32
	None	None.	0
	CW 16bit	Control Word (16 bits)	1
	Ref1 16bit	Reference 1 (16 bits)	2
	Ref2 16bit	Reference 2 (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

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Ref1 32bit	Reference 1 (32 bits)	12
	Ref2 32bit	Reference 2 (32 bits)	13
	SW 32bit	Status Word (32 bits)	14
	Act1 32bit	Actual value ACT1 (32 bits)	15
	Act2 32bit	Actual value ACT2 (32 bits)	16
…	…	…	…
155.12	FBA B data in12	See parameter 155.1 FBA B data in1.	None / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
156	**FBA B data out**	Selection of data to be transferred from fieldbus controller to IGBT supply 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.	
156.1	FBA B data out1	Parameters 156.1…156.12 select data to be transferred from the fieldbus controller to the IGBT supply unit through fieldbus adapter B. Transfer speed can be set with parameter 150.51 FBA B timelevel sel.	None / uint32
	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
	Ref1 32bit	Reference Ref1 (32 bits)	12
	Ref2 32bit	Reference Ref2 (32 bits)	13
…	…	…	…
156.12	FBA B data out12	See parameter 156.1 FBA B data out1.	None / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
160	**DDCS communication**	DDCS communication configuration. Fiber optic links connected to DDCS channels can be used to • connect units together to build a master/follower network • connect the converter to an external controller such as the AC500 PLC. See also section DDCS communication with inverter unit (page 47).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
160.1	M/F communication port	Selects the connection used by the master/follower functionality.	No connect / uint16
	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 2	Channel 2 on RDCO module.	12
	XD2D	Connector XD2D. **Note:** This connection cannot co-exist, and is not to be confused with, drive-to-drive (D2D) communication implemented by application programming (detailed in Programming manual: Drive application programming (IEC 61131-3) (3AUA0000127808 [English]).	7
160.2	M/F node address	Selects the node address for master/follower communication. No two nodes on-line may have the same address. **Note:** The allowable addresses for the master are 0 and 1. The allowable addresses for followers are 2…60.	1 / uint16
	1 ... 254	Node address.	1 = 1 / 1 = 1
160.3	M/F mode	Defines the role of the supply unit on the master/follower or drive-to-drive link.	Not in use / uint16
	Not in use	Master/follower functionality not active.	0
	DDCS master	The supply unit is the master on the master/follower (DDCS) link.	1
	DDCS follower	The supply unit is a follower on the master/follower (DDCS) link.	2
160.5	M/F HW connection	Selects the topology of the master/follower link. **Note:** Use the setting Star if using the master/follower functionality through the XD2D connector (as opposed to a fiber optic link).	Ring / uint16
	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
160.7	M/F link control	Defines the light intensity of the transmission LED of RDCO module channel CH2. (This parameter is effective only when parameter 160.1 M/F communication port	10 / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		is set to RDCO CH 2. 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.	
	1 ... 15	Light intensity.	1 = 1 / 1 = 1
160.8	M/F comm loss timeout	Sets a timeout for master/follower (DDCS) communication. If a communication break lasts longer than the timeout, the action specified by parameter 160.9 M/F comm loss function is taken. As a rule of thumb, this parameter should be set to at least 3 times the transmit interval of the master.	100 ms / uint16
	0 ... 65535 ms	Master/follower communication timeout.	1 = 1 ms / -
160.9	M/F comm loss function	Selects how the supply unit reacts to a master/follower communication break.	Fault / uint16
	NoAction	No action taken.	0
	Warning	The supply unit generates an AE81 M/F communication loss. This only occurs if control is expected from the master/follower link. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	1
	Fault	The supply unit trips on a fault (FE06 M/F communication loss). This only occurs if control is expected from the master/follower link.	2
	Fault always	The supply unit trips on a fault (FE06 M/F communication loss). This occurs even though no control is expected from the master/follower link.	3
160.10	M/F ref1 type	Selects the type and scaling of reference 1 received from the master/follower link. The resulting value is shown by 103.13 M/F or D2D ref1.	Transparent / uint16
	Auto	Type and scaling are chosen automatically according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, no scaling is applied (as with setting Transparent).	0
	Transparent	No scaling is applied.	1
	General	Generic reference with a scaling of 100 = 1 (ie. integer and two decimals).	2
	DC Voltage	The scaling is defined by parameter 146.4 DC voltage scaling.	8
	Active power	The scaling is defined by parameter 146.1 Power scaling.	9
	Reactive power	The scaling is defined by parameter 146.2 Reactive power scaling.	10
	Frequency	Reserved.	5

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	AC Voltage	Reserved.	13
160.11	M/F ref2 type	Selects the type and scaling of reference 2 received from the master/follower link. The resulting value is shown by 103.14 M/F or D2D ref2. For the selections, see parameter 160.10 M/F ref1 type.	Transparent / uint16
160.12	M/F act1 type	Selects the type/source and scaling of actual value ACT1 transmitted to the master/follower link.	Transparent / uint16
	Auto	Type and scaling are chosen automatically according to which reference chain the incoming reference is connected to. If the reference is not connected to any chain, no scaling is applied (as with setting Transparent).	0
	Transparent	No scaling is applied.	1
	General	Generic reference with a scaling of 100 = 1 (ie. integer and two decimals).	2
	DC Voltage	The scaling is defined by parameter 146.4 DC voltage scaling.	8
	Active power	The scaling is defined by parameter 146.1 Power scaling.	9
	Reactive power	The scaling is defined by parameter 146.2 Reactive power scaling.	10
	Frequency	Reserved.	5
	AC Voltage	Reserved.	13
160.13	M/F act2 type	Selects the type/source and scaling of actual value ACT2 transmitted to the master/follower link. For the selections, see parameter 160.12 M/F act1 type.	Transparent / uint16
160.14	M/F follower selection	(Effective in the master only.) Defines the followers from which data is read. See also parameters 162.28…162.33.	None / uint32
	Follower node 2	Data is read from the follower with node address 2.	2
	Follower node 3	Data is read from the follower with node address 3.	4
	Follower node 4	Data is read from the follower with node address 4.	8
	Follower nodes 2+3	Data is read from the followers with node addresses 2 and 3.	6
	Follower nodes 2+4	Data is read from the followers with node addresses 2 and 4.	10
	Follower nodes 3+4	Data is read from the followers with node addresses 3 and 4.	12
	Follower nodes 2+3+4	Data is read from the followers with node addresses 2, 3 and 4.	14
	None	None.	0
160.17	Follower fault action	(Effective in the master only.) Selects how the drive reacts to a fault in a follower.	Fault / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Note: Each follower must be configured to transmit its status word as one of the three data words in parameters 161.1…161.3. In the master, the corresponding target parameter (162.4…162.12) must be set to Follower SW.	
	No	No action taken. Unaffected units on the master/follower link will continue running.	0
	Warning	The drive generates a warning (AE82 Follower drive failure).	1
	Fault	Drive trips on FE07 Follower drive failure. All followers will be stopped.	2
160.18	Follower enable	Interlocks the starting of the master to the status of the followers. **Note:** Each follower must be configured to transmit its status word as one of the three data words in parameters 161.1…161.3. In the master, the corresponding target parameter (162.4…162.12) must be set to Follower SW.	Always / uint16
	MSW bit 0	The master can only be started if all followers are ready to switch on (bit 0 of 106.11 Main status word in each follower is on).	0
	MSW bit 1	The master can only be started if all followers are ready to operate (bit 1 of 106.11 Main status word in each follower is on).	1
	MSW bits 0 + 1	The master can only be started if all followers are ready to switch on and ready to operate (bits 0 and 1 of 106.11 Main status word in each follower are on).	2
	Always	The starting of the master is not interlocked to the status of the followers.	3
	MSW bit 12	The master can only be started if user-definable bit 12 of 106.11 Main status word in each follower is on. See parameter 106.31 MSW bit 12 sel.	4
	MSW bits 0 + 12	The master can only be started if both bit 0 and bit 12 of 106.11 Main status word in each follower are on.	5
	MSW bits 1 + 12	The master can only be started if both bit 1 and bit 12 of 106.11 Main status wordin each follower are on.	6
160.31	M/F wake up delay	Defines a wake-up delay during which no master/follower communication faults or warnings are generated. This is to allow all drives on the master/follower link to power up. The master cannot be started until the delay elapses or all monitored followers are found to be ready.	60.0 s / uint16
	0.0 ... 180.0 s	Master/follower wake-up delay.	10 = 1 s / 1 = 1 s
160.41	Extension adapter com port	Selects the channel used for connecting an optional FEA-xx extension adapter.	Not in use / uint16
	Not in use	None (communication disabled).	0

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	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 3	Channel CH 3 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 AC500 PLC).	No connect / uint16
	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).	10
	DDCS via BC	Communication to the inverter module active.	15
160.52	DDCS controller node address	Selects the node address of the IGBT supply unit for communication with the external controller. No two nodes on-line may have the same address. With an AC 800M (CI858) DriveBus connection, IGBT supply units must be addressed 1…24. With an AC 80 DriveBus connection, IGBT supply units must be addressed 1…12. With optical ModuleBus, the address of the IGBT supply unit is set according to the position value as follows: Multiply the hundreds of the position value by 16. Add the tens and ones of the position value to the result. For example, if the position value is 101, this parameter must be set to 1×16 + 1 = 17.	1 / uint16
	1 ... 254	Node address.	1 = 1 / 1 = 1
160.55	DDCS controller HW connection	Selects the topology of the fiber optic link.	Star / uint16
	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
160.56	DDCS controller baud rate	Defines the communication speed on the fiber optic link. This should be set to the same value on all devices on the link.	4 mbps / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	1 mbps	1 Mbps.	1
	2 mbps	2 Mbps.	2
	4 mbps	4 Mbps.	4
	8 mbps	8 Mbps.	8
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 CH 0. 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 / uint16
	1 ... 15	Light intensity.	1 = 1 / 1 = 1
160.58	DDCS controller comm loss time	Sets a timeout for communication with the external controller. If a communication break lasts longer than the timeout, the action specified by parameter 160.59 DDCS controller comm loss function is taken. As a rule of thumb, this parameter should be set to at least 3 times the transmit interval of the controller. **Notes:** • There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active). • With an AC 800M controller, the controller detects a communication break immediately but re-establishing the communication is done at 9-second idle intervals. Also note that the sending interval of a data set is not the same as the execution interval of the application task. On ModuleBus, the sending interval is defined by controller parameter Scan Cycle Time (by default, 100 ms).	100 ms / uint16
	0 ... 60000 ms	Timeout for communication with external controller.	1 = 1 ms / 1 = 1 ms
160.59	DDCS controller comm loss function	Selects how the IGBT supply unit reacts to a communication break between it and the external controller.	Fault / uint16
	No action	No action taken.	0
	Fault	A fault is generated.	1
	Warning	A warning is generated.	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.	Auto / uint16
	Auto	Type and scaling is chosen automatically according to the currently active control mode.	0
	Transparent	No scaling is applied.	1
	General	Generic reference without a specific unit.	2

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	DC Voltage	The scaling is defined by parameter 146.4 DC voltage scaling.	8
	Active power	The scaling is defined by parameter 146.1 Power scaling.	9
	Reactive power	The scaling is defined by parameter 146.2 Reactive power scaling.	10
	Frequency	Reserved.	5
	AC Voltage	Reserved.	13
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.	Auto / uint16
160.62	DDCS controller act1 type	Selects the type and scaling of actual value 1 transmitted to the external controller. For the selections, see parameter 160.60 DDCS controller ref1 type.	Auto / uint16
160.63	DDCS controller act2 type	Selects the type and scaling of actual value 2 transmitted to the external controller. For the selections, see parameter 160.60 DDCS controller ref1 type.	Auto / uint16
160.64	Mailbox dataset selection	Selects the pair of data sets used by the mailbox service in the drive/controller communication.	0 / uint16
	0 ... 1	Data sets 32 and 33.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
161	**DDCS transmit**	Defines the data sent to the DDCS link.	
161.1	M/F data 1 selection	Preselects the data to be sent as word 1 onto the master/follower link. See also parameter 161.25 M/F data 1 value.	Follower CW / uint32
	None	None.	0
	CW 16bit	Control Word (16 bits)	1
	SW 16bit	Status Word (16 bits)	4
	Act1 16bit	Actual value ACT1 (16 bits) **Note:** Using this setting to send a reference to the follower is not recommended as the source signal is filtered. Use the “reference” selections instead.	5
	Act2 16bit	Actual value ACT2 (16 bits) **Note:** Using this setting to send a reference to the follower is not recommended as the source signal is filtered. Use the “reference” selections instead.	6
	Follower CW	A word consisting of bits 0…11 of 106.1 Main control word.	27

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Note: Bit 3 of the follower control word is kept on as long as the master is modulating, and when it switches to 0, the follower coasts to a stop.	
	Master power	123.32 Master power	31520
	Other [value]	See Terms and abbreviations (page 63).	
161.2	M/F data 2 selection	Preselects the data to be sent as word 2 onto the master/follower link. See also parameter 161.26 M/F data 2 value. For the selections, see parameter 161.1 M/F data 1 selection.	Master power / uint32
161.3	M/F data 3 selection	Preselects the data to be sent as word 3 onto the master/follower link. See also parameter 161.27 M/F data 3 value. For the selections, see parameter 161.1 M/F data 1 selection.	None / uint32
161.25	M/F data 1 value	Displays the data to be sent onto the master/follower link as word 1 as an integer. If no data has been preselected by 161.1 M/F data 1 selection, the value to be sent can be written directly into this parameter.	- / uint16
	0 ... 65535	Data to be sent as word 1 in master/follower communication.	1 = 1 / 1 = 1
161.26	M/F data 2 value	Displays the data to be sent onto the master/follower link as word 2 as an integer. If no data has been preselected by 161.2 M/F data 2 selection, the value to be sent can be written directly into this parameter.	- / uint16
	0 ... 65535	Data to be sent as word 2 in master/follower communication.	1 = 1 / 1 = 1
161.27	M/F data 3 value	Displays the data to be sent onto the master/follower link as word 3 as an integer. If no data has been preselected by 161.3 M/F data 3 selection, the value to be sent can be written directly into this parameter.	- / uint16
	0 ... 65535	Data to be sent as word 3 in master/follower communication.	1 = 1 / 1 = 1
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 / uint32
	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	Virtual address for 16-bit actual value 1.	5
	Act2 16bit	Virtual address for 16-bit actual value 2.	6
	Other [value]	See Terms and abbreviations (page 63).	
161.52	Data set 11 data 2 selection	Selects the location where the value of data set 11 data word 2 is read from.	None / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		For the selections, see parameter 161.51 Data set 11 data 1 selection.	
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
161.101	Data set 11 data 1 value	Defines the raw data to be transmitted in data set 11 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 11 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 11 data word 2.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
161.103	Data set 11 data 3 value	Defines the raw data to be transmitted in data set 11 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 11 data word 3.	1 = 1 / 1 = 1
161.104	Data set 13 data 1 value	Defines the raw data to be transmitted in data set 13 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 13 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 13 data word 2.	1 = 1 / 1 = 1
161.106	Data set 13 data 3 value	Defines the raw data to be transmitted in data set 13 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 13 data word 3.	1 = 1 / 1 = 1
161.107	Data set 15 data 1 value	Defines the raw data to be transmitted in data set 15 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 15 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 15 data word 2.	1 = 1 / 1 = 1
161.109	Data set 15 data 3 value	Defines the raw data to be transmitted in data set 15 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 15 data word 3.	1 = 1 / 1 = 1
161.110	Data set 17 data 1 value	Defines the raw data to be transmitted in data set 17 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 17 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 17 data word 2.	1 = 1 / 1 = 1
161.112	Data set 17 data 3 value	Defines the raw data to be transmitted in data set 17 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 17 data word 3.	1 = 1 / 1 = 1
161.113	Data set 19 data 1 value	Defines the raw data to be transmitted in data set 19 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 19 data word 1.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
161.114	Data set 19 data 2 value	Defines the raw data to be transmitted in data set 19 data word 2.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 19 data word 2.	1 = 1 / 1 = 1
161.115	Data set 19 data 3 value	Defines the raw data to be transmitted in data set 19 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 19 data word 3.	1 = 1 / 1 = 1
161.116	Data set 21 data 1 value	Defines the raw data to be transmitted in data set 21 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 21 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 21 data word 2.	1 = 1 / 1 = 1
161.118	Data set 21 data 3 value	Defines the raw data to be transmitted in data set 21 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 21 data word 3.	1 = 1 / 1 = 1
161.119	Data set 23 data 1 value	Defines the raw data to be transmitted in data set 23 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 23 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 23 data word 2.	1 = 1 / 1 = 1
161.121	Data set 23 data 3 value	Defines the raw data to be transmitted in data set 23 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 23 data word 3.	1 = 1 / 1 = 1
161.122	Data set 25 data 1 value	Defines the raw data to be transmitted in data set 25 data word 1.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 25 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 25 data word 2.	1 = 1 / 1 = 1
161.124	Data set 25 data 3 value	Defines the raw data to be transmitted in data set 25 data word 3.	- / uint16
	0 ... 65535	Raw data to be transmitted in data set 25 data word 3.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
162	**DDCS receive**	Mapping of data received through the DDCS link.	
162.1	M/F data 1 selection	(Follower only) Defines a target for the data received as word 1 from the master through the master/follower link. See also parameter 162.25 M/F data 1 value.	None / uint32
	None	None.	0
	CW 16bit	Control Word (16 bits)	1
	Ref1 16bit	Reference REF1 (16 bits)	2
	Ref2 16bit	Reference REF2 (16 bits)	3
	Master power	123.32 Master power	31520
	Other [value]	See Terms and abbreviations (page 63).	
162.2	M/F data 2 selection	(Follower only) Defines a target for the data received as word 2 from the master through the master/follower link. See also parameter 162.26 M/F data 2 value. For the selections, see parameter 162.1 M/F data 1 selection.	None / uint32
162.3	M/F data 3 selection	(Follower only) Defines a target for the data received as word 3 from the master through the master/follower link. See also parameter 162.27 M/F data 3 value. For the selections, see parameter 162.1 M/F data 1 selection.	None / uint32
162.4	Follower node 2 data 1 sel	Defines a target for the data received as word 1 from the first follower (ie. the follower with node address 2) through the master/follower link. See also parameter 162.28 Follower node 2 data 1 value.	Follower SW / uint32
	None	None.	0
	Follower SW	Status word of the follower. See also parameter 160.18 Follower enable.	26
	Other [value]	See Terms and abbreviations (page 63).	
162.5	Follower node 2 data 2 sel	Defines a target for the data received as word 2 from the first follower (ie. the follower with node address 2) through the master/follower link. See also parameter 162.29 Follower node 2 data 2 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.6	Follower node 2 data 3 sel	Defines a target for the data received as word 3 from the first follower (ie. the follower with node address 2) through the master/follower link. See also parameter 162.30 Follower node 2 data 3 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.7	Follower node 3 data 1 sel	Defines a target for the data received as word 1 from the second follower (ie. the follower with node address 3) through the master/follower link. See also parameter 162.31 Follower node 3 data 1 value.	Follower SW / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		For the selections, see parameter 162.4 Follower node 2 data 1 sel.	
162.8	Follower node 3 data 2 sel	Defines a target for the data received as word 2 from the second follower (ie. the follower with node address 3) through the master/follower link. See also parameter 162.32 Follower node 3 data 2 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.9	Follower node 3 data 3 sel	Defines a target for the data received as word 3 from the second follower (ie. the follower with node address 3) through the master/follower link. See also parameter 162.33 Follower node 3 data 3 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.10	Follower node 4 data 1 sel	Defines a target for the data received as word 1 from the third follower (ie. the follower with node address 4) through the master/follower link. See also parameter 162.34 Follower node 4 data 1 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	Follower SW / uint32
162.11	Follower node 4 data 2 sel	Defines a target for the data received as word 2 from the third follower (ie. the follower with node address 4) through the master/follower link. See also parameter 162.35 Follower node 4 data 2 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.12	Follower node 4 data 3 sel	Defines a target for the data received as word 3 from the third follower (ie. the follower with node address 4) through the master/follower link. See also parameter 162.36 Follower node 4 data 3 value. For the selections, see parameter 162.4 Follower node 2 data 1 sel.	None / uint32
162.25	M/F data 1 value	(Follower only) Displays, in integer format, the data received from the master as word 1. Parameter 162.1 M/F data 1 selection can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 1 in master/follower communication.	1 = 1 / 1 = 1
162.26	M/F data 2 value	(Follower only) Displays, in integer format, the data received from the master as word 2. Parameter 162.2 M/F data 2 selection can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 2 in master/follower communication.	1 = 1 / 1 = 1
162.27	M/F data 3 value	(Follower only) Displays, in integer format, the data received from the master as word 3.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		Parameter 162.3 M/F data 3 selection can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	
	0 ... 65535	Data received as word 3 in master/follower communication.	1 = 1 / 1 = 1
162.28	Follower node 2 data 1 value	Displays, in integer format, the data received from the first follower (ie. follower with node address 2) as word 1. Parameter 162.4 Follower node 2 data 1 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 1 from follower with node address 2.	1 = 1 / 1 = 1
162.29	Follower node 2 data 2 value	Displays, in integer format, the data received from the first follower (ie. follower with node address 2) as word 2. Parameter 162.5 Follower node 2 data 2 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 2 from follower with node address 2.	1 = 1 / 1 = 1
162.30	Follower node 2 data 3 value	Displays, in integer format, the data received from the first follower (ie. follower with node address 2) as word 3. Parameter 162.6 Follower node 2 data 3 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 3 from follower with node address 2.	1 = 1 / 1 = 1
162.31	Follower node 3 data 1 value	Displays, in integer format, the data received from the second follower (ie. follower with node address 3) as word 1. Parameter 162.7 Follower node 3 data 1 sel sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 1 from follower with node address 3.	1 = 1 / 1 = 1
162.32	Follower node 3 data 2 value	Displays, in integer format, the data received from the second follower (ie. follower with node address 3) as word 2. Parameter 162.8 Follower node 3 data 2 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0 ... 65535	Data received as word 2 from follower with node address 3.	1 = 1 / 1 = 1
162.33	Follower node 3 data 3 value	Displays, in integer format, the data received from the second follower (ie. follower with node address 3) as word 3. Parameter 162.9 Follower node 3 data 3 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 3 from follower with node address 3.	1 = 1 / 1 = 1
162.34	Follower node 4 data 1 value	Displays, in integer format, the data received from the third follower (ie. follower with node address 4) as word 1. Parameter 162.10 Follower node 4 data 1 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 1 from follower with node address 4.	1 = 1 / 1 = 1
162.35	Follower node 4 data 2 value	Displays, in integer format, the data received from the third follower (ie. follower with node address 4) as word 2. Parameter 162.11 Follower node 4 data 2 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 2 from follower with node address 4.	1 = 1 / 1 = 1
162.36	Follower node 4 data 3 value	Displays, in integer format, the data received from the third follower (ie. follower with node address 4) as word 3. Parameter 162.12 Follower node 4 data 3 sel can be used to select a target for the received data. This parameter can also be used as a signal source by other parameters.	- / uint16
	0 ... 65535	Data received as word 3 from follower with node address 4.	1 = 1 / 1 = 1
162.37	M/F communication status 1	In the master, displays the status of the communication with followers. In a follower, bit 0 indicates the status of the communication with the master.	- / uint16
b0	Follower 1 / Foll	1 (in the master) = Communication with follower 1 OK. 1 (in a follower) = Communication with master OK.	
b1	Follower 2	1 = Communication with follower 2 OK.	
b2	Follower 3	1 = Communication with follower 3 OK.	
b3	Follower 4	1 = Communication with follower 4 OK.	
b4	Follower 5	1 = Communication with follower 5 OK.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b5	Follower 6	1 = Communication with follower 6 OK.	
b6	Follower 7	1 = Communication with follower 7 OK.	
b7	Follower 8	1 = Communication with follower 8 OK.	
b8	Follower 9	1 = Communication with follower 9 OK.	
b9	Follower 10	1 = Communication with follower 10 OK.	
b10	Follower 11	1 = Communication with follower 11 OK.	
b11	Follower 12	1 = Communication with follower 12 OK.	
b12	Follower 13	1 = Communication with follower 13 OK.	
b13	Follower 14	1 = Communication with follower 14 OK.	
b14	Follower 15	1 = Communication with follower 15 OK.	
b15	Follower 16	1 = Communication with follower 16 OK.	
	0000h...FFFFh		1 = 1
162.38	M/F communication status 2	In the master, displays the status of the communication with followers.	- / uint16
b0	Follower 17	1 = Communication with follower 17 OK.	
b1	Follower 18	1 = Communication with follower 18 OK.	
b2	Follower 19	1 = Communication with follower 19 OK.	
b3	Follower 20	1 = Communication with follower 20 OK.	
b4	Follower 21	1 = Communication with follower 21 OK.	
b5	Follower 22	1 = Communication with follower 22 OK.	
b6	Follower 23	1 = Communication with follower 23 OK.	
b7	Follower 24	1 = Communication with follower 24 OK.	
b8	Follower 25	1 = Communication with follower 25 OK.	
b9	Follower 26	1 = Communication with follower 26 OK.	
b10	Follower 27	1 = Communication with follower 27 OK.	
b11	Follower 28	1 = Communication with follower 28 OK.	
b12	Follower 29	1 = Communication with follower 29 OK.	
b13	Follower 30	1 = Communication with follower 30 OK.	
b14	Follower 31	1 = Communication with follower 31 OK.	
b15	Follower 32	1 = Communication with follower 32 OK.	
	0000h...FFFFh		1 = 1
162.41	M/F follower ready status 1	In the master, displays the ready status of the communication with followers.	- / uint16
b0	Follower 1	1 = Follower 1 ready.	
b1	Follower 2	1 = Follower 2 ready.	
b2	Follower 3	1 = Follower 3 ready.	
b3	Follower 4	1 = Follower 4 ready.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b4	Follower 5	1 = Follower 5 ready.	
b5	Follower 6	1 = Follower 6 ready.	
b6	Follower 7	1 = Follower 7 ready.	
b7	Follower 8	1 = Follower 8 ready.	
b8	Follower 9	1 = Follower 9 ready.	
b9	Follower 10	1 = Follower 10 ready.	
b10	Follower 11	1 = Follower 11 ready.	
b11	Follower 12	1 = Follower 12 ready.	
b12	Follower 13	1 = Follower 13 ready.	
b13	Follower 14	1 = Follower 14 ready.	
b14	Follower 15	1 = Follower 15 ready.	
b15	Follower 16	1 = Follower 16 ready.	
	0000h...FFFFh		1 = 1
162.42	M/F follower ready status 2	In the master, displays the ready status of the communication with followers.	- / uint16
b0	Follower 17	1 = Follower 17 ready.	
b1	Follower 18	1 = Follower 18 ready.	
b2	Follower 19	1 = Follower 19 ready.	
b3	Follower 20	1 = Follower 20 ready.	
b4	Follower 21	1 = Follower 21 ready.	
b5	Follower 22	1 = Follower 22 ready.	
b6	Follower 23	1 = Follower 23 ready.	
b7	Follower 24	1 = Follower 24 ready.	
b8	Follower 25	1 = Follower 25 ready.	
b9	Follower 26	1 = Follower 26 ready.	
b10	Follower 27	1 = Follower 27 ready.	
b11	Follower 28	1 = Follower 28 ready.	
b12	Follower 29	1 = Follower 29 ready.	
b13	Follower 30	1 = Follower 30 ready.	
b14	Follower 31	1 = Follower 31 ready.	
b15	Follower 32	1 = Follower 32 ready.	
	0000h...FFFFh		1 = 1
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 / uint32
	None	None.	0
	CW 16bit	Virtual address for 16-bit control word.	1
	Ref1 16bit	Virtual address for 16-bit reference 1.	2
	Ref2 16bit	Virtual address for 16-bit reference 2.	3

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Other [value]	See Terms and abbreviations (page 63).	
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
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 / uint32
162.101	Data set 10 data 1 value	Defines the raw data to be received in data set 10 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 10 data word 1.	1 = 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.	- / uint16

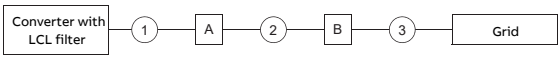
No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0 ... 65535	Raw data to be received in data set 10 data word 2.	1 = 1 / 1 = 1
162.103	Data set 10 data 3 value	Defines the raw data to be received in data set 10 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 10 data word 3.	1 = 1 / 1 = 1
162.104	Data set 12 data 1 value	Defines the raw data to be received in data set 12 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 12 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 12 data word 2.	1 = 1 / 1 = 1
162.106	Data set 12 data 3 value	Defines the raw data to be received in data set 12 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 12 data word 3.	1 = 1 / 1 = 1
162.107	Data set 14 data 1 value	Defines the raw data to be received in data set 14 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 14 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 14 data word 2.	1 = 1 / 1 = 1
162.109	Data set 14 data 3 value	Defines the raw data to be received in data set 14 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 14 data word 3.	1 = 1 / 1 = 1
162.110	Data set 16 data 1 value	Defines the raw data to be received in data set 16 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 16 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 16 data word 2.	1 = 1 / 1 = 1
162.112	Data set 16 data 3 value	Defines the raw data to be received in data set 16 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 16 data word 3.	1 = 1 / 1 = 1
162.113	Data set 18 data 1 value	Defines the raw data to be received in data set 18 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 18 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 18 data word 2.	1 = 1 / 1 = 1
162.115	Data set 18 data 3 value	Defines the raw data to be received in data set 18 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 18 data word 3.	1 = 1 / 1 = 1
162.116	Data set 20 data 1 value	Defines the raw data to be received in data set 20 data word 1.	- / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	0 ... 65535	Raw data to be received in data set 20 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 20 data word 2.	1 = 1 / 1 = 1
162.118	Data set 20 data 3 value	Defines the raw data to be received in data set 20 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 20 data word 3.	1 = 1 / 1 = 1
162.119	Data set 22 data 1 value	Defines the raw data to be received in data set 22 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 22 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 22 data word 2.	1 = 1 / 1 = 1
162.121	Data set 22 data 3 value	Defines the raw data to be received in data set 22 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 22 data word 3.	1 = 1 / 1 = 1
162.122	Data set 24 data 1 value	Defines the raw data to be received in data set 24 data word 1.	- / uint16
	0 ... 65535	Raw data to be received in data set 24 data word 1.	1 = 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.	- / uint16
	0 ... 65535	Raw data to be received in data set 24 data word 2.	1 = 1 / 1 = 1
162.124	Data set 24 data 3 value	Defines the raw data to be received in data set 24 data word 3.	- / uint16
	0 ... 65535	Raw data to be received in data set 24 data word 3.	1 = 1 / 1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
190	**BAMU measurements**	Grid measurement signals from BAMU measurement unit. BAMU measures voltages and currents configured in parameter group 191 BAMU configuration. All parameters in this group are read-only.	
190.1	Phase voltage U1	Shows the RMS value of phase voltage U1a.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U1a.	1 = 1 V / 1 = 1 V
190.2	Phase voltage V1	Shows the RMS value of phase voltage U1b.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U1b.	1 = 1 V / 1 = 1 V
190.3	Phase voltage W1	Shows the RMS value of phase voltage U1c.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U1c.	1 = 1 V / 1 = 1 V
190.6	Mains voltage U1-V1	Shows the RMS value of line-to-line voltage U1ab.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U1ab.	1 = 1 V / 1 = 1 V

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
190.7	Mains voltage V1-W1	Shows the RMS value of line-to-line voltage U1bc.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U1bc.	1 = 1 V / 1 = 1 V
190.8	Mains voltage W1-U1	Shows the RMS value of line-to-line voltage U1ca.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U1ca.	1 = 1 V / 1 = 1 V
190.15	Frequency 1	Shows the frequency of the measured voltage U1.	- / real32
	0.00 ... 100.00 Hz	Frequency of the measured voltage U1.	1 = 1 Hz / 1 = 1 Hz
190.20	Phase voltage U2	Shows the RMS value of phase voltage U2a.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U2a.	1 = 1 V / 1 = 1 V
190.21	Phase voltage V2	Shows the RMS value of phase voltage U2b.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U2b.	1 = 1 V / 1 = 1 V
190.22	Phase voltage W2	Shows the RMS value of phase voltage U2c.	- / real32
	0.00 ... 30000.00 V	RMS value of phase voltage U2c.	1 = 1 V / 1 = 1 V
190.25	Mains voltage U2-V2	Shows the RMS value of line-to-line voltage U2ab.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U2ab.	1 = 1 V / 1 = 1 V
190.26	Mains voltage V2-W2	Shows the RMS value of line-to-line voltage U2bc.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U2bc.	1 = 1 V / 1 = 1 V
190.27	Mains voltage W2-U2	Shows the RMS value of line-to-line voltage U2ca.	- / real32
	0.00 ... 30000.00 V	RMS value of line-to-line voltage U2ca.	1 = 1 V / 1 = 1 V
190.34	Frequency 2	Shows the frequency of the measured voltage U2.	- / real32
	0.00 ... 100.00 Hz	Frequency of the measured voltage U2.	1 = 1 Hz / 1 = 1 Hz
190.40	Phase current U1	Shows the RMS value of phase current Ia.	- / real32
190.41	Phase current V1	Shows the RMS value of phase current Ib.	- / real32
190.42	Phase current W1	Shows the RMS value of phase current Ic.	- / real32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
191	**BAMU configuration**	Settings for BAMU measurement unit.	
191.1	U1 measurement	Enables U1 measurements.	No / uint16
	No	U1 measurements disabled.	0
	Yes	U1 measurements enabled.	1
191.2	U1 meas type	Selects U1 voltage measurement type. For more information on BAMU unit measurements, see BAMU-12C auxiliary measurement unit hardware manual (3AXD50000117840 [English]).	Mains voltage / uint16
	Mains voltage	Main voltage measurement.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Phase voltage	Voltage measurement against phase ground.	2
	Phase voltage neutral	Voltage measurement against virtual ground.	3
191.10	U2 measurement	Enables U2 measurements.	No / uint16
	No	U2 measurements disabled.	0
	Yes	U2 measurements enabled.	1
191.11	U2 meas type	Selects U2 voltage measurement type. For more information on BAMU unit measurements, see BAMU-12C auxiliary measurement unit hardware manual (3AXD50000117840 [English]).	Mains voltage / uint16
	Mains voltage	Main voltage measurement.	1
	Phase voltage	Voltage measurement against phase ground.	2
	Phase voltage neutral	Voltage measurement against virtual ground.	3
191.20	I measurement	Enables current measurements.	No / uint16
	No	Current measurements disabled.	0
	Yes	Current measurements enabled.	1
191.22	Current transf. ratio	Defines the transformation ratio of the current transformer. Example: If transformation ratio is 2000/1A, set the value of this parameter to 2000.	- / real32
191.29	Board type	Displays the type of BAMU unit.	Not found / uint16
	BAMU-11	Not supported.	0
	BAMU-12	BAMU-12.	16
	Not found	No BAMU unit found.	65535
191.30	BAMU 1 channel	Defines the channel for BAMU unit measurements. Set BAMU channel to the first unused module channel. For example, if the unit already has five module channels in use, set number to six. Reboot the control unit after setting this parameter.	- / uint16
	0 ... 12	BAMU channel.	1 = 1 / 1 = 1
191.40	Transformer location	Selects the transformer location in main circuit in measurements with BAMU measurement unit. The figure below shows the possible transformer and circuit breaker locations in main circuit (A and B), and possible measurement locations for voltages U1 and U2 (1, 2 and 3). Locations are set with parameters 191.40…191.43. In case of errors in measurement settings, warning 5E1C Bamu meas settings is generated. See also section BAMU measurements (page 61).  	Not set / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Not set	Not set.	0
	Location A	Transformer is located in location A (on the converter-side).	1
	Location B	Transformer is located in location B (on the grid-side).	2
191.41	Circuit braker location	Selects the circuit breaker location in main circuit in measurements with BAMU measurement unit. See the figure in parameter 191.40 Transformer location. See also section BAMU measurements (page 61).	Not set / uint16
	Not set	Not set.	0
	Location A	Circuit breaker is located in location A (on the converter-side).	1
	Location B	Circuit breaker is located in location B (on the grid-side).	2
191.42	U1 meas location	Selects the measurement location of voltage U1 in measurements with BAMU measurement unit. See the figure in parameter 191.40 Transformer location. See also section BAMU measurements (page 61).	Not set / uint16
	Not set	Not set.	0
	Location 1	Voltage U1 is measured from location 1 (from grid-side terminals of an LCL filter).	2
	Location 2	Voltage U1 is measured from location 2 (after a circuit breaker or transformer).	3
	Location 3	Voltage U1 is measured from location 3 (from the grid-side of a transformer or circuit breaker).	4
191.43	U2 meas location	Selects the measurement location of voltage U2 in measurements with BAMU measurement unit. See the figure in parameter 191.40 Transformer location. See also section BAMU measurements (page 61).	Not set / uint16
	Not set	Not set.	0
	Other	Other.	1
	Location 2	Voltage U2 is measured from location 2 (after a circuit breaker or transformer).	3
	Location 3	Voltage U2 is measured from location 3 (from the grid-side of a transformer or circuit breaker).	4

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
195	**HW configuration**	Various hardware-related settings.	
195.1	Supply voltage	Selects the supply voltage range. The value affects the DC voltage control, trip and brake chopper limits of the supply unit. **Note:** The current rating of the supply unit is also affected by the selected supply voltage.	Not given / uint16

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Not given	No voltage defined. The IGBT supply unit will not start modulating before another value is selected. The supply unit displays warning AE24 Supply voltage unselected until you have defined the value.	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
195.4	Control board supply	Specifies how the control unit of the IGBT supply unit is powered.	External 24V / uint16
	Internal 24V	The control unit is powered from the power unit it is connected to. This is the default setting.	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
195.9	Switch fuse controller	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. On units without a DC switch, this parameter should be set to Disable. The charging controller monitors the charging of the unit, and sends an enable command when the charging has finished (ie. DC switch is closed after the 'charging OK' lamp lights, and charging switch opened). For more information, see xSFC documentation.	PU default / uint16
	Disable	Communication with xSFC disabled.	0
	Enable	Communication with xSFC enabled.	1
	PU default	Communication with xSFC enabled for liquid-cooled modules and disabled for air-cooled modules	2
195.12	Reduced run mask	Specifies which converter modules have been removed from the converter configuration. A value other than 0 activates the reduced run function. See section Reduced run function (page 34).	- / uint16
b0	Module 1 removed	Module 1 has been removed.	
b1	Module 2 removed	Module 2 has been removed.	
b2	Module 3 removed	Module 3 has been removed.	
b3	Module 4 removed	Module 4 has been removed.	
b4	Module 5 removed	Module 5 has been removed.	
b5	Module 6 removed	Module 6 has been removed.	
b6	Module 7 removed	Module 7 has been removed.	
b7	Module 8 removed	Module 6 has been removed.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b8	Module 9 removed	Module 9 has been removed.	
b9	Module 10 removed	Module 10 has been removed.	
b10	Module 11 removed	Module 11 has been removed.	
b11	Module 12 removed	Module 12 has been removed.	
b12…15	Reserved		
	0000h…FFFFh		1 = 1
195.13	Reduced run mode	Specifies the number of supply modules available. This parameter must be set if reduced run is required. A value other than 0 activates the reduced run function. If the control program cannot detect the number of modules specified by this parameter, a fault (5E0E Reduced run) is generated. See section Reduced run function (page 34). 0 = Reduced run disabled 1…8 = Number of modules available	- / uint16
	0 ... 65535	Number of modules available.	- / 1 = 1
195.14	Connected modules	Shows which power modules have been detected.	- / uint16
b0	Module 1	1 = Module 1 has been detected.	
b1	Module 2	1 = Module 2 has been detected.	
b2	Module 3	1 = Module 3 has been detected.	
b3	Module 4	1 = Module 4 has been detected.	
b4	Module 5	1 = Module 5 has been detected.	
b5	Module 6	1 = Module 6 has been detected.	
b6	Module 7	1 = Module 7 has been detected.	
b7	Module 8	1 = Module 8 has been detected.	
b8	Module 9	1 = Module 9 has been detected.	
b9	Module 10	1 = Module 10 has been detected.	
b10	Module 11	1 = Module 11 has been detected.	
b11	Module 12	1 = Module 12 has been detected.	
b12…15	Reserved		
	0000h…FFFFh		1 = 1
195.16	Router mode	Enables/disables router mode. When router mode is active, the PSL2 channels connected to another control unit (ie. those selected by 195.17 Router channel config) are routed to the power units (IGBT supply modules) connected to this control unit. See section Router mode (page 60). **Note:** This parameter cannot be changed while the supply unit is running.	Off / uint32
	Off	Router mode inactive.	0
	On	Router mode active.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Other [bit]	See Terms and abbreviations (page 63).	
195.17	Router channel config	Selects which PSL2 channels on the control unit are connected to another control unit and routed to a local power unit. **Notes:** • The local power units are to be connected to successive channels starting from CH1. The other control unit is then connected to one or more successive channels starting from the first free channel. • The lowest channel selected in this parameter is routed to the local power unit with the lowest number, etc. • There must be at least as many local power modules as there are routed channels. • This parameter cannot be changed while the supply unit is running. See section Router mode (page 60).	- / uint16
b0	ch1	0	
b1	ch2	1 = Channel CH2 is routed to the local power unit (which is connected to CH1).	
b2	ch3	1 = Channel CH3 is routed to a local power unit.	
b3	ch4	1 = Channel CH4 is routed to a local power unit.	
b4	ch5	1 = Channel CH5 is routed to a local power unit.	
b5	ch6	1 = Channel CH6 is routed to a local power unit.	
b6	ch7	1 = Channel CH7 is routed to a local power unit.	
b7	ch8	1 = Channel CH8 is routed to a local power unit.	
b8	ch9	1 = Channel CH9 is routed to a local power unit.	
b9	ch10	1 = Channel CH10 is routed to a local power unit.	
b10	ch11	1 = Channel CH11 is routed to a local power unit.	
b11	ch12	1 = Channel CH12 is routed to a local power unit.	
b12…15	Reserved		
	0000h…FFFFh		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.	- / uint16
b0…1	Reserved		
b2	Internally charged	(Only visible with a ZCU control unit) Internal charging in use. Reserved for future purposes, activating this bit may lead to hardware failure. Do not use!	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b3	RO2 for -07 cabinet cooling fan	Configures RO2 for cabinet cooling fan. Sets parameters 110.27 RO2 source and 110.29 RO2 OFF delay write-protected.	
b4	Internally powered control unit	1 = Yes. (Sets parameter 195.4 Control board supply to Internal 24V.)	
b5	Reserved		
b6	Off grid enable	1 = Optimal grid control functionality active.	
b7	Reserved		
b8	Service switch	Service switch is wired to DI6. Sets parameter 131.1 External event 1 source to DI6.	
b9	Reserved		
b10	Brake resistor, IP54 fan	Brake resistor Klixon from SAFUR and IP54 fan Klixon are connected in series to DIIL. Sets parameter 120.12 Run enable 1 source to 110.1, bit 15.	
b11	INU – ISU communication via RDCO	Enables DDCS communication with ACS880 inverter. Selects DDCS controller as the control source, enables the communication and configures required dataset parameters.	
b12	Reserved		
b13	DIO1 for brake chopper feedback	Reserved.	
b14	DOL fan control	Direct-on-line cooling fan is used.	
b15	ACS880LC	Sets parameter 111.9 DIO2 function to Input, 131.38 Fuse trip fault source to DIO2, 131.32 Aux circuit breaker fault source to DI4 and 206.01 I/O bus enable to Yes.	
	0000h…FFFFh		1 = 1
195.30	Parallel type list filter	Filters the list of drive/supply unit types listed by parameter 195.31 Parallel type configuration.	No filter / uint16
	No filter	All types listed.	1
	400 V	-3 (380…415 V) types listed.	2
	500 V	-5 (380…500 V) types listed.	3
	690 V	-7 (525…690 V) types listed.	4
195.31	Parallel type configuration	Defines the drive/supply unit type if it consists of parallel-connected modules. If the drive/supply unit consists of a single module, leave the value at Not selected.	Not selected / uint16
	Not selected	The drive/supply unit does not consist of parallel-connected modules, or type not selected.	0
	[Drive/supply unit type]	Drive/supply unit type consisting of parallel-connected modules.	-
195.38	DOL fan start delay	Defines the delay before starting a direct-on-line fan after run command.	7 s / real32
	0 ... 60 s	Delay before starting a direct-on-line fan.	1 = 1 s / 1 = 1 s

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
195.51	Current offset calibration	Disables/enables the current offset calibration. In calibration, the current is measured and averaged for 500 ms. Measured value is considered as current offset and it is reduced from actual measurement values. Automatic mode is strongly recommended if AC mode is used. Otherwise default selection No is recommended.	No / uint16
	No	Disabled.	0
	Automatic	Automatic current offset calibration is enabled.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
196	**System**	Language selection; parameter save and restore; control unit reboot; user lock.	
196.1	Language	Selects the language of the parameter interface and other displayed information.	Not selected / uint16
	Not selected	None.	0
	English	English.	1033
196.2	Pass code	Pass codes can be entered into this parameter to activate further access levels (see parameter 196.3 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 44).	0 / uint32
	0…99999999	Pass code.	1 = 1
196.3	Access levels active	Shows which access levels have been activated by pass codes entered into parameter 196.2 Pass code.	- / uint16
b0	End user	End user	
b1	Service	Service	
b2	Advanced programmer	Advanced users	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b3	.	Reserved.	
b4	RADIUS service	Reserved.	
b5	.	Reserved.	
b6	.	Reserved.	
b7	.	Reserved.	
b8	.	Reserved.	
b9	.	Reserved.	
b10	.	Reserved.	
b11	OEM access level 1	Reserved.	
b12	OEM access level 2	Reserved.	
b13	OEM access level 3	Reserved.	
b14	Parameter lock	Parameter lock	
b15	.	Reserved.	
	0000h…FFFFh		1 = 1
196.6	Parameter restore	Restores the original settings of the control program, ie. parameter default values. **Note:** This parameter cannot be changed while the IGBT supply unit is running.	Done / uint16
	Done	Restoring is completed.	0
	Restore defs	All editable parameter values are restored to default values, except • I/O extension module settings • control panel/PC communication settings • fieldbus adapter settings • parameter 195.1 Supply voltage • parameter 195.20 HW options word 1 and the differentiated defaults implemented by it.	8
	Clear all	All editable parameter values are restored to default values, except • control panel/PC communication settings • parameter 195.1 Supply voltage • parameter 195.20 HW options word 1 and the differentiated defaults implemented by it. PC tool communication is interrupted during the restoring.	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.	32

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
196.7	Parameter save manually	Saves the valid parameter values to 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 / uint16
	Done	Save completed.	0
	Save	Save in progress.	1
196.8	Control board boot	Changing the value of this parameter to 1 reboots the control unit. The value reverts to 0 automatically.	- / uint16
	0 ... 1	1 = Reboot control unit.	1 = 1 / 1 = 1
196.10	User set status	Shows the status of the user parameter sets. This parameter is read-only. See also section User parameter sets (page 42).	n/a / uint16
	n/a	No user parameter sets have been saved.	0
	Loading	A user set is being loaded.	1
	Saving	A user set is being saved.	2
	Faulted	Invalid or empty parameter set.	3
	User set 1	User set 1 has been loaded.	4
	User set 2	User set 2 has been loaded.	5
	User set 3	User set 3 has been loaded.	6
	User set 4	User set 4 has been loaded.	7
196.11	User set save/load	Enables the saving and restoring of up to four custom sets of parameter settings. See section User parameter sets (page 42). The set that was in use before powering down the IGBT supply unit is in use after the next power-up. **Notes:** • Some hardware configuration settings, such as I/O extension module and fieldbus configuration parameters (groups 114…116 and 151…156), and parameters 150.1 and 150.31), and forced input/output values (such as 110.3 and 110.4) are not included in user parameter sets. • Parameter changes made after loading a set are not automatically stored – they must be saved using this parameter. • If no sets have been saved, attempting to load a set will create all sets from the currently active parameter settings. • Switching between sets is only possible with the supply unit stopped.	No action / uint16
	No action	Load or save operation complete; normal operation.	0
	IO mode	Load user parameter set using parameters 196.12 User set I/O mode in1 and 196.13 User set I/O mode in2.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Load set 1	Load user parameter set 1.	2
	Load set 2	Load user parameter set 2.	3
	Load set 3	Load user parameter set 3.	4
	Load set 4	Load user parameter set 4.	5
	Save to set 1	Save user parameter set 1.	18
	Save to set 2	Save user parameter set 2.	19
	Save to set 3	Save user parameter set 3.	20
	Save to set 4	Save user parameter set 4.	21
196.12	User set I/O mode in1	When parameter 196.11 User set save/load is set to IO mode, selects the user parameter set together with parameter 196.13 User set I/O mode in2 as follows: <table><tr><th>Status of source defined by 196.12</th><th>Status of source defined by 196.13</th><th>User parameter set selected</th></tr><tr><td>0</td><td>0</td><td>Set 1</td></tr><tr><td>1</td><td>0</td><td>Set 2</td></tr><tr><td>0</td><td>1</td><td>Set 3</td></tr><tr><td>1</td><td>1</td><td>Set 4</td></tr></table>	Off / uint32
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (110.2 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (110.2 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (110.2 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (110.2 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (110.2 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (110.2 DI delayed status, bit 5).	7
	DIO1	Digital input/output DIO1 (111.2 DIO delayed status, bit 0).	10
	DIO2	Digital input/output DIO2 (111.2 DIO delayed status, bit 1).	11
	Other [bit]	See Terms and abbreviations (page 63).	
196.13	User set I/O mode in2	See parameter 196.12 User set I/O mode in1.	Off / uint32
196.20	Time sync primary source	Defines the 1st priority external source for synchronization of the unit's time and date.	DDCS Controller / uint16
	Internal	No external source selected.	0
	DDCS Controller	External controller.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
	Fieldbus A or B	Fieldbus interface A or B.	2
	Fieldbus A	Fieldbus interface A.	3
	Fieldbus B	Fieldbus interface B.	4
	D2D or M/F	The master station on a master/follower or drive-to-drive link.	5
	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-xx 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 drive via the parameter interface from a fieldbus or application program. This may be necessary if the fieldbus protocol does not support time synchronization.	12055 days / uint16
	1 ... 59999 days	Days since beginning of 1980.	1 = 1 days / 1 = 1 days
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 / uint16
	0 ... 1439 min	Minutes since midnight.	1 = 1 min / 1 = 1 min
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 / uint16
	0 ... 59999 ms	Number of milliseconds since last minute.	1 = 1 ms / 1 = 1 ms
196.29	Time sync source status	Time source status word. This parameter is read-only.	- / uint16
b0	Time tick received	1 = 1st priority tick received: Tick has been received from 1st priority source.	
b1	Aux Time tick received	1 = 2nd priority tick received: Tick has been received from 2nd priority source.	
b2	Tick interval is too long	1 = Yes: Tick interval too long (accuracy compromised).	
b3	DDCS controller	1 = Tick received: Tick has been received from an external controller.	
b4	Master/Follower	1 = Tick received: Tick has been received through the master/follower link.	
b5	Reserved		
b6	D2D	1 = Tick received: Tick has been received through the drive-to-drive link.	
b7	FbusA	1 = Tick received: Tick has been received through fieldbus interface A.	
b8	FbusB	1 = Tick received: Tick has been received through fieldbus interface B.	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
b9	EFB	1 = Tick received: Tick has been received through the embedded fieldbus interface.	
b10	Ethernet	Reserved.	
b11	Panel link	1 = Tick received: Tick has been received from the control panel, or Drive composer PC tool connected to the control panel.	
b12	Ethernet tool link	1 = Tick received: Tick has been received from Drive composer PC tool through an FENA-xx module.	
b13	Parameter setting	1 = Tick received: Tick has been set by parameters 196.24…196.26.	
b14	RTC	1 = RTC time in use: Time and date have been read from the real-time clock.	
b15	Drive On-Time	1 = Drive on-time in use: Time and date are displaying drive on-time.	
	0000h…FFFFh		1 = 1
196.39	Power up event logging	Enables/disables power-up logging. When enabled, an event (BE08 Power up) is logged by the IGBT supply unit upon each power-up.	Enable / uint16
	Disable	Power-up event logging disabled.	0
	Enable	Power-up event logging enabled.	1
196.51	Clear fault and event logger	Clears the contents of the event logs. See section Warning/fault history and analysis (page 232).	- / uint16
	0 ... 65535	00001 = Clear the event logs. (The value will automatically revert to 00000.)	1 = 1 / 1 = 1
196.61	User data logger status word	Provides status information on the user data logger (see section User data logger).	- / uint16
b0	Running	1 = The user data logger is running. The bit is cleared after the post-trigger time has passed.	
b1	Triggered	1 = The user data logger has been triggered. The bit is cleared when the logger is restarted.	
b2	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.	
b3	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.	
b4…15	Reserved		
	0000h…FFFFh		1 = 1
196.63	User data logger trigger	Triggers, or selects a source that triggers, the user data logger.	Off / uint32
	Off	0.	0
	On	1.	1
	Other [bit]	See Terms and abbreviations (page 63).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
196.64	User data logger start	Starts, or selects a source that starts, the user data logger.	Off / uint32
	Off	0.	0
	On	1.	1
	Other [bit]	See Terms and abbreviations (page 63).	
196.65	Factory data logger time level	Selects the sampling interval for the factory data logger.	500us / uint16
	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 25).	No / uint16
	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 196.2 Pass code, activate parameter 196.8 Control board boot, or cycle the power. See also section User lock (page 44).	10000000 / uint32
	10000000…99999999	New user pass code.	1 = 1
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 / uint32
	10000000…99999999	Confirmation of new user pass code.	1 = 1
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 196.2 Pass code. **Note:** We recommend you select all the actions and functionalities unless otherwise required by the application.	- / uint16
b0	Disable ABB access levels	1 = ABB access levels (service, advanced programmer, etc.; see 196.3) disabled	
b1	Freeze parameter lock state	1 = Changing the parameter lock state prevented, ie. pass code 358 has no effect	
b2	Disable file download	1 = Loading of files to drive prevented. This applies to • firmware upgrades • safety functions module configuration	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		• parameter restore • loading an adaptive program • loading and debugging an application program • changing home view of control panel • editing drive 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.	
b3	Disable FB write to hidden	1 = Access to parameters on disabled access levels from fieldbus prevented.	
b4…5	Reserved		
b6	Protect AP	1 = Creating a backup and restoring from a backup prevented.	
b7	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.	
b8…10	Reserved		
b11	Disable OEM access level 1	1 = OEM access level 1 disabled	
b12	Disable OEM access level 2	1 = OEM access level 2 disabled	
b13	Disable OEM access level 3	1 = OEM access level 3 disabled	
b14…15	Reserved		
	0000h…FFFFh		1 = 1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
197	**Grid control**	Configuration of the active damping functionality.	
197.20	DC-ctrl active damping	Enables/disables the active damping functionality. See section Active damping (page 62).	Yes / uint16
	No	Active damping functionality disabled.	0
	Yes	Active damping functionality enabled. This is the default selection.	1

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
199	**Off grid configuration**	Configuration of the optimal grid control functionality. This parameter group contains parameters related to configuration of the optimal grid control functionality	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
		(option +N8053). For details on the parameters in this group, see Optimal grid control of ACS880 IGBT supply control program supplement (3AXD50000164745 [English]).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
206	**I/O bus configuration**	Distributed I/O bus settings. This group 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, refer to CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
207	**I/O bus service**	Distributed I/O bus settings. This group 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, refer to CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
208	**I/O bus diagnostics**	Distributed I/O bus settings. This group 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, refer to CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).	

No.	Name / Range / Selection	Description	Def / Type FbEq 16b / 32b
209	**I/O bus fan identification**	Distributed I/O bus settings. This group 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, refer to CIO-01 I/O module and distributed I/O bus user's manual (3AXD50000126880 [English]).	

7

Fault tracing

What this chapter contains

The chapter lists the warning and fault messages including possible causes and corrective actions. The causes of most warnings and faults can be identified and corrected using the information in this chapter. If not, an ABB service representative should be contacted.

Warnings and faults are listed below in separate tables. Each table is sorted by warning/fault code.

Safety

WARNING!
Only qualified electricians are allowed to service the IGBT supply unit. See ACS880 multidrive cabinets and modules safety instructions (3AUA0000102301 [English]) for air-cooled units, and ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English]) for liquid-cooled units.

Indications

Warnings and faults

Warnings and faults indicate an abnormal status. The codes and names of active warnings/faults are displayed on the control panel as well as the Drive composer PC tool. Only the codes of warnings/faults are available over fieldbus.

Warnings do not need to be reset; they stop showing when the cause of the warning ceases. 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 supply unit can be restarted. Faults can also be reset from an external source selected by parameter 131.11 Fault reset selection.

Warning and fault indications can be directed to a relay output or a digital input/output by selecting Warning, Fault or Fault (-1) in the source selection parameter. See sections

- Programmable digital inputs and outputs (page 27)
- Programmable relay outputs (page 27), and
- Programmable I/O extensions (page 28).

Pure events

In addition to warnings and faults, there are pure events that are only recorded in the event logs. The codes of these events are included in the Warning, fault and pure event messages table.

Editable messages

For some warnings and faults, the message text can be edited and instructions and contact information added. To edit these messages, choose **Menu - Settings - Edit texts** on the control panel or Drive composer pro PC tool.

Warning/fault history and analysis

Event logs

The IGBT supply unit has two event logs that can be accessed from the main Menu on the control panel. The logs can also be accessed (and reset) using the Drive composer PC tool.

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 the 64 most recent events. All indications are stored in the event logs with a time stamp and other information.

Auxiliary codes

Some events generate an auxiliary code that often helps in pinpointing the problem. The auxiliary code is displayed on the control panel together with the message. It is also stored in the event log details. In the Drive composer PC tool, the auxiliary code (if any) is shown in the event listing.

Factory data logger

The supply unit has a data logger that samples preselected values at 500-microsecond (default; see parameter 196.65 Factory data logger time level) intervals. 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 101.1 DC voltage, 101.9 Grid voltage, 101.21 Converter current %, 101.12 Power, 101.15 Reactive power %, 106.1 Main control word, 130.1 Limit word 1, 130.3 Limit word 3 and 106.11 Main status word. 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 control unit used with certain supply unit types (especially those with parallel-connected supply modules) contains a data logger that collects data from the supply modules to help fault tracing and analysis. The data is saved onto the SD memory card attached to the control 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 104.1…104.20.

Fault and warning words

With fault and warning words, it is possible to read status of multiple events simultaneously. 16-bit fault word 104.21 Fault word 1 shows activity of some predefined faults. 16-bit warning word 104.31 Warning word 1 shows activity of some predefined warnings. 16-bit event word 104.40 Event word 1 shows activity of user-configurable events. Each bit of 104.40 Event word 1 is configurable by event (basic) code, and optionally auxiliary code. If auxiliary code is set to zero, all auxiliary codes are accepted. Configuration of 104.40 Event word 1 is done by parameters 104.41…104.72.

Bits 3, 8 and 10 of 104.21 Fault word 1 can indicate several events as listed below. Also, bits 0 and 3 of 104.31 Warning word 1 can indicate several events as listed below. To use these bits, the user selects one of the codes listed below in that bit.

104.21 Fault word 1, bit 3 **Code and name**
CFE0 Power unit temperature • 2E04 IGBT overload • 4E02 IGBT temperature • 4E01 Cooling • 4E03 Excess temperature • 4E04 Excess temperature difference

104.21 Fault word 1, bit 8 **Code and name**
CFE1 Internal system fault • 6E03 Task overload • 6E04 Stack overflow • 6E05 Internal file load • 6E06 Internal record load • 6E07 Application loading • 6E09 Internal SSW fault • 6E0B Kernel overload • 6E15 Text data overflow • 6E16 Text 32-bit table overflow • 6E17 Text 64-bit table overflow • 6E18 Text file overflow • 6E1D Internal error

104.21 Fault word 1, bit 10 **Code and name**

CFE3 Field bus comm

- 7E0B FBA A communication
- 7E0C FBA B communication
- 7E11 DDCS controller comm loss

104.31 Warning word 1, bit 0

Code and name

CFE4 Field bus comm

- AE30 FBA A communication
- AE31 FBA B communication
- AE6D DDCS controller comm loss

104.31 Warning word 1, bit 3

Code and name

CFE2 Power unit temperature

- AE12 IGBT overtemperature
- AE13 Cooling
- AE14 Excess temperature
- AE15 Excess temperature difference
- AE16 IGBT temperature
- AE04 IGBT overload

Warning, fault and pure event messages

Code (hex)	Event name / Aux. code	Cause	What to do
2E00	Overcurrent	Output current has exceeded internal fault limit.	Check supply voltage. Check that there are no power factor correction capacitors or surge absorbers in supply cable. Check generatormotor load and acceleration times. Check power semiconductors (IGBTs) and current transducers. 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 phase that triggered the fault (**0**: No detailed information available, **1**: U-phase, **2**: V-phase, **4**: W-phase, **3**/**5**/**6**/**7**: multiple phases).
2E01	Earth leakage	IGBT supply unit has detected an earth fault. Programmable fault: 131.20 Earth fault	Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. If no earth fault can be detected, contact your local ABB representative.
2E02	Short circuit	IGBT supply unit has detected short circuit.	Check supply cable. Check there are no power factor correction capacitors or surge absorbers in supply cable. Check the 32-bit auxiliary code for the location of the short circuit (bit **0**: Upper branch of U-phase, bit **1**: Lower branch of U-phase, bit **2**: Upper branch of V-phase, bit **3**: Lower branch of V-phase, bit **4**: Upper branch of W-phase, bit **5**: Lower branch of W-phase, bits **6...7**: reserved, bits **8...19**: The channel number of the control unit from which the fault was received, bits **20...31**: reserved). For example, auxiliary code 0x0002A means lower branches of UVW phases. After correcting the cause of the fault, reboot the control unit (using parameter 196.8 Control board boot) or by cycling power.
2E04	IGBT overload	Excessive IGBT junction to case temperature.	Check the load.
2E05	BU current difference	Current difference detected by the branching unit (BU).	Check converter fuses. Check converter(s). Check inverter(s).

Code (hex)	Event name / Aux. code	Cause	What to do
			Check LCL filter. Power off all boards. If the fault persists, contact your local ABB representative. Check the auxiliary code (format XXXYYYZZ). “XXX” specifies the source of the first error (see “YYY”). “YYY” specifies the module through which control unit channel the fault was received (**001**: Channel 1, **002**: Channel 2, **004**: Channel 3, **008**: Channel 4, **010**: Channel 5, …, **800**: Channel 12, **other than exponent of 2**: combinations of multiple channels from the above. For example, 003 refers to channels 1 and 2.). "ZZ" indicates the phase (**01**: U, **02**: V, **03**: W).
2E06	BU earth leakage	Earth leakage detected by the branching unit: sum of all currents exceeds the level.	Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. If no earth fault can be detected, contact your local ABB representative.
2E08	Ext earth leakage	External earth fault trigged by input selected with parameter 131.28 Ext earth leakage signal source.	Check external earth fault source. Usually only one device is allowed in the same network.
2E09	DC short circuit	After closing the charging contactor, the voltage did not rise above 10% from nominal voltage in 0.2 seconds (can be set in service level), but the current rose above level set by parameter 120.22 Max current for MCB closing. There is a short-circuit in DC busbar.	Check DC busbar.
3E00	Supply phase loss	Input phase loss detected by the IGBT bridge.	Check the AC fuses. Check for input power supply imbalance.
3E02	Charge relay lost	No acknowledgement received from charge relay.	Contact your local ABB representative.
3E04	DC link overvoltage	Excessive intermediate circuit DC voltage.	Check that parameter 195.1 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)	Event name / Aux. code	Cause	What to do
3E05	DC link undervoltage	Intermediate circuit DC voltage is not sufficient because of a missing supply phase or blown fuse.	Check supply cabling, fuses and switchgear.
3E06	BU DC link difference	Difference in DC voltages between parallel-connected supply modules.	Check the DC fuses. Check the connection to the DC bus. If the problem persists, contact your local ABB representative. 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).
3E07	BU voltage difference	Difference in main voltages between parallel-connected supply modules.	Check the supply network connections. Check the AC fuses. If the problem persists, contact your local ABB representative.
3E08	LSU charging	DC link voltage is not high enough after charging.	Check mains supply and fuses. Check the event log for an auxiliary code. The auxiliary code identifies the event (see below). Check external charging tuning parameters 120.22…120.30. Check the connection from the relay output to the charging contactor. Check that the DC voltage measuring circuit is working correctly.
	1	Voltage rise is not acceptable.	Check parameter 120.26 Maximum dU/dt.
	2	DC voltage level is not acceptable.	Check supply connection. Check parameter 195.1 Supply voltage and parameter 120.25 MCB closing level.
	3	Charging current is too high.	Check parameter 120.22 Max current for MCB closing.
	4	Charging time is too high.	Check supply connections, voltage of power supply network and PSL2 link cable.
	5	After closing the charging contactor, the voltage did not rise above 10% from nominal voltage in 0.2 seconds (can be set in service level), and current was below the level set by parameter 120.22 Max current for MCB closing.	Check the supply connection, and power unit must be externally powered to measure voltage.
	8	Parameter 120.28 MCB relay timing is set too high. The DC voltage drops too low.	Check parameter 120.28 MCB relay timing.

Code (hex)	Event name / Aux. code	Cause	What to do
3E09	Charging count	There are too many DC link charging attempts.	Two attempts in five minutes is allowed to prevent charging circuit overheating.
3E0A	LSU charging busbar	The DC voltage rise in 10 ms is not acceptable during charging. The level is below the value set in parameter 120.26 Maximum dU/dt, but DC voltage has not reached the level set in parameter 120.25 MCB closing level.	Check the connections of the DC capacitors in the power modules and parameters 120.25 MCB closing level and 120.26 Maximum dU/dt. Check that the input voltage is stable during start.
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.
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 IGBT supply unit power.
4E03	Excess temperature	Power unit module temperature is excessive.	See AE19 Measurement circuit temperature (page 252).
4E04	Excess temperature difference	High temperature difference between the IGBTs of different phases. The amount of available temperatures depends on the frame size.	See AE15 Excess temperature difference (page 251).
4E06	Cabinet temperature	Overtemperature detected either in cabinet, LCL filter or auxiliary transformer. 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.	Check parameter 131.34 Cabinet temperature supervision. Check the temperature source of the cabinet, LCL filter and auxiliary transformer.
4E07	Control board temperature	Control board temperature is excessive.	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 258).
5E01	Auxiliary fan not running	Broken fan detected.	Replace the fan.
	1	Auxiliary fan 1 broken	Replace the fan 1.
	2	Auxiliary fan 2 broken	Replace the fan 2.
5E03	XSTO or X52 circuit open	Circuit connected to XSTO and/or X52 is open.	Check XSTO and X52 circuit connections.

Code (hex)	Event name / Aux. code	Cause	What to do
			Check the auxiliary code (format 0xXXXYZZZZ). XXX not in use. Y = 1 XSTO ACT (XSTO and X52 are both missing jumpers), ZZZZ is all zero Y = 2 XSTO 1 HW (XSTO IN1 or X52 is missing jumper), ZZZZ indicates the channel Y = 3 XSTO 2 HW (XSTO IN2 or X52 is missing jumper), ZZZZ indicates the channel Y = 4 not in use Y = 5 XSTO 1 loss (XSTO IN1 and X52 is missing jumper), ZZZZ is all zero Y = 6 XSTO 2 loss (XSTO IN2 and X52 is missing jumper), ZZZZ is all zero Restart the control unit to reset this fault.
5E04	PU logic error	Power unit memory has cleared.	Cycle the power to the supply unit. If the control unit is externally powered, also reboot the control unit (using parameter 196.8 Control board boot) or by cycling its power. If the problem persists, contact your local ABB representative.
5E05	Rating ID mismatch	The hardware of the supply 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 supply unit. If the control unit is externally powered, reboot the control unit (using parameter 196.8 Control board boot) or by cycling its power. Check the auxiliary code (format 0X0Y). “X” indicates the first faulty PU channel in hexadecimal (1…C) (With a ZCU control unit, “X” can be 1 or 2 but this is irrelevant to the fault). “Y” indicates the auxiliary code category. The auxiliary code categories are as follows: 1 = PU and CU ratings not the same. Rating ID has changed. 2 = Parallel connection rating ID has changed. 3 = PU types 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 PUs. 6 = PU rating ID is 0. 7 = Reading PU rating ID or PU type failed on PU connection. 8 = PU not supported (illegal rating ID).

Code (hex)	Event name / Aux. code	Cause	What to do
			9 = Incompatible module current rating (unit contains a module with too low a current rating). **A** - Selected parallel rating ID not found from database. With parallel connection faults (UCU control unit), the format of the auxiliary code is 0X0Y.
5E06	Main contactor	Control program does not receive main contactor on (1) acknowledgement through digital input even control program has closed the contactor control circuit with relay output. Main contactor / main breaker is not functioning properly, or there is a loose / bad connection.	Check main contactor / main breaker control circuit wiring. Check the status of other switches connected to contactor control circuit. See the delivery-specific circuit diagrams. Check main contactor operating voltage level (should be 230 V). Check digital input DI3 connections.
5E07	PU communication	The way the control unit is powered does not correspond to parameter setting. Communication errors detected between the control unit and the power unit.	Check setting of 195.4 Control board supply. 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.
5E0A	Measurement circuit ADC	Measurement circuit analog-to-digital converter fault.	Contact your local ABB representative, quoting the auxiliary code.
5E0B	PU board powerfail	Power unit power supply failure.	Check the auxiliary code (format ZZZY YYXX). “YY Y” specifies the affected module (**0...C**, always 0 for ZCU control units). “XX” specifies the affected power supply (**1**: Power supply 1, **2**: Power supply 2).

Code (hex)	Event name / Aux. code	Cause	What to do
5E0D	PU communication configuration	Version check cannot find a matching power unit FPGA logic, or number of connected power 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 196.8 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.
5E0E	Reduced run	Number of supply modules detected does not match the value of parameter 195.13 Reduced run mode, or the value of parameter 195.13 Reduced run mode indicates a configuration that is not possible (Examples: 5×R8i, that is not available, or the number of remaining modules is 1 in 195.13 in case the original number of modules is 3 (ie. two modules out of three are removed, which is not allowed)). See section Reduced run function (page 34).	Check that the value of 195.13 Reduced run mode, corresponds to the number of supply modules present. Check that the modules present are powered from the DC bus and connected by fiber optic cables to the control unit. If all modules of the supply unit are in fact available (eg. maintenance work has been completed), check that parameter 195.13 is set to 0 (reduced run function disabled).
5E0F	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
5E10	Charging feedback	• Charging feedback signal missing • Incorrect parameter setting • The charging switch and DC switch were operated out of sequence, or a start command was issued before the unit was ready.	• Check the feedback signal coming from the charging system. • Check the setting of parameter 195.9 Switch fuse controller. Enable the parameter only if an xSFC charging controller is installed. • The normal power-up sequence is: 1. Close charging switch. 2. After charging finishes (charging OK lamp lights), close DC switch.

Code (hex)	Event name / Aux. code	Cause	What to do
			3. Open charging switch.
5E11	Unknown PU fault	Unidentified power unit logic fault.	Check the logic and firmware compatibility. Contact your local ABB representative.
5E12	BAMU configuration	Error in configuration of BAMU unit.	Check the parameter settings of parameter group 191 BAMU configuration. Check the auxiliary code. Lower 16 bits show the fault details on BAMU unit settings and upper 16 bits show the configuration details (format 0xWXYZ). “W” indicates the BAMU unit in question (**1**: BAMU1, **2**: BAMU2). “X” specifies the type of BAMU unit (**2**: BAMU-12). “Y” specifies the BAMU channel (**1...12**). “Z” indicates the error type (**1**: False measurement range, **2**: False filtering configuration, **3**: Unsupported BAMU type, **4**: Module not found, **5**: Setting of parameter 191.42 U1 meas location when the optimal grid control functionality is enabled). Auxiliary code 0x0000: Wrong channel configuration.
5E13	Auxiliary Circuit breaker	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 drive.	See AE19 Measurement circuit temperature (page 252).
5E18	Charging contactor	Supply voltage is removed while the drive is running.	Reconnect the supply voltage.
5E1C	BAMU meas settings	Error in settings (parameters 191.40...191.43) of BAMU measurement unit.	Check the settings of parameters 191.40...191.43. Check the auxiliary code for details (**1**: Voltage U1 measurement location is not set (check parameter 191.42), **2**: Either voltage U2 measurement location is not set or voltage U1 measurement location is after U2 (check parameters 191.42 and 191.43), **3**: Transformer and circuit breaker are either not set or at the same location (check parameters 191.40 and 191.41), **4**: Voltage U1 measurement location 1 or selection Other is not allowed in this configuration (check parameter 191.42), **5**: Circuit breaker location B is not allowed in this configuration (check parameter 191.41), 6: Voltage U1 measurement is disabled (check parameter 191.1)).

Code (hex)	Event name / Aux. code	Cause	What to do
5EA1	SoC overtemperature	System on a chip (SoC) temperature is too high.	Check proper cooling of the drive.
6488	Restart after firmware malfunction	Firmware malfunction.	Reboot due to CPU error exception, watchdog bark, watchdog bite or unrecoverable DDR ECC error. If Drive composer tool is available, send a 'support package' (see Drive composer manual for instructions) to your local ABB representative.
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 196.8 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.	Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E04	Stack overflow	Internal fault.	Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E05	Internal file load	File read error.	Reboot the control unit (using parameter 196.8 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.	Check the auxiliary code. See actions for each code below.
	8006	Not enough memory for the application.	Reduce the size of the application. Reduce the number of parameter mappings. See the drive-specific log generated by Automation Builder.
	8007	The application contains the wrong library version.	Update the system library or reinstall Automation Builder. See the drive-specific log generated by Automation Builder.
	800A	The application contains an unknown target (system) library function.	Update the system library or reinstall Automation Builder.

Code (hex)	Event name / Aux. code	Cause	What to do
			See the drive-specific log generated by Automation Builder.
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 and its mounting screw is tight. Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E09	Internal SSW fault	Internal fault.	Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E0A	User Set Fault	Loading of user parameter set failed because • requested set does not exist • set is not compatible with control program • IGBT supply unit was switched off during loading.	Ensure that a valid user parameter set exists. Reload if uncertain.
6E0B	Kernel overload	Operating system error.	Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative.
6E0C	Parameter system	Parameter load or save failed.	Try forcing a save using parameter 196.7 Parameter save manually. Retry.
6E0D	FBA A parameter conflict	The supply 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 supply 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.
6E0F	EFB comm loss	The embedded fieldbus (EFB) interface has detected a communication loss.	Contact your local ABB representative.
6E10	EFB config file	Embedded fieldbus protocol is unable to access its config file.	Contact your local ABB representative.
6E11	EFB invalid parameterization	Invalid embedded fieldbus configuration.	Contact your local ABB representative.

Code (hex)	Event name / Aux. code	Cause	What to do
6E12	EFB load fault	Unable to load protocol firmware or version mismatch between protocol and system firmware.	Contact your local ABB representative.
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.
6E19	Synchronization fault	Synchronization to supply network has failed.	Monitor possible network transients.
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 drive 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	Drive has received an emergency stop command.	Check that it is safe to continue operation. Return the emergency stop pushbutton to normal position. Restart the drive.
6E1D	Internal SW error	Internal error.	Contact your local ABB representative. Quote the auxiliary code (check the event details in the event log).
6E1E	Unrecoverable SW Error	An unrecoverable error has occurred.	Record the fault code and the auxiliary fault code and report them to your local ABB representative. Cycle power to the unit to recover.
6E1F	Licensing fault	There are two types of licenses being used in ACS880 drives: licenses that need to be found from the unit which allow the firmware to be executed, and licenses that prevent the firmware from running.The license is indicated by the value of the auxiliary code field. The license is Nxxxx, where xxxx is indicated by the 4-digit value of the auxiliary code field.	Record the auxiliary codes of all active licensing faults and contact your product vendor for further instructions. This fault requires a reboot of the control unit either by switching the power off and on, or using parameter 196.8 Control board boot.
	8201	A restrictive license is found from the unit. The firmware on this supply unit cannot be executed because a Low harmonic license is found from the unit. This unit is meant to be used with IGBT supply control program (2Q) only.	Contact your product vendor for further instructions.
6E20	Fault reset	Fault reset has been requested and done.	Informative fault.
6E22	Internal SSW fault 2	Internal fault.	Reboot the control unit (using parameter 196.8 Control board boot) or by cycling power. If the problem

Code (hex)	Event name / Aux. code	Cause	What to do
			persists, contact your local ABB representative.
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 supply unit.
	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 supply unit.
	0011	Program too large.	Remove blocks until the error stops.
	0012	Program is empty.	Correct the program and download it to the supply unit.
	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, 0024	Program file incompatible with current firmware version.	Adapt the program to current block library and firmware version.
	002A	Too many blocks.	Edit the program to reduce the number of blocks.
	Other	–	Contact your local ABB representative, quoting the auxiliary code.
7E00	Encoder Option module comm loss	Communication between the supply unit and option module (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. Try to install 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	Cyclical communication between the supply unit and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost. Programmable fault: 150.2 FBA A comm loss func	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.

Code (hex)	Event name / Aux. code	Cause	What to do
7E0C	FBA B communication	Cyclical communication between supply 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.
7E0D	INU-LSU comm loss	DDCS communication between units is lost. Data update took longer than timeout defined with parameter 160.58 DDCS controller comm loss time.	Check the operation of optical fibers and FDCO adapters, and that they are connected correctly. Transmit to other end receive and vice versa. Both ends should be active.
7E10	Ext I/O comm loss	The I/O extension module types specified by parameters do not match the detected configuration.	Check the event log for an auxiliary code (format XXYY YYYY). “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 YYYY” indicates the problem (see actions for each code below).
	00 0001	Communication with module failed.	Check that the module is properly seated in its slot. Check that the module and the slot connector is not damaged. Try installing the module into another slot.
	00 0002	Module not found.	Check the type and location settings of the modules (parameters 114.1/114.2, 115.1/115.2 or 116.1/116.2). Check that the module is properly seated in its slot. Check that the module and the slot connector is not damaged. Try installing the module into another slot.
	00 0003	Configuration of module failed.	Check the type and location settings of the modules (parameters 114.1/114.2, 115.1/115.2 or 116.1/116.2). Check that the module is properly seated in its slot. Check that the module and the slot connector is not damaged. Try installing the module into another slot.
	00 0004	Configuration of module failed.	Check the type and location settings of the modules (parameters 114.1/114.2, 115.1/115.2 or 116.1/116.2). Check that the module is properly seated in its slot. Check that the module and the slot connector is not damaged.

Code (hex)	Event name / Aux. code	Cause	What to do
			Try installing the module into another slot.
7E11	DDCS controller comm loss	DDCS (fiber optic) communication between the supply unit and external controller is lost. Programmable fault: 160.59 DDCS controller comm loss function	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.
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.
8E07	Net lost	Net lost is detected. Duration of net lost is too long.	Check AC grid supply and investigate reason for net lost.
9E01	External fault 1	Fault in external device 1. (This information is configured through one of programmable digital inputs.)	Check external devices for faults. Check the setting of parameter 131.1 External event 1 source.
9E02	External fault 2	Fault in external device 2. (This information is configured through one of programmable digital inputs.)	Check external devices for faults. Check the setting of parameter 131.3 External event 2 source.
9E03	External fault 3	Fault in external device 3. (This information is configured through one of programmable digital inputs.)	Check external devices for faults. Check the setting of parameter 131.5 External event 3 source.
9E04	External fault 4	Fault in external device 4. (This information is configured through one of programmable digital inputs.)	Check external devices for faults. Check the setting of parameter 131.7 External event 4 source.
9E05	External fault 5	Fault in external device 5. (This information is configured through one of programmable digital inputs.)	Check external devices for faults. Check the setting of parameter 131.9 External event 5 source.
A799	Ext I/O comm loss	The I/O extension module types specified by parameters do not match the detected configuration.	See 7E10 Ext I/O comm loss (page 248).
A8C3	Low LCL-filter capacitance	Estimated LCL filter capacitance has decreased below limit.	See the auxiliary codes below.
	1	The minimum capacitance is less than 80% of the maximum.	Check the condition of the LCL filter capacitor.
	2	There is more than 30% difference between LCL filter capacitance used by control and the estimated value,	Verify the parametrized LCL filter capacitance.

Code (hex)	Event name / Aux. code	Cause	What to do
		indicating that the user-given capacitance is probably wrong.	
AE00	Current calibration	Current offset and gain measurement calibration will occur at next start.	Informative warning.
AE01	Overcurrent	Output current has exceeded internal fault limit.	Check supply voltage. Check that there are no power factor correction capacitors or surge absorbers in supply cable. Check motor load and acceleration times. Check power semiconductors (IGBTs) and current transducers. Check the auxiliary code (format XXXY YYZZ). With parallel-connected supply modules, “Y YY” specifies through which control unit channel the fault was received. “ZZ” indicates the phase that triggered the fault (**0**: No detailed information available, **1**: U-phase, **2**: V-phase, **4**: W-phase, **3**/**5**/**6**/**7**: multiple phases).
AE02	Earth leakage	IGBT supply has detected load unbalance.	Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. Check the auxiliary code (format XXXY YYZZ, where “Y YY” is the module channel number starting from 1). With parallel-connected modules, “Y YY” specifies through which control unit channel the fault was received.
AE03	Short circuit	IGBT supply has detected short circuit.	Check supply cable. Check there are no power factor correction capacitors or surge absorbers in supply cable.
AE04	IGBT overload	Excessive IGBT junction to case temperature.	Check supply cable.
AE05	BU current difference	Current difference detected by the branching unit (BU).	Check converter fuses. Check converter(s). Check inverter(s). Check LCL filter.
AE06	BU earth leakage	Earth leakage detected by the branching unit: sum of all currents exceeds the level.	Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable.

Code (hex)	Event name / Aux. code	Cause	What to do
AE09	DC link overvoltage	Excessive intermediate circuit DC voltage. **Note:** This warning can be shown only when the IGBT supply unit is not modulating.	Check that parameter 195.1 Supply voltage is set according to the supply voltage in use.
AE0A	DC link undervoltage	Intermediate circuit DC voltage is not sufficient due to missing phase in supply voltage, blown fuse or rectifier bridge internal fault. **Note:** This warning can be shown only when the IGBT supply unit is not modulating.	Check supply and fuses.
AE0B	DC not charged	The voltage of the intermediate DC circuit has not yet risen to operating level.	Check the input voltage setting in parameter 195.1 Supply voltage. Check the input voltage. If the problem persists, contact your local ABB representative.
AE0C	BU DC link difference	DC link voltage difference detected by the branching unit.	Check DC fuses. Check converter module connections to DC link.
AE0D	BU voltage difference	Main voltage difference detected by the branching unit.	Check AC fuses. Check supply cable.
AE0E	Incorrect temperature sensor setup	Sensor type mismatch or faulty wiring between an encoder interface module and the temperature sensor.	Check the wiring of the sensor. The auxiliary code (see the event log) identifies the interface module. (0 = Module 1, 1 = Module 2).
AE10	Ext Tmp1 warning	External temperature 1 warning detected by Pt100 sensor.	Check parameters 130.50 Ext Tmp1 input selection and 130.52 Ext Tmp1. Check wiring of Pt100 sensor.
AE11	Ext Tmp2 warning	External temperature 2 warning detected by Pt100 sensor.	Check parameters 130.51 Ext Tmp2 input selection and 130.53 Ext Tmp2. Check wiring of Pt100 sensor.
AE14	Excess temperature	Power unit temperature is excessive.	See AE19 Measurement circuit temperature (page 252).
AE15	Excess temperature difference	High temperature difference between the IGBTs of different phases.	Check the cabling. 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”

Code (hex)	Event name / Aux. code	Cause	What to do
			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 IGBT supply unit power.
AE17	PU communication	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 (**8**: Transmission errors in PSL link [see “XXX”], **9**: Transmitter FIFO warning limit hit). “XXX” specifies the transmission error direction and detailed warning code (**0**: Rx/communication error, **1**: Tx/Reed-Solomon symbol error, **2**: Tx/no synchronization error, **3**: Tx/Reed-Solomon decoder failures, **4**: Tx/Manchester coding errors).
AE18	Safe torque off	Circuit connected to XSTO:IN1 and/or XSTO:IN2 is open.	Check XSTO circuit connections. See section Default I/O diagram of the supply control unit (page 48). For more information, see appropriate hardware manual.
AE19	Measurement circuit temperature	Problem with internal temperature measurement of the drive.	Check the auxiliary code (format XXXY YYZZ). “Y YY” specifies through which control unit channel the fault was received (“0 00” with a ZCU control unit). “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.
AE1D	Measurement circuit DFF	Problem with current or voltage measurement of the power unit.	Contact your local ABB representative.

Code (hex)	Event name / Aux. code	Cause	What to do
AE1E	PU state feedback	State feedback from output phases does not match control signals.	Contact your local ABB representative.
AE1F	Charging feedback	Charging feedback signal missing.	Check the feedback signal coming from the charging system.
AE21	Flash erase speed exceeded	The flash memory (in the memory unit) has been erased too frequently, compromising the lifetime of the memory.	Avoid forcing unnecessary parameter saves by parameter 196.7 or cyclic parameter writes (such as user logger triggering through parameters). Check the auxiliary code (format XYYY YZZZ). “X” specifies the source of warning (**1**: generic flash erase supervision). “ZZZ” specifies the flash subsector number that generated the warning.
AE24	Supply voltage unselected	The supply voltage range has not been defined.	Define the supply voltage range (parameter 195.1 Supply voltage).
AE25	FBA A parameter conflict	The supply 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 supply 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.	Adjust either the jumper setting (on the control unit) or parameter 112.15/112.25. **Note:** Control board reboot (either by cycling the power or through parameter 196.8 Control board boot) is required to validate any changes in the jumper 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.

Code (hex)	Event name / Aux. code	Cause	What to do
			Note: Control board reboot (either by cycling the power or through parameter 196.8 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 114.1, 114.2, 115.1, 115.2, 116.1 and 116.2). Check that the modules are properly installed.
AE30	FBA A communication	Cyclical communication between the supply 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	FBA B communication	Cyclical communication between supply 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.
AE32	EFB comm loss	The embedded fieldbus (EFB) interface has detected a communication loss.	Contact your local ABB representative.
AE3E	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.
AE40	Output relay warning	Warning generated by an edge counter. Programmable warnings: 133.35 Edge count 1 warn sel 133.45 Edge count 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 2: 133.33 Edge count 1 src 3: 133.43 Edge count 2 src.
AE41	Supply unit starts warning	Warning generated by an edge counter. Programmable warnings: 133.35 Edge count 1 warn sel 133.45 Edge count 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 2: 133.33 Edge count 1 src 3: 133.43 Edge count 2 src.

Code (hex)	Event name / Aux. code	Cause	What to do
AE42	Power ups warning	Warning generated by an edge counter. Programmable warnings: 133.35 Edge count 1 warn sel 133.45 Edge count 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 2: 133.33 Edge count 1 src 3: 133.43 Edge count 2 src.
AE43	Main contactor warning	Warning generated by an edge counter. Programmable warnings: 133.35 Edge count 1 warn sel 133.45 Edge count 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 2: 133.33 Edge count 1 src 3: 133.43 Edge count 2 src.
AE44	DC charge warning	Warning generated by an edge counter. Programmable warnings: 133.35 Edge count 1 warn sel 133.45 Edge count 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 2: 133.33 Edge count 1 src 3: 133.43 Edge count 2 src.
AE45	On-Time 1 warning	Warning generated by on-time timer 1.	Check the source of the warning (parameter 133.13 On-time 1 src).
AE46	On-Time 2 warning	Warning generated by on-time timer 2.	Check the source of the warning (parameter 133.23 On-time 2 src).
AE47	Edge counter 1 warning	Warning generated by edge counter 1.	Check the source of the warning (parameter 133.33 Edge count 1 src).
AE48	Edge counter 2 warning	Warning generated by edge counter 2.	Check the source of the warning (parameter 133.43 Edge count 2 src).
AE49	Value integrator 1 warning	Warning generated by value counter 1.	Check the source of the warning (parameter 133.53 Value count 1 src).
AE4A	Value integrator 2 warning	Warning generated by value counter 2.	Check the source of the warning (parameter 133.63 Value count 2 src).
AE4B	Device clean warning	Warning generated by an on-time timer. Programmable warnings: 133.14 On-time 1 warn sel 133.24 On-time 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 0: 133.13 On-time 1 src 1: 133.23 On-time 2 src 10: 105.4 Main fan on-time counter.
AE4C	DC capacitor warning	Warning generated by an on-time timer. Programmable warnings: 133.14 On-time 1 warn sel 133.24 On-time 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 0: 133.13 On-time 1 src 1: 133.23 On-time 2 src 10: 105.4 Main fan on-time counter.
AE4D	Cabinet fan warning	Warning generated by an on-time timer. Programmable warnings: 133.14 On-time 1 warn sel 133.24 On-time 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 0: 133.13 On-time 1 src 1: 133.23 On-time 2 src 10: 105.4 Main fan on-time counter.
AE4E	Cooling fan warning	Warning generated by an on-time timer. Programmable warnings: 133.14 On-time 1 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 0: 133.13 On-time 1 src

Code (hex)	Event name / Aux. code	Cause	What to do
		133.24 On-time 2 warn sel	1: 133.23 On-time 2 src 10: 105.4 Main fan on-time counter.
AE4F	Additional cooling fan warning	Warning generated by an on-time timer. Programmable warnings: 133.14 On-time 1 warn sel 133.24 On-time 2 warn sel	Check the event log for an auxiliary code. Check the source of the warning corresponding to the code: 0: 133.13 On-time 1 src 1: 133.23 On-time 2 src 10: 105.4 Main fan on-time counter.
AE51	External warning 1	Warning generated by external device 1. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.1 External event 1 source.
AE52	External warning 2	Warning generated by external device 2. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.3 External event 2 source.
AE53	External warning 3	Warning generated by external device 3. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.5 External event 3 source.
AE54	External warning 4	Warning generated by external device 4. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.7 External event 4 source.
AE55	External warning 5	Warning generated by external device 5. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.9 External event 5 source.
AE56	INU-LSU comm loss	DDCS (fiber optic) communication between converters (for example, the inverter unit and the supply unit) is lost.	Check settings of parameter group 160 DDCS communication. Check the corresponding settings in the control program of the other converter. Check the cable connections. If necessary, replace the cables.
AE57	Autoreset	A fault is about to be autoreset.	Informative warning. See the settings in parameter group 131 Fault functions.
AE58	Emergency stop (off2)	IGBT supply 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 IGBT supply unit.
AE59	Emergency stop (off1 or off3)	IGBT supply unit has received an emergency stop (mode selection off1 or off3) command.	Check that it is safe to continue operation. Return emergency stop push button to normal position. Restart the IGBT supply unit.
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.

Code (hex)	Event name / Aux. code	Cause	What to do
AE5B	Run enable missing	No run enable signal is received.	Check setting of parameter 120.12 Run enable 1 source. Switch signal on (e.g. in the fieldbus Control Word) or check wiring of selected source.
AE5C	xCU redundant supply missing	External power feedback signal is missing. The feedback differs from the parameter setting.	Check parameter 195.4 Control board supply.
AE5F	Temperature Warning	Supply module temperature is excessive due to eg, module overload or fan failure.	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 supply module for dust pick-up. Clean whenever necessary.
AE60	Control board temperature	Control board temperature is excessive.	Check the auxiliary code. See actions for each code below.
	(none)	Temperature above the warning limit.	Check the ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up.
	1	Thermistor broken.	Contact an ABB service representative for control unit replacement.
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.
AE68	Emergency stop	Emergency stop warning is activated.	Check that it is safe to continue operation.
AE6D	DDCS controller comm loss	DDCS (fiber optic) communication between the supply unit and external controller is lost. Programmable fault: 160.59 DDCS controller comm loss function	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	Contact your local ABB representative.

Code (hex)	Event name / Aux. code	Cause	What to do
		duplicated measurements that is outside the limits.	
AE73	Fan	Cooling fan is 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**, always 0 for ZCU control units). “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.	Check the auxiliary code. See actions for each code below.
	1	No SD card	Insert a compatible, writable SD card into the SD CARD slot of the control unit.
	2	SD card write-protected	Insert a compatible, writable SD card into the SD CARD slot of the control unit.
	3	SD card unreadable	Insert a compatible, writable SD card into the SD CARD slot of the control unit.
AE78	Net lost	Net lost is detected.	Check AC grid supply and investigate reason for momentary net lost.
AE79	Power fail saving	Power fail saving is requested too frequently. Due to the limited saving interval some of the requests do not trigger the saving and power fail data may be lost. This may be caused by DC voltage oscillation.	Check the supply voltage.
AE7A	Invalid BAMU configuration	BAMU measurements for used charging logic are not configured.	Enable and configure external measurements in parameter group 191 BAMU configuration.
AE80	Auxiliary fan not running	Auxiliary fan is not connected or it is broken.	Check the auxiliary fan connection or replace the fan.
AE81	M/F communication loss	Master/follower communication is lost.	Check the auxiliary code. The code indicates which node address (defined by parameter 160.2 in each supply unit) on the master/follower link is affected.

Code (hex)	Event name / Aux. code	Cause	What to do
			Check settings of parameter group 160 DDCS communication. On the FDCO module (if present), check that the DDCS link switch is not set to 0 (OFF). Check the cable connections. If necessary, replace the cables.
AE82	Follower drive failure	A follower drive has tripped.	Check the auxiliary code. Add 2 to the code to find out the node address of the faulted unit. Correct the fault in the follower drive.
AE84	Fan service counter	A cooling fan has reached the end of its estimated lifetime.	Check the auxiliary code. The code indicates which fan is to be replaced. **0**: Main cooling fan **1**: Auxiliary cooling fan **2**: Auxiliary cooling fan 2 **3**: Cabinet cooling fan **4**: PCB compartment fan Refer to the hardware manual of the drive for fan replacement instructions.
AE85	Charging count	There are too many DC link charging attempts.	Two attempts in five minutes is allowed to prevent charging circuit overheating.
AE87	Ext earth leakage	External earth fault trigged by input selected with parameter 131.28 Ext earth leakage signal source.	Check external earth fault source. Usually only one device is allowed in the same network. Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. If no earth fault can be detected, contact your local ABB representative.
AE88	Parameter map configuration	Too much data in parameter mapping table created in Drive customizer.	See Drive customizer PC tool user's manual (3AUA0000104167 [English]).
AE8A	User lock open	The user lock is open, ie. user lock configuration parameters 196.100…196.102 are visible.	Close the user lock by entering an invalid pass code in parameter 196.2 Pass code. See section User lock (page 44).
AE8B	User pass code not confirmed	A new user pass code has been entered in parameter 196.100 but not confirmed in 196.101.	Confirm the new pass code by entering the same code in 196.101. To cancel, close the user lock without confirming the new code. See section User lock (page 44).
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.

Code (hex)	Event name / Aux. code	Cause	What to do
AEA0	Phase order	Supply unit has detected that phase order differs from expected.	Make sure that all direct-on-line fans in filters and power units are rotating in correct direction. This warning can be suppressed by using parameter 131.40.
BE02	MCB maintenance	Main circuit breaker has worked 70000 times and it should be maintained according to the maintenance plan.	Maintain the main circuit breaker.
BE03	External pure event 1	Pure event generated by external device 1. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.1 External event 1 source.
BE04	External pure event 2	Pure event generated by external device 2. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.3 External event 2 source.
BE05	External pure event 3	Pure event generated by external device 3. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.5 External event 3 source.
BE06	External pure event 4	Pure event generated by external device 4. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.7 External event 4 source.
BE07	External pure event 5	Pure event generated by external device 5. (This information is configured through one of programmable digital inputs.)	Check external devices. Check the setting of parameter 131.9 External event 5 source.
BE08	Power up	The IGBT supply unit has been powered up. Programmable event: 196.39 Power up event logging	Informative event.
BE09	SSW internal diagnostics	Control unit rebooted unexpectedly.	Informative event.
BE0B	SW internal information	Software is gathering information.	Informative event.
D000	Memory unit	There are problems with external memory device.	Contact your local ABB representative.
FE06	M/F communication loss	Master/follower communication is lost.	See AE81 M/F communication loss (page 258).
FE07	Follower drive failure	A follower has tripped.	Check the auxiliary code. Add 2 to the code to find out the node address of the faulted unit. Correct the fault in the follower.

8

Fieldbus control through the embedded fieldbus interface (EFB)

This feature is not supported by the current firmware version.

9

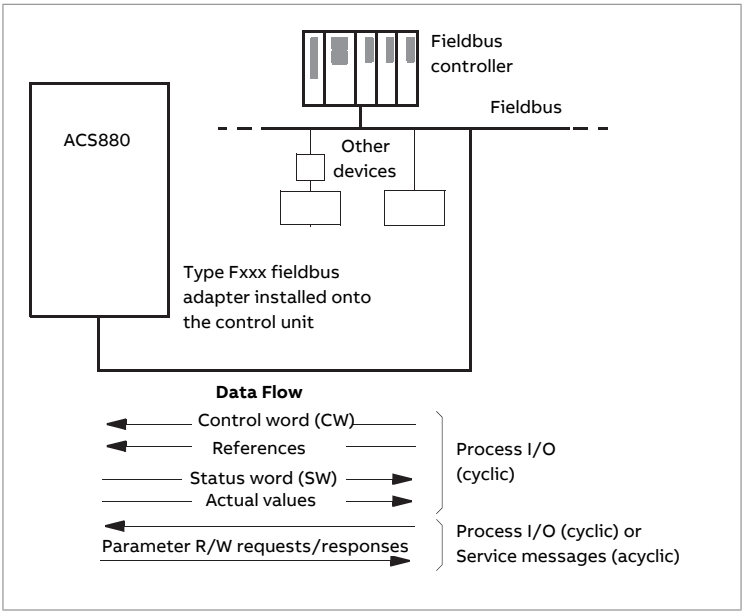
Fieldbus control through a fieldbus adapter

What this chapter contains

This chapter describes how the IGBT supply 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 IGBT supply unit through a fieldbus interface if the unit is equipped with an optional fieldbus adapter (for example, option +K454). Then the supply unit can be connected to an external control system through a serial communication link. The fieldbus adapter can be installed into any free option slot of the control unit.



The supply unit can be set to receive all of 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 150.1…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/-21 Ethernet adapter module user's manual (3AUA0000093568 [English]).

Basics of the fieldbus control interface

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

Data transmitted from the IGBT supply unit to the fieldbus controller is defined by parameters 152.1 FBA A data in1 … 152.12 FBA A data in12. The data transmitted from the fieldbus controller to the IGBT supply unit is defined by parameters 153.1 FBA data out1 … 153.12 FBA data out12.

Control word and Status word

The Control word is the principal means for controlling the IGBT supply unit from a fieldbus system. It is sent by the fieldbus master station to the IGBT supply unit through the adapter module. The IGBT supply 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 269 and 271 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 IGBT supply unit controlled through the fieldbus, the module must be defined as the source for control information, e.g. Reference.

If parameter 150.12 FBA A debug mode 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 Transparent 16 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 146.1…146.4.

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 146.1 Power scaling.

Example for PROFIBUS®:

146.4 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

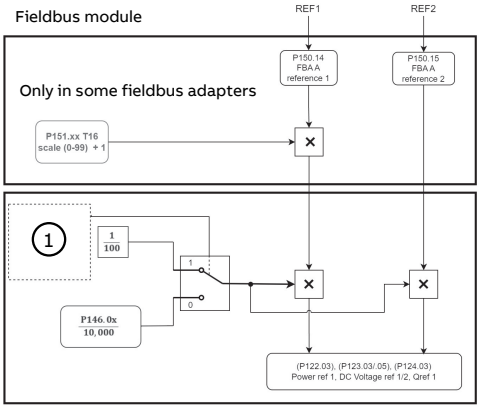
Actual values are 16-bit words containing information on the operation of the IGBT supply unit. The types of the monitored signals are selected by parameters 150.7 FBA A actual 1 type and 150.8 FBA A actual 2 type.

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.

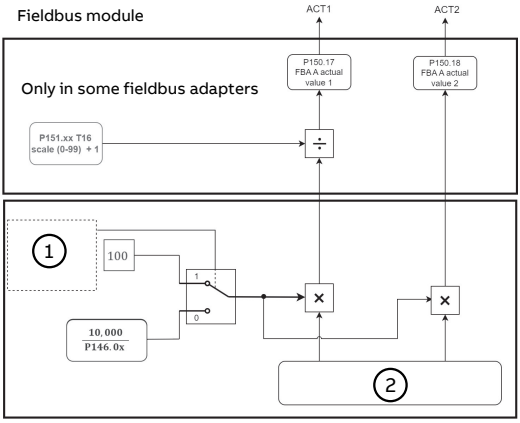
Fieldbus scaling diagram

The diagram below shows the fieldbus scaling principle.

Fieldbus reference values scaling diagram



Fieldbus actual values scaling diagram



1	1 = 150.04/05 FBA A ref1/2 type set to 'General' 0 = 'DC voltage', 'Active power' or 'Reactive power'
2	Actual values from parameter group 101. Eg. (P101.01), (P101.12), (P101.14) DC voltage, Active power, Reactive power

Notes:

- 'General' type limits the range of what the FBA A/B actual value 1/2 can display. The actual value is a 16-bit integer with range -32,768 to 32,767. Since 'General' always multiplies the raw value by 100, the raw values it can display are limited to -327 to 327.
- In P146.0x, x can be:
  - (146.01) 1 = Power scaling when Operation mode is Power control
  - (146.04) 4 = DC voltage scaling when Operation mode is DC control

Contents of the fieldbus Control word

Bit	Name	Value	Description
0	On/Off	1	Start charging. **Note:** This bit affects only in external charge mode, ie. when the parameter 120.30 External charge enable is set to Yes. In internal change mode charging is handled automatically.
		0	Open main contactor (switch power off).
1	Off2	1	Emergency stop bit 2
		0	Open main contactor
2	Off3	1	Emergency stop bit 3
		0	Open main contactor
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	1	Fault reset (0 -> 1) if an active fault exists. Enter switch-on inhibited.
		0	Continue normal operation.
8	-	1	Not in use
		0	Not in use
9	-	1	Not in use
		0	Not in use
10	Remote cmd	1	Fieldbus control enabled.
		0	Fieldbus control disabled (some bits still operate, eg. Reset).

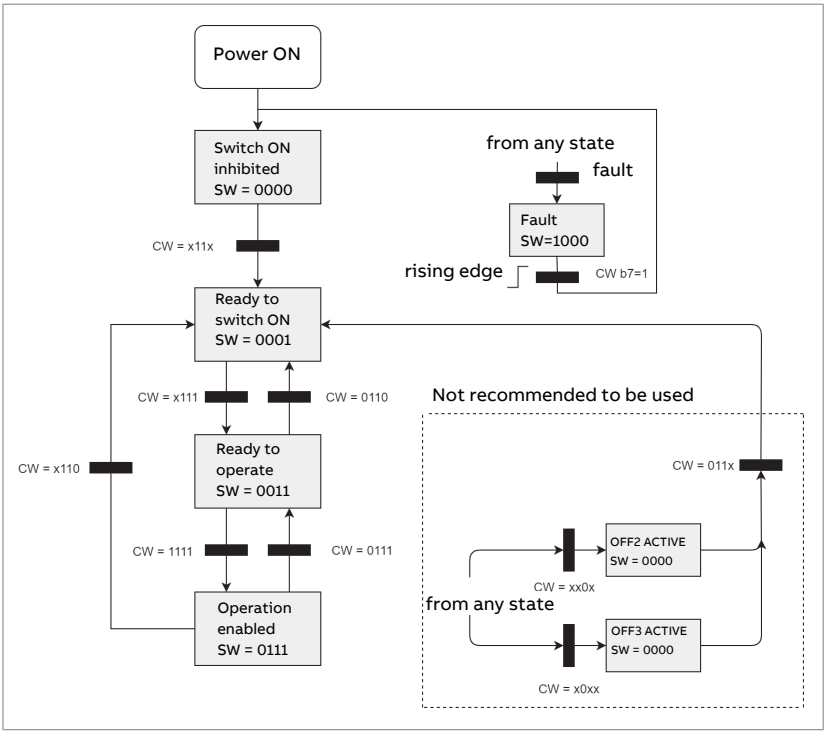
Bit	Name	Value	Description
11	Ext ctrl loc	1	Select External Control Location EXT2. Effective if control location is parameterized to be selected from fieldbus.
		0	Select External Control Location EXT1. Effective if control location is parameterized to be selected from fieldbus.
12	User bit 0	1	User 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	STATE/Description
0	Ready to switch ON	1	Ready to switch on.
		0	Not ready to switch on.
1	Ready run	1	Ready to operate, DC link charged.
		0	Not ready to operate, DC link not charged.
2	Ready ref	1	Operation enabled.
		0	Operation inhibited.
3	Tripped	1	Fault
		0	No fault
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	Warning active.
		0	No warning active.
8	Modulating	1	Converter is modulating.
		0	Converter is not modulating.
9	Remote	1	Fieldbus control enabled.
		0	Fieldbus control disabled (some bits still operate, eg. Reset).
10	Net OK	1	Network voltage is OK (Ready ref = operation is enabled).
		0	Network voltage is lost (Ready ref = operation is inhibited).
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.

Bit	Name	Value	STATE/Description
14	Charging	1	Charging contactor closed.
		0	Charging contactor open.
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



State	Status word (bits 0…3)	Description
Switch ON inhibited	0000	ISU interlocking prevents charging.
Ready to switch ON	0001	Main contactor open. No active interlocking that would prevent charging.
Ready to operate	0011	DC link charged. Not modulating.
Operation enabled	0111	Charged and modulating. Also when diode mode is active.
Fault	1000	Modulation stopped and main contactor opened.

Note: Main control word bit 10 (Remote cmd) must be set to 1 for the commands to take effect. Setting Main control word bit 10 (Remote cmd) to 0 stops the supply unit when controlled via fieldbus.

Setting up the IGBT supply unit for fieldbus control

Before configuring the IGBT supply 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 main contactor and the IGBT supply unit on and off through the fieldbus, the Run enable command at the digital input DI2 (by default) must be on (1).

1. Power up the IGBT supply unit.
2. Enable the communication between the IGBT supply unit and the fieldbus adapter module by setting the parameter 150.1 FBA A enable.
3. With 150.2 FBA A comm loss func, select how the IGBT supply 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 IGBT supply unit.

4. With 150.3 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 adapter, set parameter 151.05 Profile to mode Trans16.

7. Define the process data transferred to and from the IGBT supply 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 152.1 and 153.1 respectively.

8. Save the valid parameter values to permanent memory by setting parameter 196.7 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 120.1 Ext1 commands to Fieldbus A.

11. Set the relevant control parameters to control the IGBT supply unit according to the application.

Setting up communication through inverter unit

Communication port is selected with parameter 60.71 INU-LSU communication port in inverter unit and with parameter 160.51 DDCS controller comm port in IGBT supply unit. Connect fiber optic cables between inverter unit and IGBT supply unit. Typically RDCO CH1 is used in inverter unit and RDCO CH0 is used in IGBT supply unit when UCU control unit is in use. When ZCU control unit is used, eg. channel A on FDCO module in slot 3 is used in IGBT supply unit. Setting the parameter 195.20 HW options word 1 bit 11 to Yes automatically sets all the communication parameters to their right values.

Set the parameters as follows:

IGBT supply unit parameter	Setting
120.1 Ext1 commands	DDCS controller
120.2 Ext1 start trigger type	Level
160.58 DDCS controller comm loss time	Set time, eg. 4 ms.
160.51 DDCS controller comm port	Set port to be used. Eg, slot 3A is used with ZCU control unit, and RDCO CH0 is used with UCU control unit.
161.51 Data set 11 data 1 selection	SW 16bit
162.51 Data set 10 data 1 selection	CW 16bit

Inverter unit parameter	Setting
94.01 LSU control	On
60.71 INU-LSU communication port	RDCO CH1
61.151 INU-LSU data set 10 data 1 sel	LSU CW
62.151 INU-LSU data set 11 data 1 sel	LSU SW

In IGBT supply unit, data transmitted from the IGBT supply unit is defined with parameters 161.51 Data set 11 data 1 selection…161.53 Data set 11 data 3 selection. Data is received using parameters 162.51 Data set 10 data 1 selection…162.53 Data set 10 data 3 selection.

In inverter unit, data transmitted to the IGBT supply unit is defined with parameters 61.151…61.153. Data is received using parameters 62.151…62.153.

10

Drive-to-drive link

This feature is not supported by the current firmware version.

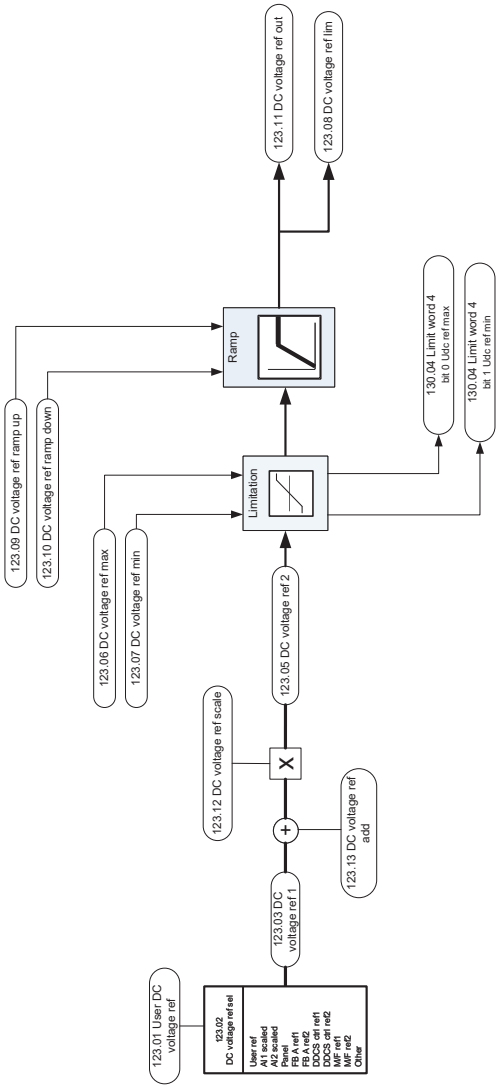
11

Control chain diagrams

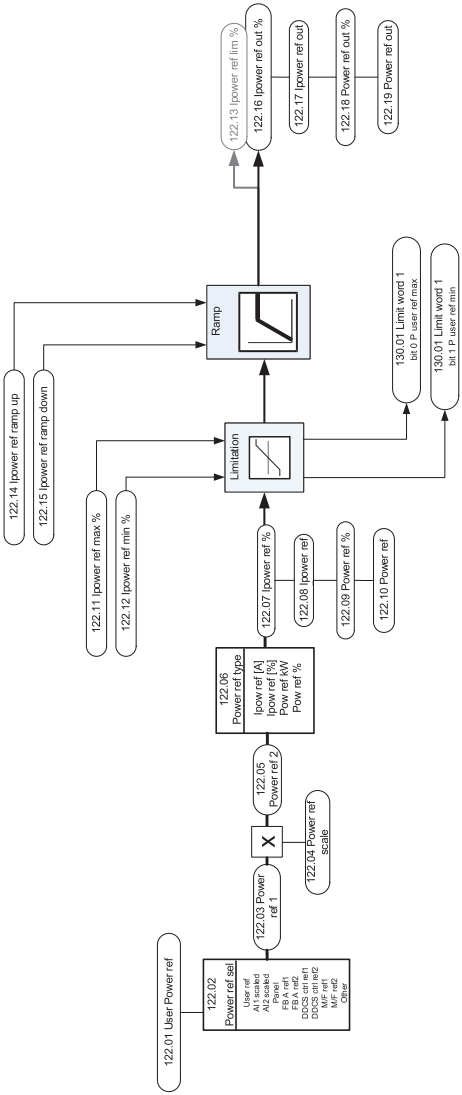
What this chapter contains

The chapter presents the control chain diagrams of the control program.

DC voltage reference chain

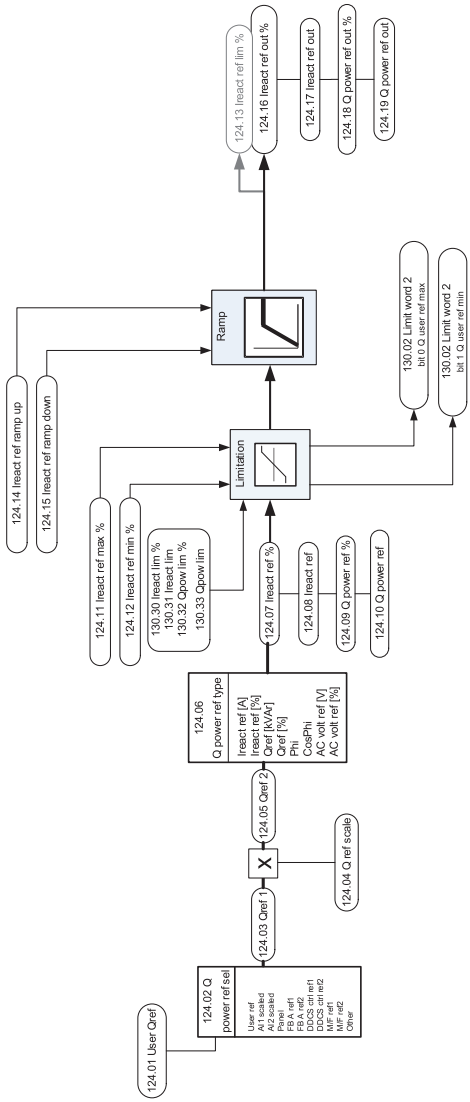


Power reference chain



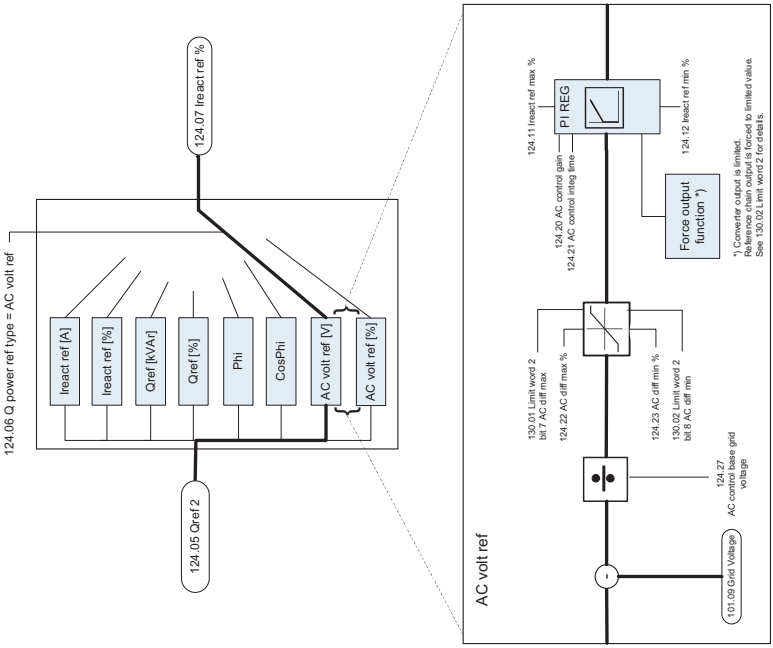
Reactive power reference chain

Reactive power control overview

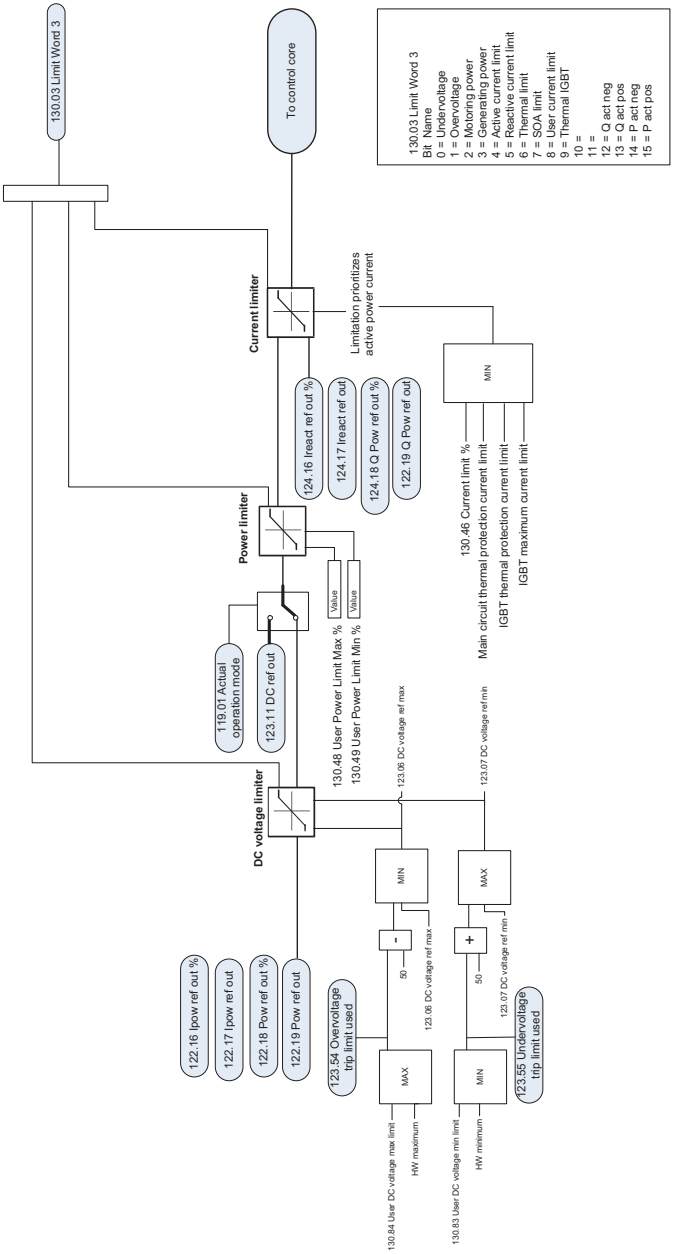


Reactive power control detail – Processing of the reference type AC voltage

This diagram is a detail of Reactive power control overview (page 282). It illustrates the conversion of the reference type AC voltage to the reactive current reference.



Current limitation chain



12

Usage of open source code and third party dependencies

Certain open source software components may be used as identified below.

Fast Fourier Transform library (KISS FFT)

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