

Firmware manual

PVS800-57B central inverters



List of related manuals

Hardware manuals and guides	Code (English)
<i>PVS800-57B central inverters hardware manual</i>	3AXD50000048300
<hr/>	
Firmware manuals and guides	
<i>PVS800-57B central inverters firmware manual</i>	3AXD50000048332
<hr/>	
Option manuals and guides	
<i>PVS800-57B central inverters commissioning and maintenance manual</i>	3AXD50000048331
<i>ACX-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>Drive composer Start-up and maintenance PC tool User's manual</i>	3AUA0000094606
<i>Cybersecurity for ABB drives Technical guide</i>	3AXD10000492137
<i>Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.</i>	

Firmware manual

PVS800-57B central inverters

3AXD50000048332 Rev A

© 2017 ABB Oy. All Rights Reserved.

EN
EFFECTIVE: 2017-07-13

Table of contents

List of related manuals	2
List of figures in program features	9
1. Introduction to this manual	
Contents of this chapter	11
Applicability	11
Safety instructions	11
Target audience	12
Contents of the manual	12
Terms and abbreviations	12
Related documents	12
Cybersecurity disclaimer	13
2. Using the control panel	
.....	15
3. Program features	
Contents of this chapter	17
Product overview	17
Operational description	18
Inverter start/stop	19
Inverter operation	19
Transfer trip	19
Shutdown	19
Control interfaces	19
Control panel	19
Fieldbus	19
Grid code settings	20
Preset grid codes	20
Customizing grid code settings	20
Grid monitoring	21
Nominal values	21
Connection delays	21
Connection limits	22
Voltage monitoring	22
Sliding overvoltage	23
Frequency monitoring	23
Combinatory limit	24
Rate of change of frequency	24
Anti-islanding	24
External grid monitoring relay	25
Fault ride-through tripping curve	25
Grid support	27
Reactive power control	30
Q(U) control curve	31
Q(P) control curve	32
cos phi(P) control curve	33

Power prioritization	33
Night Q production	34
Active power limitations	36
External active power limit	36
Flat-top limit	36
Limitation after grid connection and after grid fault	36
Limitation based on grid voltage	37
Limitation based on grid frequency	39
Power gradient	40
DC input current monitoring (available with G417 option)	42
Overcurrent detection	42
Reverse current detection	42
Current deviation detection	42
Blown fuse detection	43
Temperature control	44
Temperature measurements	44
Temperature based grid current limitation	44
Temperature based operation inhibits	45
Thermal protection switches	45
Fan control	45
Grounding and insulation resistance monitoring	47
Insulation resistance measurement	47
Grounding state machine	48
Status information	51
State machines	51
Status words	51
Power production status	51
Disconnection status	52
Customer external faults	52
MV station monitoring and control	53
Digital inputs	53
Analog inputs	54
Digital output	55
DC input monitor	56
DC input voltage monitor	56
DC current monitor	56
User lock	57

4. Parameters

Contents of this chapter	59
Terms and abbreviations	59
Summary of parameter groups	61
Parameter listing	63
101 Actual values	63
104 Warnings and faults	64
107 System info	65
110 Standard DI, RO	66
114 Extension I/O module 1	66
115 Extension I/O module 2	67
116 Extension I/O module 3	67
119 Operation mode	68
121 Fast power off	69
123 DC voltage reference	69

124 Reactive power reference	70
125 FRT support curve	74
126 FRT tripping curve	78
130 Limits	80
132 Autoreset	84
135 Grid monitoring	85
147 Data storage	93
149 Panel port communication	97
150 FBA	97
151 FBA A settings	104
152 FBA A data in	107
153 FBA A data out	107
154 FBA B settings	108
155 FBA B data in	110
156 FBA B data out	110
164 SCADA configuration	111
165 SCADA data in	111
166 SCADA data out	112
173 Inverter status	112
174 DC input current monitor	115
176 Customer IOs	121
177 MV Station	124
184 Energy metering	132
185 Health monitoring	133
189 Inverter control	134
190 External measurements	136
195 HW configuration	138
196 System	140
202 Fan control	144
204 PLC Extension Inputs	145
205 PLC Extension Outputs	150
207 Thermal limitation	151
208 DC input monitor	152
210 Grounding supervision	153
211 Temperatures	157
213 Wake-up monitor	159
214 Switch control	161

5. Troubleshooting

Contents of this chapter	163
Reset a fault	163
Event history	164
Event logs	164
Fault messages generated by inverter	165
Fault messages	165
Warning messages generated by the inverter	178

6. Communication interfaces

Contents of this chapter	191
System overview	191
Connecting inverter to communication or fieldbus network	192
Setting up the inverter for fieldbus control	193

Accessing inverter parameters	194
-------------------------------------	-----

7. Tools

Contents of this chapter	195
Drive loader 2	195
Drive composer entry	195
Drive composer pro	195

Further information

List of figures in program features

PVS800-57B inverter operational states	18
Voltage monitoring timing diagram	22
Frequency monitoring timing diagram	23
Low-voltage ride-through (LVRT) tripping curve	25
High-voltage ride-through (HVRT) tripping curve	26
Grid support current curve	28
Q(U) control curve	31
Q(P) control curve	32
cos phi (P) control curve	33
Night Q production curve	34
Night Q mode to power generation mode transition curve	35
After grid connection and after grid fault limitation curve	36
Constant P(U) limitation	37
Droop P(U) limitation curve	38
Incremental P(f) limitation curve	39
Free running P(f) limitation curve	40
Power gradient: Active power ramp curve	40
Power gradient: Shut down ramp curve	41
Grounding state machine controls	49
Inverter output current limitation curve	54

1

Introduction to this manual

Contents of this chapter

This chapter describes the contents of the manual. It also contains information on the applicability of the manual, safety instructions, target audience, related documents, terms, and abbreviations.

Applicability

This manual is applicable to PVS800-57B central inverters with control program version 1.41 or later (see parameter [107.05 Firmware ver](#)).

Safety instructions

Follow all safety instructions delivered with the inverter.

- Read the complete safety instructions before you install, commission, or use the inverter. Complete safety instructions are given at the beginning of the hardware manual.
- Read the software function specific warnings and notes before changing the default settings of the function. These warnings and notes are presented together with the parameter descriptions wherever appropriate.
- Read the task specific safety instructions before starting the task. These safety instructions are presented together with the procedure wherever appropriate.

Target audience

This manual is intended for people who commission, adjust the parameters of, or operate, monitor or troubleshoot PVS800-57B central inverters.

The reader is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

Contents of the manual

The chapters of this manual are briefly described below.

- *Introduction to this manual* (this chapter).
- *Using the control panel* (page 15) gives instructions for using the control panel.
- *Program features* (page 17) describes the firmware features of the PVS800-57B.
- *Parameters* (page 59) describes the parameters of the control program.
- *Troubleshooting* (page 163) lists all alarm and fault messages with possible causes and corrective actions.
- *Communication interfaces* (page 191) describes the menu structure of the PVS800-57B inverter user interface.
- *Tools* (page 195) describes the PC tools that can be used with PVS800-57B inverter.

Terms and abbreviations

Term	Definition
BAMU	Auxiliary measuring unit
BCU	Type of control unit.
DDCS	Serial communication protocol used in ABB inverters
Drive Composer	PC tool for operating, controlling, and monitoring ABB inverters
FCI	Fieldbus communication interface for the ABB S800 I/O system
FENA	Ethernet and Modbus TCP adapter module (optional)
LCL	Passive line filter
MPPT	Maximum power point tracking. An inverter firmware function that automatically operates the photovoltaic generator, array, string, or module at its maximum power point.
NETA	Ethernet adapter module (optional)
MGND board	Grounding monitoring board
RAM	Random-access memory

Related documents

See section [List of related manuals](#) on the inside of front cover.

Cybersecurity disclaimer

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

2

Using the control panel

The PVS800-57B uses the common control panel with drives. Refer to ACX-AP-x assistant control panels user's manual ([3AUA0000085685](#)) [English]).

3

Program features

Contents of this chapter

This chapter describes program features. For each feature there is a list of related parameters, faults, and alarms, if applicable.

Product overview

The PVS800-57B is a central inverter for converting, adjusting, and conveying power generated by a solar generator to the electrical power system.

See features listed below:

Feature	See page	Feature	See page
<i>Operational description</i>	18	<i>DC input current monitoring (available with G417 option)</i>	42
<i>Inverter start/stop</i>	19	<i>Temperature control</i>	44
<i>Control interfaces</i>	19	<i>Grounding and insulation resistance monitoring</i>	47
<i>Grid code settings</i>	20	<i>Status information</i>	51
<i>Grid monitoring</i>	21	<i>Customer external faults</i>	52
<i>Grid support</i>	27	<i>MV station monitoring and control</i>	53
<i>Reactive power control</i>	30	<i>DC input monitor</i>	56
<i>Night Q production</i>	34	<i>User lock</i>	57
<i>Active power limitations</i>	36		

Operational description

PVS800-57B inverter operation follows the state machine described below.

Standby – inverter is not enabled.

Initialize – inverter initializes the internal systems and performs self-tests.

Disconnected – inverter waits for permission to connect to the grid.

Connecting – inverter performs DC voltage and grid stability tests.

MPPT – is the normal operational state during power generation.

Standby or Night Q production – When the DC power level from panels is low, the inverter is in this state depending on the night mode settings (parameter [213.51 Night Q production](#)).

Disconnecting – disconnects the grid.

Initialize – If inverter is not enabled or if fault occurs, inverter enters this state and waits to be reset.

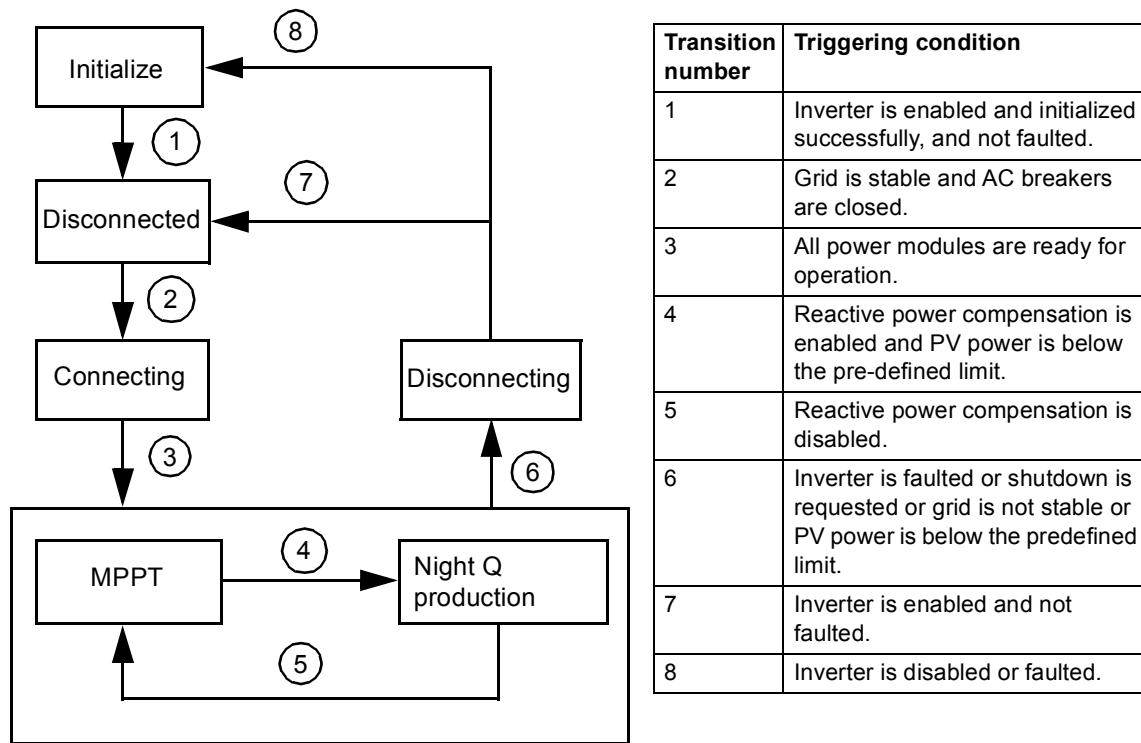


Figure 1. PVS800-57B inverter operational states

Inverter start/stop

Inverter operation

The parameter [189.01 Inverter operation](#) can be used to shut down the inverter in a controlled way and to disable autonomous operation. In addition to shut down, inverter operation also sets the main state machine to the initial state and also affects grid monitoring delays. Grid monitoring delays are restarted after enabling the operation.

Note: Software update is possible only if inverter operation is disabled.

Transfer trip

The Transfer trip function allows to remotely shutdown the inverter as fast as possible. The parameter [189.04 SCADA transfer trip](#) can be written by, e.g., SCADA systems. In addition, the IO signal can be used to signal the inverter to shut down. The input that is the source for the transfer trip signal can be selected with parameter [189.03 IO transfer trip source](#) signal.

When transfer trip is triggered an event can be generated. The generated event depends on the action selected by parameter [189.05 Transfer trip event](#).

Shutdown

The inverter can be signaled to shutdown in a controlled way using an IO signal. The parameter [189.06 IO shutdown source](#) can be used to select which input is the source for the stop signal. In addition, parameter [189.07 SCADA shutdown](#) can be used to signal the inverter to shut down.

When shutdown is requested, an event can be generated. The generated event depends on the action selected by parameter [189.08 Shutdown event](#).

Settings

Parameter group: [189 Inverter control](#)

Control interfaces

Control panel

The control unit of the inverter can be monitored and controlled locally from a single ACS-AP-I assistant control panel.

Fieldbus

The inverter can be connected to several automation systems through fieldbus interfaces. For information on how to control/monitor the inverter through an external control system, see [Communication interfaces](#) on page 191.

Settings

Parameter groups: [151 FBA A settings](#), and [154 FBA B settings](#).

Grid code settings

■ Preset grid codes

The inverter has preset grid code settings for numerous installation countries. The installation grid is set with parameter [135.01 Grid code](#). Pre-defined grid codes can be seen from the parameter list.

Note: New pre-defined grid codes may be added in every software version. This may cause the pre-defined grid code list to be outdated in this manual. The inverter will not operate without a valid grid code setting.

When a grid code is selected, all the necessary parameter settings are set to match the grid requirements. The grid code settings affect parameters in the following groups: [125 FRT support curve](#), [126 FRT tripping curve](#), [130 Limits](#) and [135 Grid monitoring](#). The parameters include, e.g., tripping limits for under- and overvoltage and under- and overfrequency, initial connection delays, a variety of reconnection delays, anti-islanding settings, fault ride-through settings, power limitation settings, and MPPT recovery settings. Usually the grid code is not changed during the lifetime of the inverter.

If you need to change the grid code, note that changing the parameter [135.01 Grid code](#) always overrides manual changes performed on the above-mentioned parameter groups.

The ready-made parameter settings that are installed by the selected grid code can be modified according to the local requirements after the grid code is set. See more details in the *Customizing grid code settings* section below.

■ Customizing grid code settings

To change the grid code-related parameter settings (parameters in groups [125 FRT support curve](#), [126 FRT tripping curve](#), [130 Limits](#) and [135 Grid monitoring](#)), follow this procedure:

Disable the inverter

1. Enter the **Parameter** menu.
2. Select [189.01 Inverter operation](#) and press **Edit**.
3. Change the value from **Enable** to **Disable** and press **Save**. After a short period, the inverter stops running and it is possible to change the parameter values.

Customize settings

1. Enter the parameter list: **Menu - Parameters - Complete list**.
2. Check that you have set a grid code with parameter [135.01 Grid code](#).
3. Make required changes to the parameters in groups: [125 FRT support curve](#), [126 FRT tripping curve](#), [130 Limits](#) and [135 Grid monitoring](#).

Enable the inverter and save the parameter changes to permanent memory

1. Select [189.01 Inverter operation](#) to **Enable**.
2. Save parameter values by setting the parameter [196.07 Param save](#).

Settings

Parameters: [135.01 Grid code](#), [189.01 Inverter operation](#)

Grid monitoring

The inverter monitors grid conditions with internal measurements. The measured frequency and voltages are compared against the limits set in parameter group [135 Grid monitoring](#). If the measured values do not stay within the limit for a certain minimum period of time, the inverter declares the grid as unstable and disconnects from the grid and inhibits grid connection.

There are two types of grid monitoring limits: normal limit and connection limit.

Normal limit – is always active and can declare the grid unstable at anytime.

Connection limit – is active when the inverter is not connected to the grid. Typically connection limit is stricter than normal limit.

All grid monitoring limits can be enabled independently. Grid monitoring and fault ride-through are parallel features. They can both be enabled or disabled separately.

Note:

- All grid monitoring settings are reset when the grid code is changed.
- Depending on the installation grid, an external third party-certified grid monitoring relay may be needed.

■ Nominal values

Note: Consider the fault ride-through settings when defining grid monitoring limits.

The inverter monitors the line-to-line voltages. The settings for grid monitoring can be set in relation to nominal values.

Settings

Parameters: [135.02 Nominal LL voltage](#), [135.04 Nominal frequency](#)

■ Connection delays

Typically, it is required that the grid must be stable for a time period before connection to the grid is allowed. For this purpose there is a set of delays.

- [135.10 Initial connection delay](#) must expire before the first grid connection attempt can be made after a power-up.
- [135.11 Reconnection delay](#) defines the delay that must expire after a disconnection before the following reconnection can be made.
- [135.13 Quick reconnection delay](#) is used if the grid is unstable for less than the time defined in parameter [135.12 Quick disturbance limit](#). Thus a short unstable grid allows a faster reconnection. If parameter [135.12](#) is set to **0**, quick reconnection is not used.

Settings

Parameters: [135.10...135.13](#)

■ Connection limits

The inverter's grid monitoring function includes a connection condition check that is active when the inverter is attempting to connect to the grid. Typically, grid connection limits are more stringent than grid disconnection limits. Connection limits may also be referred to as "cut-in" conditions. There are connection limits for underfrequency, overfrequency, overvoltage, and undervoltage. Each phase/main voltage is independently monitored. The connection limits can be disabled, enabled only for the first connection, or enabled also for reconnections.

Settings

Parameters: [135.20...135.27](#)

■ Voltage monitoring

There are four limits for undervoltage monitoring and four limits for overvoltage monitoring. Each limit has an enable parameter, a limit parameter, and a time parameter.

When the limit is enabled and the measured value exceeds the limit for the duration of the time parameter, the grid is declared as unstable. All limit checks are logically connected in parallel. Each phase/main voltage is independently monitored.

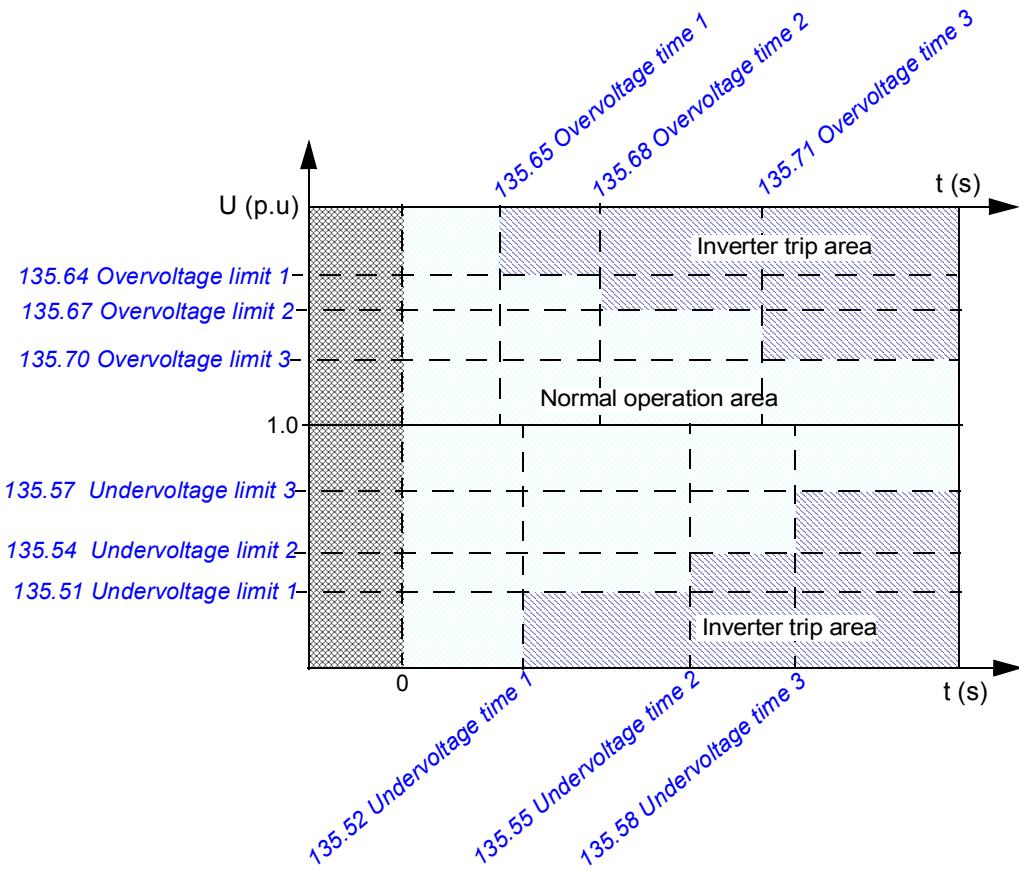


Figure 2. Voltage monitoring timing diagram

Settings

Parameters: [135.50 Undervoltage enable 1...135.74 Overvoltage time 4](#)

Sliding overvoltage

Sliding overvoltage implements monitoring for a slowly rising AC voltage. A ten minute average value is calculated and compared against the limit. Each phase/main voltage is independently monitored. The duration for the tolerated overvoltage situation can be set with parameter [135.77 Sliding overvoltage time](#).

Settings

Parameters: [135.75 Sliding overvoltage enable](#), [135.76 Sliding overvoltage limit](#), [135.77 Sliding overvoltage time](#)

Frequency monitoring

There are six limits for underfrequency and four limits for overfrequency monitoring. All limits have an enable parameter, limit parameter, and time parameter. When limit is enabled and measured value exceeds the limit for a duration of the time parameter, the grid is declared as unstable. All limit checks are logically connected in parallel.

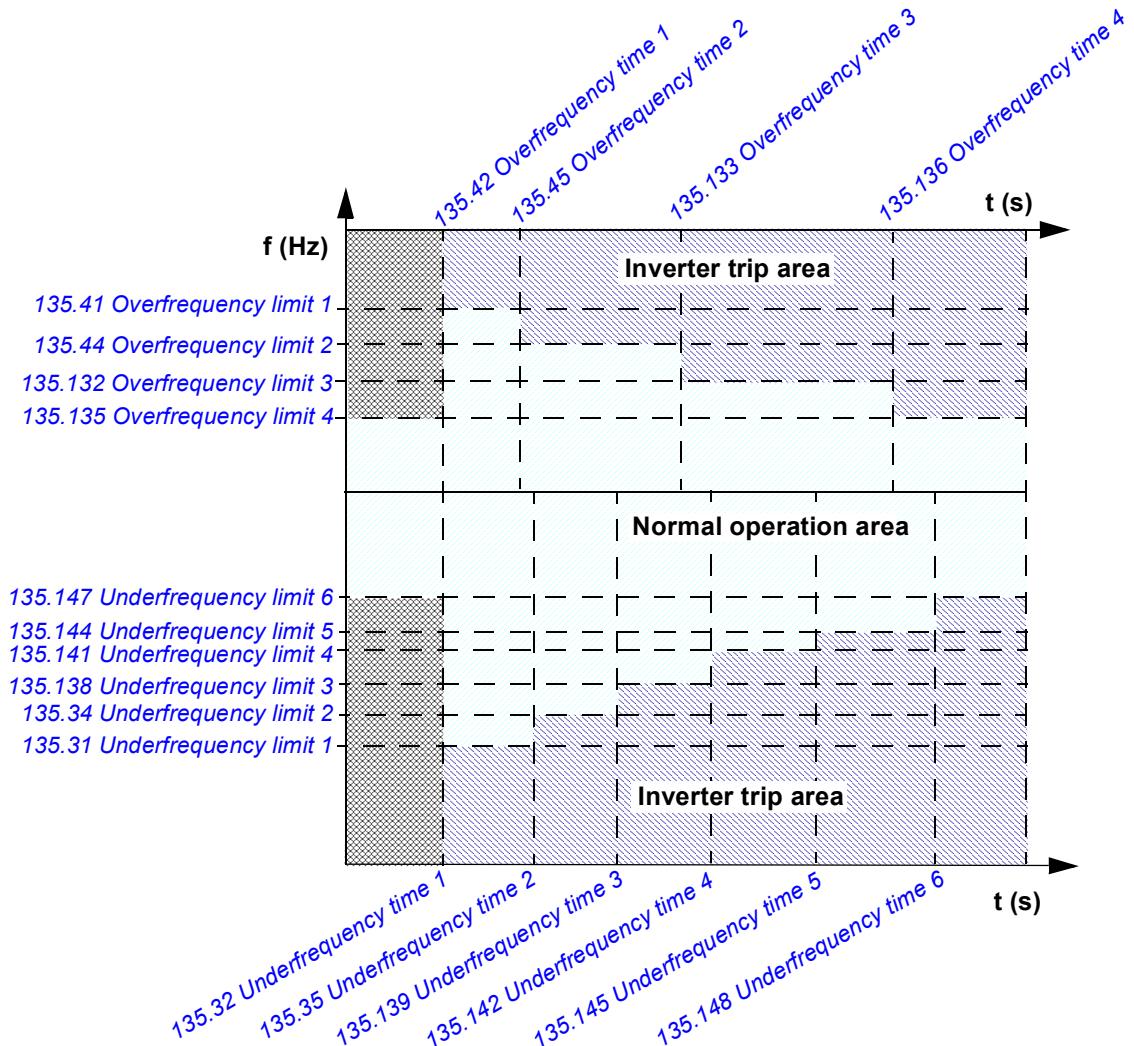


Figure 3. Frequency monitoring timing diagram

Settings

Parameters: [135.30 Underfrequency enable 1](#)...[135.45 Overfrequency time 2](#) and [135.131 Overfrequency enable 3](#)...[135.148 Underfrequency time 4](#)

Combinatory limit

Combinatory limit monitors grid voltage and frequency simultaneously. There are limits for the positive sequence and the negative sequence of grid voltage, and limits for underfrequency and overfrequency.

The grid is declared as unstable, if

- the negative sequence voltage and the frequency are outside their limits, or
- the positive sequence voltage and the frequency are outside their limits.

If either of the conditions is true for the time defined by parameter [135.81 Combinatory trip time](#), the grid is declared as unstable and the inverter disconnects from the grid.

Settings

Parameters: [135.80 Combinatory trip](#), [135.81 Combinatory trip time](#), [135.84 Comb pos seq voltage limit](#), [135.85 Comb neg seq voltage limit](#), [135.86 Comb underfrequency limit](#), [135.87 Comb overfrequency limit](#)

Rate of change of frequency

The grid frequency rate of change (RoCoF) has enable and limit parameters. If it is enabled and the limits are exceeded, the inverter disconnects from the grid.

Settings

Parameters: [135.110 Rate of change of freq enable](#), [135.111 Rate of change of freq limit](#)

Anti-islanding

The inverter Anti-islanding function prevents an island situation in an electrical grid. An island in a grid is a situation in which a generator powers part of the grid even though the power from the utility grid is cut off. Islanding can be dangerous to people working on the grid and not realizing that the circuit is still powered. For that reason, distributed power generators such as solar inverters must detect an island situation and immediately stop feeding power to the grid.

In a typical case when a part of the grid is islanded, the voltage and/or frequency of the islanded part changes rapidly, and thus the island can be detected using voltage and/or frequency limits. However, the worst-case scenario of an island situation is when the load of the islanded grid part matches the energy production and this is when the limit based voltage and/or frequency island detection method may fail. To also detect the worst-case balanced load island situation, the active frequency shift based method can be used in the inverter. The active method forces the voltage and/or frequency to rapidly change even in the balanced load island situation. The island detection voltage and/or frequency limits will then be exceeded causing the inverter to stop energy production.

The detection limits of the function can be configured using parameters which are preset so that relevant grid-dependent requirements are fulfilled.

The Anti-islanding function can be enabled or disabled with parameter [135.100 Anti-islanding](#).

The inverter also supports an external transfer trip signal through SCADA or I/O.

Settings

Parameters: [135.100...135.108](#)

External grid monitoring relay

Depending on the installation, an external third party-certified grid monitoring relay may be used. If an external relay is used, loose limits for grid monitoring should be set. The recommended setting for the overvoltage monitoring limit is 130 %. The limit for undervoltage monitoring should be set below the external relay setting.

The inverter can use external grid monitoring through the parameter [135.16 External trip](#) that can be written, e.g., by fieldbus. If this parameter has a value of 1, external grid monitoring indicates an unstable grid.

Settings

Parameter: [135.16 External trip](#)

Fault ride-through tripping curve

The fault ride-through (FRT) tripping curve function is an extra undervoltage and overvoltage tripping function. The function programs a curve where the inverter disconnects from the grid. The grid codes define the inverter behavior during a grid fault. Typically, they specify the following:

- how long a dip can last for
- how long a swell can last for
- how to behave with symmetrical voltage dips and peaks
- how to behave with asymmetrical voltage dips and peaks.

There are two different cases of FRT function:

- Low-voltage ride-through (LVRT), see page [25](#) and
- High-voltage ride-through (HVRT), see page [26](#).

The FRT function can be enabled with parameter [126.01 FRT enable](#).

Low-voltage ride-through (LVRT) tripping curve

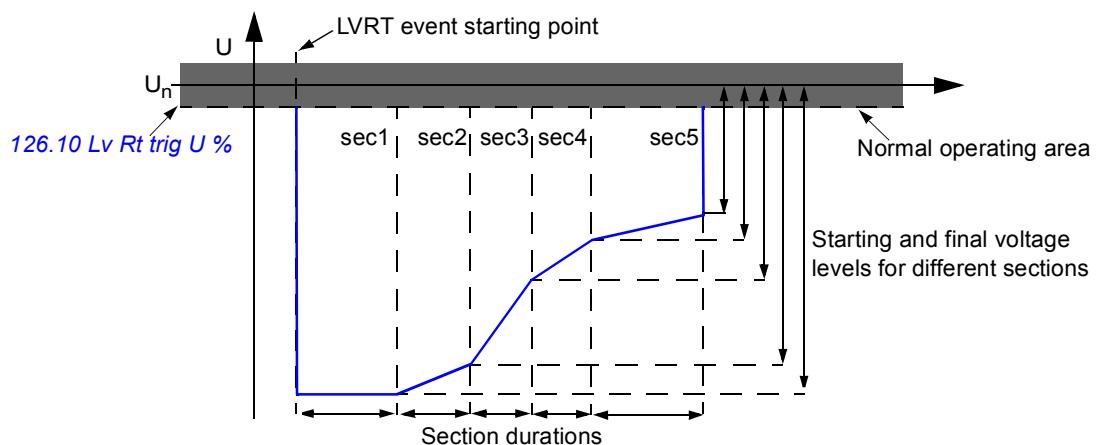


Figure 4. Low-voltage ride-through (LVRT) tripping curve

If the grid voltage drops below the low-voltage ride-through triggering level defined by parameter [126.10 Lv Rt trig U %](#), the inverter indicates a grid warning. If the grid transient lasts longer than the voltage dependent time defined by parameters [126.12 Lv Rt sec 1 time](#) ... [126.28 Lv Rt ext U %](#), the inverter trips. Otherwise the inverter operates normally without interruptions after the LVRT event has ended.

After the LVRT event, the MPPT of the inverter starts generating power according to the voltage level present. A fast recovery function can be enabled with parameter [178.03 Fast recovery](#). This enables a rapid recovery of the DC link voltage from the open circuit voltage to the voltage that was present before the LVRT. The ramp for the function can be set with parameter [178.41 Recovery ramp](#). These parameters are set by the grid code.

The LVRT tripping curve is defined using five temporal sections. Each section is parametrically defined by duration, starting, and final voltage level. These parameters exist in the parameter group [126 FRT tripping curve](#). The figure below shows an example of the LVRT tripping curve. When the voltage remains above the line defined by the five sections, the inverter stays connected to the grid; otherwise the inverter stops operation.

The voltage comparisons are defined using parameters [126.02 Lv Rt symm sig...](#) [126.03 Lv Rt asymm sig](#). The asymmetric limit can be set with parameter [126.06 Asymm/symm limit](#).

Note: Consider the grid monitoring settings when defining LVRT settings.

Settings

Parameter groups: [126 FRT tripping curve](#), [178 MPPT settings](#)

High-voltage ride-through (HVRT) tripping curve

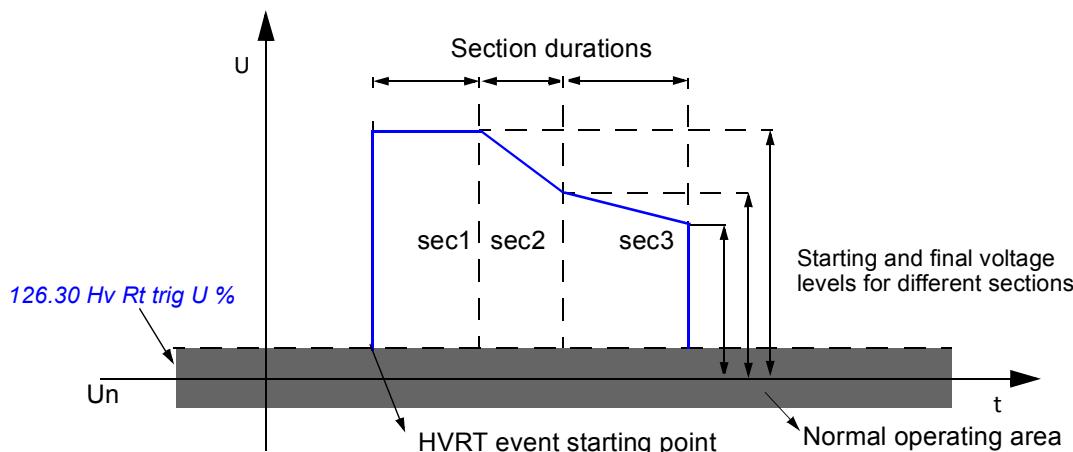


Figure 5. High-voltage ride-through (HVRT) tripping curve

If the grid voltage rises above the high-voltage ride-through (HVRT) triggering level defined by parameter [126.30 Hv Rt trig U %](#), the inverter indicates a grid warning. If the grid transient lasts longer than the voltage dependent time defined by parameters [126.32 Hv Rt sec 1 time...](#) [126.42 Hv Rt S3 end U %](#), the inverter trips. Otherwise the inverter operates normally without interruptions after the HVRT event has ended.

The HVRT tripping curve is defined using three temporal sections. Each section is parametrically defined by duration, starting, and final voltage level (See group [126 FRT tripping curve](#)). The figure below shows an example of the HVRT tripping curve. When the voltage remains below the line defined by the three sections, the inverter stays connected to the grid; otherwise the inverter stops operation.

The voltage comparisons are defined using parameters [126.04 Hv Rt symm sig](#) and [126.05 Hv Rt asymm sig](#). The asymmetric limit can be set with parameter [126.06 Asymm/symm limit](#).

Settings

Parameter group [126 FRT tripping curve](#)

Grid support

Grid support allows injecting capacitive or inductive current to the grid. This function supports grid voltage during a voltage peak. Typically, the amount of reactive current depends on the grid voltage level. Different grid codes demand different grid support functionalities and are defined by parameter settings. The grid support reactive power reference overrides the normal reactive power reference.

Note: The parameter settings are preset according to the grid code.

Triggering grid support

Grid support activates when the voltage drops below the low trigger level [125.04 Lv Gs trig U %](#) or rises above the high trigger level [125.18 Hv Gs trig U %](#). The actual voltage that is compared against the trigger level can be selected separately for symmetric and asymmetric faults with parameters [125.02 Gs symm sig](#) and [125.03 Gs asymm sig](#), respectively. The asymmetric limit is set with parameter [126.06 Asymm/symm limit](#) as a ratio of negative and positive sequence grid voltages.

Trigger voltages are relative to a reference voltage and are set to either nominal voltage or to a pre-fault 60 second average voltage. The reference voltage is selected using parameter [125.51 Gs reference voltage](#). If the selection is Nominal voltage, then the selected actual voltage is compared against the nominal value. However, a typical no-fault voltage can vary from one connection point to another. This can be taken into account by setting the reference voltage to a 60 s average. The averaged voltage is selected with parameter [125.52 Gs average voltage](#) and this value is then used as a reference voltage. In practice this means that if the pre-fault voltage is 110 % and the trigger is set to 90 %, grid support is triggered at $110 - (100 - 90) = 100$ % of nominal voltage, where the difference is between nominal voltage and trigger voltage.

Grid support current

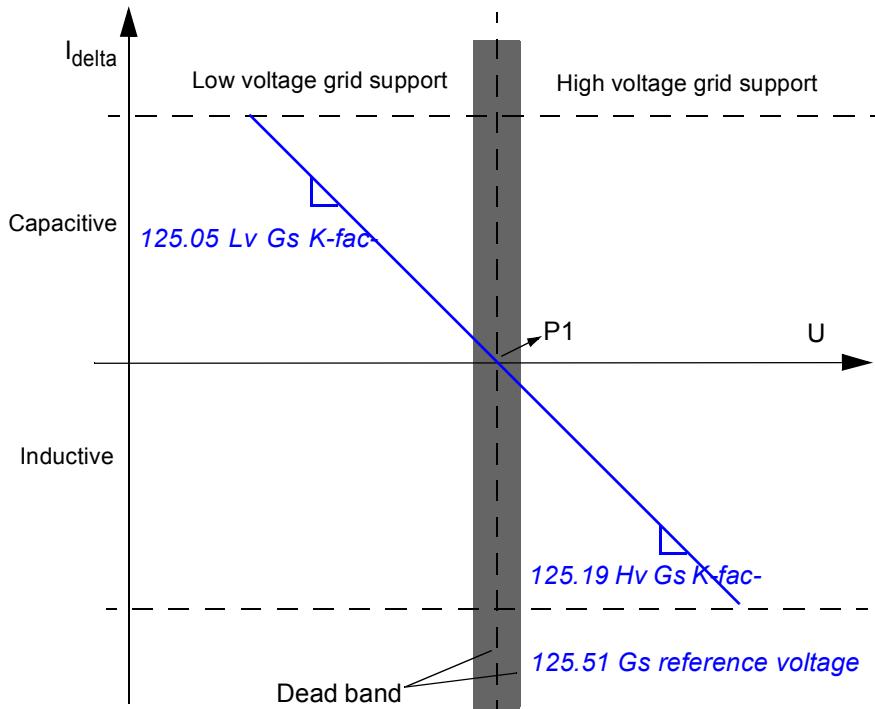


Figure 6. Grid support current curve

During a grid fault, the injected reactive current comprises of a base part, I_{base} , and an additional grid support part, I_{delta} . The base part can either be zero or equal to a pre-dip value that is calculated as a 60 second average of the actual reactive current. The base part can be configured with parameter [125.50 Gs base current](#). Grid support current I_{delta} depends on the difference between the above-mentioned reference voltage and the selected actual voltage.

In the figure above, the reference voltage is shown as a dotted vertical line. The actual voltage is compared against this reference line. The mapping of voltage difference depends on the selected support mode.

- Grid support is active as long as the selected voltage stays outside the dead band, or the voltage returns within the dead band for less than the time defined by parameter [125.36 Gs after dip time](#).
- Grid support is deactivated when the voltage returns within the dead band for the time defined by parameter [125.36 Gs after dip time](#).

The total current during a grid fault can be limited with parameter [125.37 Frt Imax %](#).

There are also ramp times for active current and reactive current that are used during grid fault. For example, the parameter [125.28 Frt Ireact ref ramp up](#) defines how fast reactive current is ramped up when voltage drops.

Support modes

Grid support mode is selected using parameter [125.01 Grid support](#). It defines how the measured voltage value is converted into a reactive current reference. Four conversion modes can be defined/selected.

Disabled – In this mode FRT grid support is not active. Instead, the inverter follows the reactive power settings defined by parameter group [124 Reactive power reference](#).

Mode 0 – I_{delta} is set to zero and base current I_{base} is defined by parameter [125.50 Gs base current](#). In this case, the same base current value is used throughout the entire FRT event.

Mode 1 – k-factor mode. The amount of grid support is defined with the starting point P1 and the grid support gains as described in the figure above. There are separate gains for low voltage and high voltage ride-through grid support. These are set in [125.05 Lv Gs K-factor](#) and [125.19 Hv Gs K-factor](#). Point P1 is defined with voltage and current settings using parameters [125.06 Lv Gs P1 volt %](#), [125.07 Lv Gs P1 cur %](#), [125.20 Hv Gs P1 volt %](#) and [125.21 Hv Gs P1 cur %](#). Note that point P1 can be different for low voltage and high voltage grid support. With P1, an offset can be added to the grid support current.

Mode 2 – This mode can be used when a piecewise linear grid support current is needed. The mode uses five points on the low voltage side and three points on the high voltage side to map the voltage to grid support current references. The areas between the points are interpolated.

Active power reserve

To also have control over the DC input voltage during grid faults, when reactive power has a higher priority, a small amount of current can be reserved for active power. This reserve power is defined by parameter [125.53 Gs active power reserve](#) and the maximum reserve current by parameter [125.54 Gs max reserve current](#).

Settings

Parameter groups: [125 FRT support curve](#), [126 FRT tripping curve](#)

Diagnostics

Parameter groups: [130 Limits](#), [135 Grid monitoring](#)

Reactive power control

The inverter is capable of generating a selectable amount of reactive power to the grid (positive = capacitive, negative = inductive). A reference value for reactive power can be given via the control unit or fieldbus interface. The inverter also supports reactive power generation according to defined curves such as $Q(U)$, $Q(P)$, and $\cos\phi$ (P).

A reference type for the reactive power can be selected from several different types (see parameter [124.06 Q power ref type](#)). A reference value must also be entered for parameter [124.01 User Qref](#) according to the selected reference format. The 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.

Ramping is used for reactive current. The ramps can be set from parameter [124.14 Ireact ref ramp up](#) and [124.15 Ireact ref ramp down](#). The main tasks of the reactive current ramping are:

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

When parameter [124.06 Q power ref type](#) is set to **Q(x) regulation curve**, the parameter [124.30 Q\(x\) curve](#) is used to select the curve type. Examples of different curve types are shown below. Lock-in and lock-out conditions define when the selected curve is active. The curve is defined with six points that map the input signal to the output signal.

The reactive power control curve activates when lock-in condition set by parameter [124.31 Lock-in level](#) is fulfilled and deactivates when lock-out condition set by parameter [124.32 Lock-out level](#) is fulfilled. The lock-in condition can be set so that the curves are always active (set to zero (power>0)).

Q(U) control curve

In Q(U) control curve mode, reactive power generated by the inverter depends on the grid voltage as described in the example figure below. Active power in percent is used as a lock-in condition.

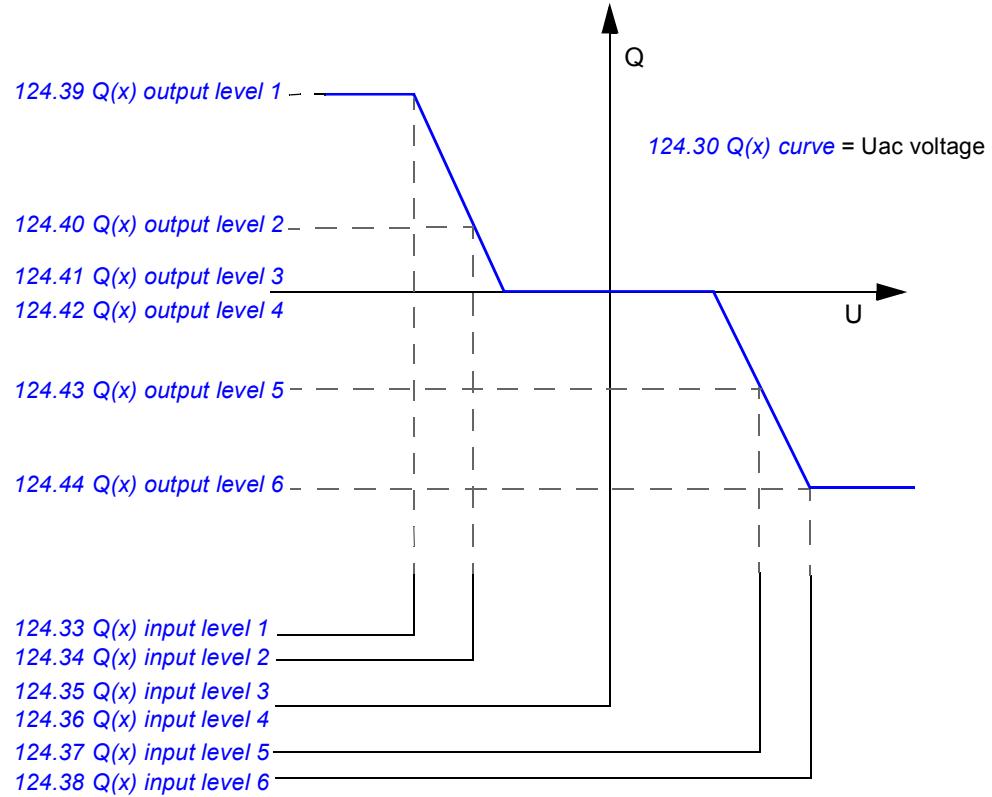


Figure 7. Q(U) control curve

■ Q(P) control curve

In Q(P) control curve mode, the reactive power generated by the inverter depends on the active power as described in the example figure below. Grid voltage in percent is used as a lock-in condition.

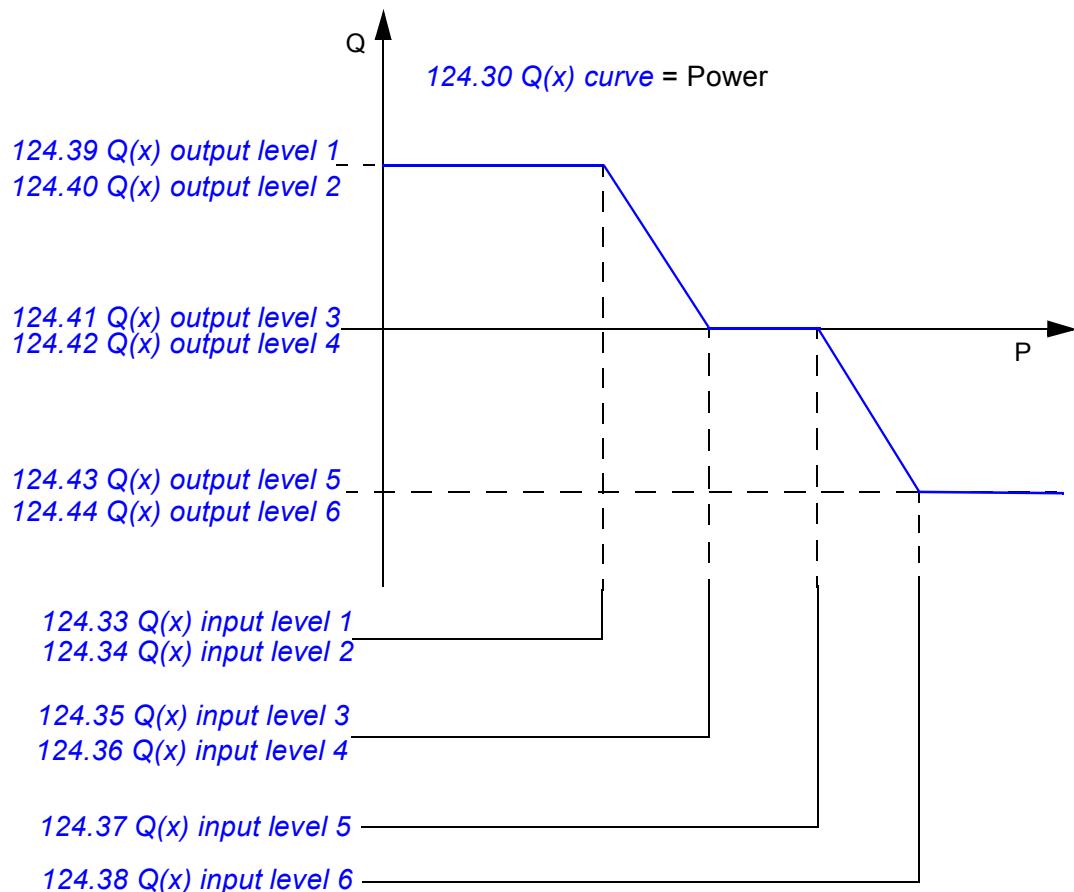


Figure 8. Q(P) control curve

cos phi(P) control curve

In cos phi(P) control curve mode, the reactive power generated by the inverter depends on the active power. Grid voltage is used as a lock-in condition. When setting this curve, crossing cos phi level one must be defined using two different points for the same point. For example, input level 2 = 0,5; output level 2 = 1,0 and input level 3 = 0,5; output level 3 = 1,0.

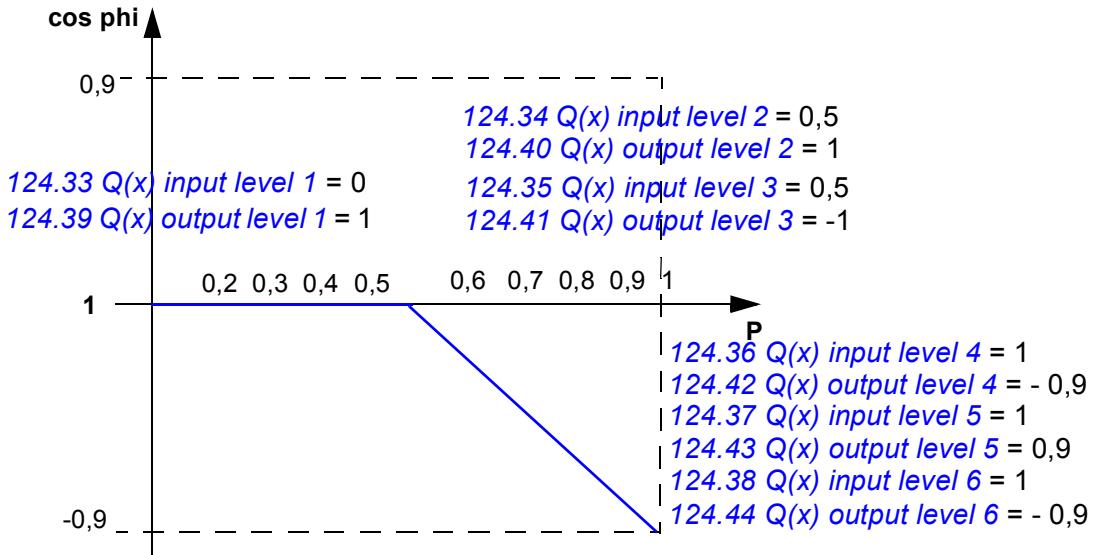


Figure 9. cos phi (P) control curve

Power prioritization

Prioritization of the active and reactive power can be set using parameter [130.101 Limit priority](#).

Note: The inverter can generate reactive power according to the given reference if the current limit of the inverter is not exceeded. If the inverter is already feeding the maximum allowed current to the grid, the parameter [130.101 Limit priority](#) defines whether active or reactive power is limited.

Settings

Parameters: [124.01 User Qref](#), [124.06 Q power ref type](#), [124.14 Ireact ref ramp up](#), [124.15 Ireact ref ramp down](#), [124.30 Q\(x\) curve](#), [124.31 Lock-in level](#), [124.32 Lock-out level](#), [124.33 Q\(x\) input level 1](#)...[124.44 Q\(x\) input level 6](#), and [130.101 Limit priority](#).

Night Q production

During normal inverter operation, the inverter enters sleep mode when the sun goes down since there is no active power available from the solar panels. This ends both active and reactive power production. However, reactive power production during the night may be of use to the solar plant by eliminating the need for extra reactive power compensation at sites where it would otherwise be required.

The night reactive power (Night Q) production function is deactivated by default. It can be activated or forced on using parameter [213.51 Night Q production](#). The operation of night Q production is as follows:

- When the inverter enters Sleep mode, the reactive power reference is checked. If the absolute value of the reactive power reference is larger than the value in parameter [213.52 Night Q low power](#), the inverter disconnects from the DC side, but not from the AC side, and continues to generate reactive power. If the mode is forced on, it stays connected to the AC grid even if the absolute value of the reactive power reference is smaller than the value in parameter [213.52 Night Q low power](#). The shutdown procedure without the effect of reactive power is shown in the figure below. The figure shows the inverter shutdown operation and night Q transition operation when the active power is below the minimum power limit for the delay time defined by parameter [213.17 Disconnection delay for sleep-mode](#).

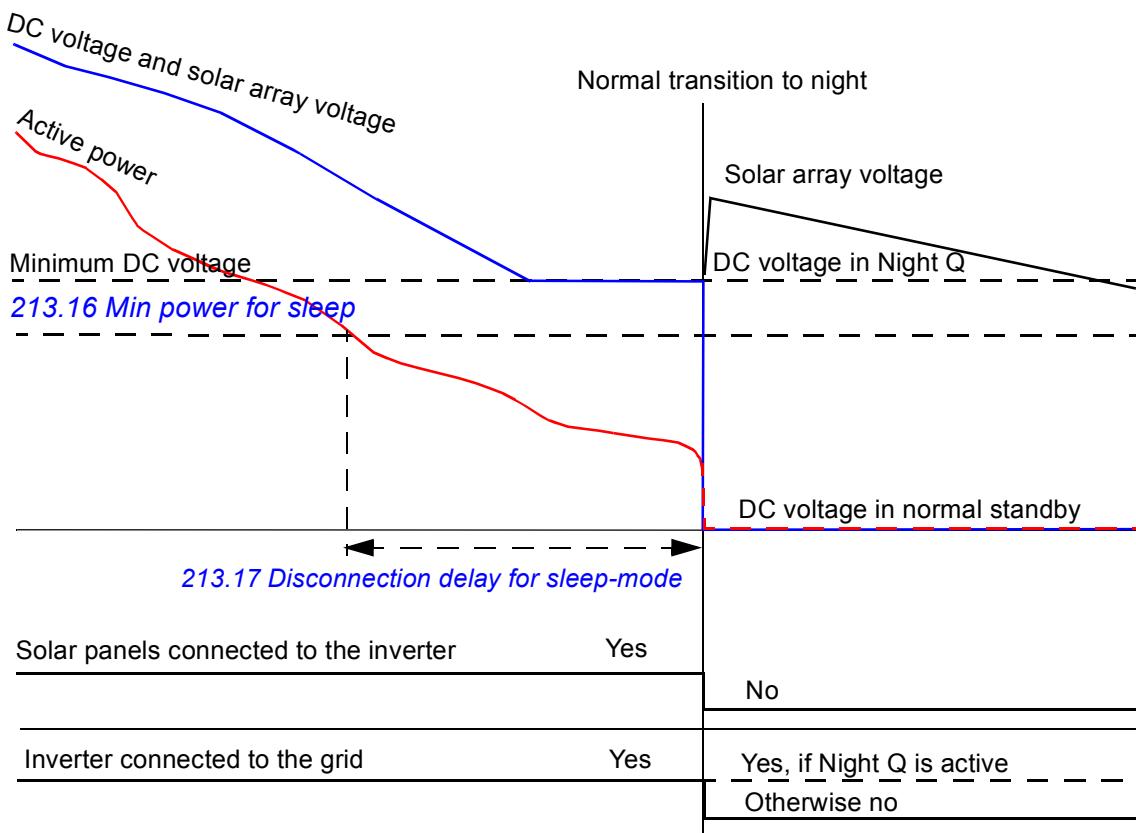


Figure 10. Night Q production curve

- If the absolute value of the reactive power reference decreases [213.52 Night Q low power](#) for a duration of [213.53 Night Q delay](#), the inverter disconnects from the AC side and proceeds to normal Sleep mode.
- A separate reactive power reference can be set for Night Q production with parameter [213.54 Night Q reference](#). If this reference differs from 0 kvar, it is used. If the reference is 0 kvar, the normal reactive power reference is used.
- If during the night, the absolute value of the reactive power reference increases above [213.52 Night Q low power](#), the inverter connects to the AC grid and starts producing reactive power.
- In the morning, the inverter transfers smoothly from Night Q mode to power generation mode, when the panels produce enough power for the panel DC voltage to rise above the required limit. See figure below.

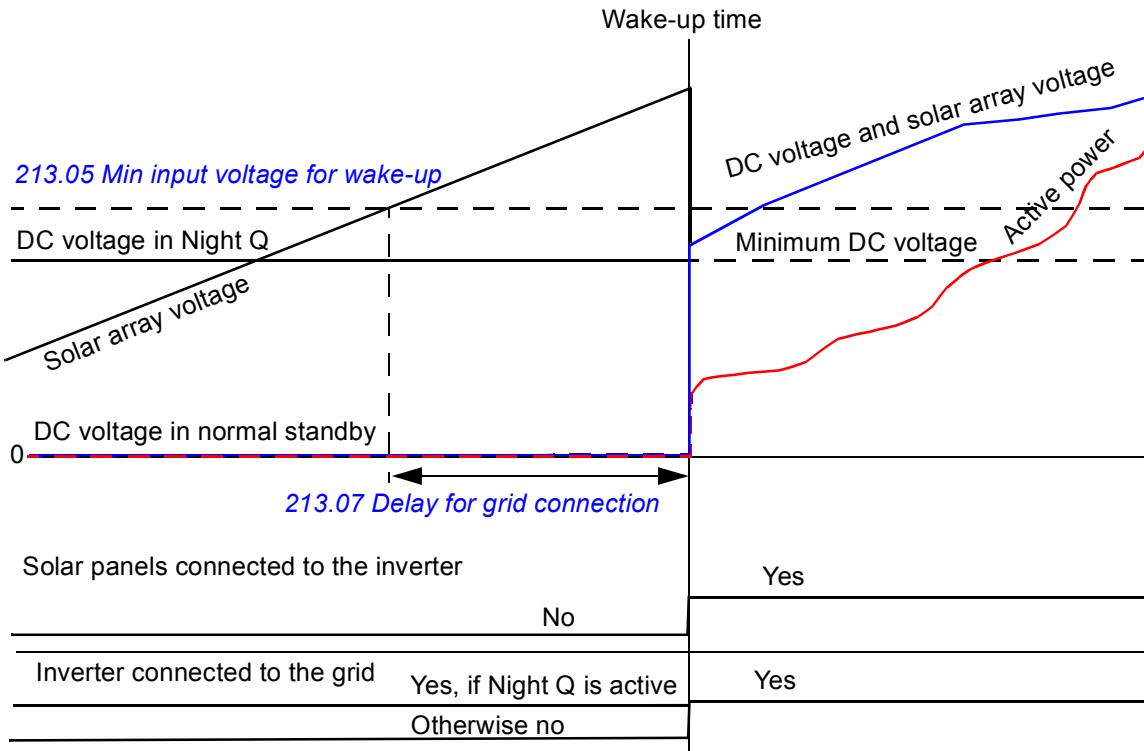


Figure 11. Night Q mode to power generation mode transition curve

Settings

Parameters: [213.51](#)...[213.54](#)

Active power limitations

External active power limit

Inverter output power can be limited by defining the maximum output power value using parameter [130.75 External power limit](#). The external power limit has ramps defined using parameters [130.98 External limit ramp up](#) and [130.99 External limit ramp down](#).

Flat-top limit

External power limit is designed for temporary power limitation. Flat-top limit permanently limits the inverter's active power capacity to a value lower than nominal. Normally the inverter has a semi-circular power capacity as the inverter can produce as much active power as it can produce reactive power. However, with the flat-top limit, this capacity can be cut by reducing the amount of active power. Note that in the end flat-top is only one constant active power limit.

Limitation after grid connection and after grid fault

Active power can be limited after a grid connection and after a grid fault. The limitation type can be selected using parameter [130.70 Connect limit type](#). The limitation can be set as active always, active only after a grid fault, or never active. There are different ramp rates for grid connections and re-connections after grid faults. A limitation ramp starts from 0 %. A ramp is defined as a percent of nominal power per minute.

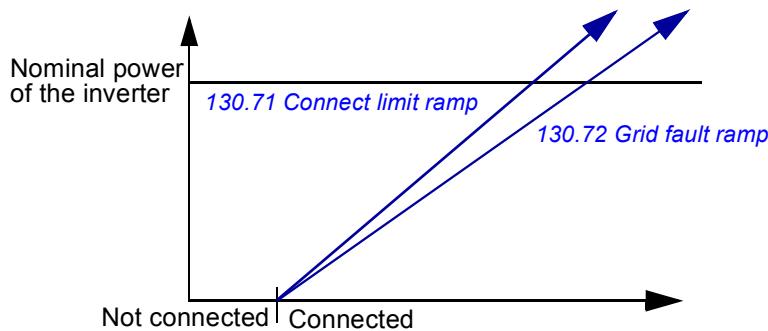


Figure 12. After grid connection and after grid fault limitation curve

■ Limitation based on grid voltage

Active power limitation as a function of grid voltage can be used to reduce grid voltage rise. The function's characteristics can be set through parameter [130.76 P\(U\) limiter](#). The limiter can either be Disabled, Slow ramp mode, or a Instant ramp mode.

Constant P(U) limitation

When average grid voltage exceeds the value in parameter [130.77 P\(U\) trigger level](#), the power limit is ramped down to [130.79 P\(U\) limit level](#). The value in parameter [130.80 P\(U\) limit ramp](#) is used for ramping the power limit down.

Later, when the average grid voltage falls below [130.78 P\(U\) release level](#), the power limit is released and power is ramped up by [130.81 P\(U\) release ramp](#). The red line in the figure below shows the active power limit.

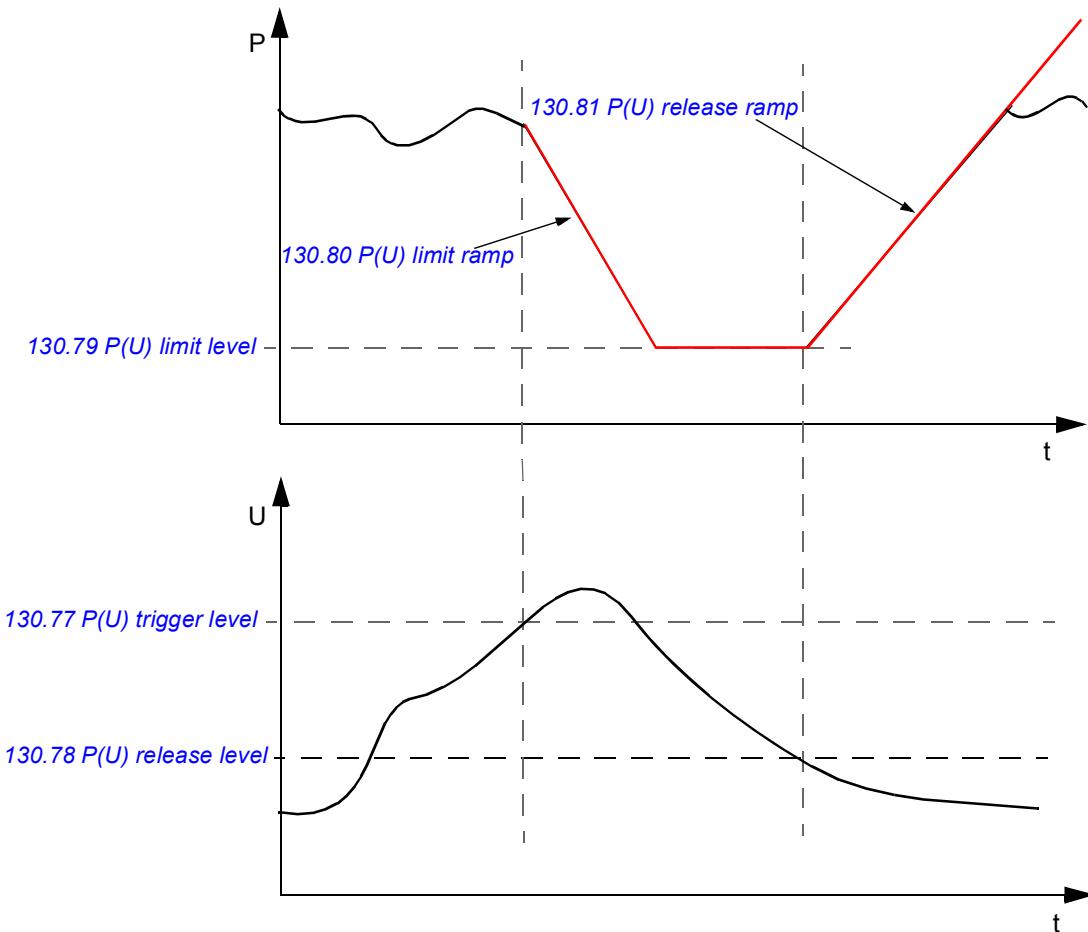


Figure 13. Constant P(U) limitation

Droop P(U) limitation curve

When average grid voltage exceeds the value in parameter [130.77 P\(U\) trigger level](#), droop limitation is activated and the power limitation gradient is calculated based on the grid voltage and the values in parameters [130.77 P\(U\) trigger level](#), [130.79 P\(U\) limit level](#), [130.82 P\(U\) end level](#).

Limitation is in effect until the voltage drops below the value defined by parameter [130.78 P\(U\) release level](#). When the average grid voltage falls below parameter [130.78](#), the power limit is released and power is ramped up using parameter [130.81 P\(U\) release ramp](#).

The average grid voltage is filtered with a time constant defined by parameter [130.83 P\(U\) filtering time constant](#). Parameter [130.84 P\(U\) used power](#) selects the power level, either nominal power or the power at the time of exceeding the trigger level.

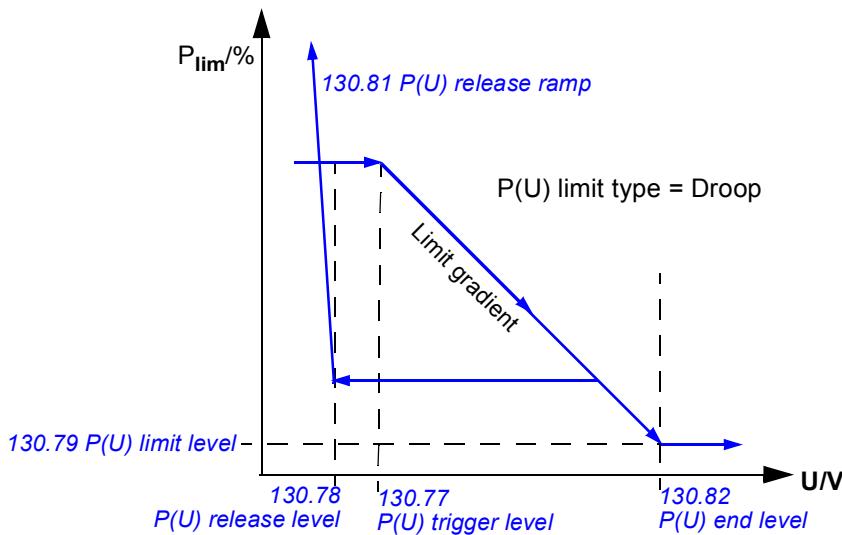


Figure 14. Droop P(U) limitation curve

■ Limitation based on grid frequency

Power limitation based on grid frequency can be set to operate in either incremental P(f) or free-running P(f) mode. The P(f) limitation type can be selected with parameter [130.62 P\(f\) limit type](#).

Incremental P(f) limitation curve

The frequency that starts power limitation is defined by parameter [130.63 P\(f\) corner frequency](#). When this frequency is surpassed, the current power value is saved and the power limit is calculated in relation to this power level. The limit stays in effect until the frequency drops below the value defined by parameter [130.65 P\(f\) release frequency](#). After the time defined in parameter [130.66 P\(f\) release time](#) has expired, the power limit is ramped up with the parameter [130.67 P\(f\) release ramp](#) in relation to nominal power.

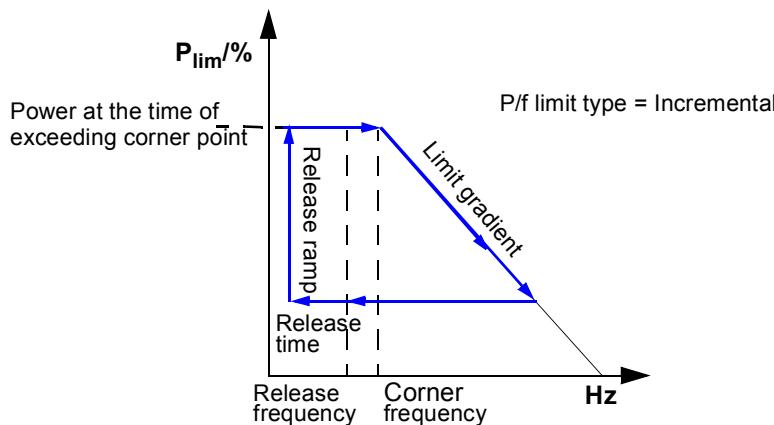


Figure 15. Incremental P(f) limitation curve

Free running P(f) limitation curve

When the value in parameter [130.63 P\(f\) corner frequency](#) is surpassed, the current power level is saved and the power limit is calculated in relation to this power level. The limit is set to change freely according to the frequency above the corner frequency. When the frequency drops below the value specified by parameter [130.63](#), the power limit is ramped up using parameter [130.67 P\(f\) release ramp](#) in relation to the power reference type specified by [130.68 P\(f\) release ramp ref.](#)

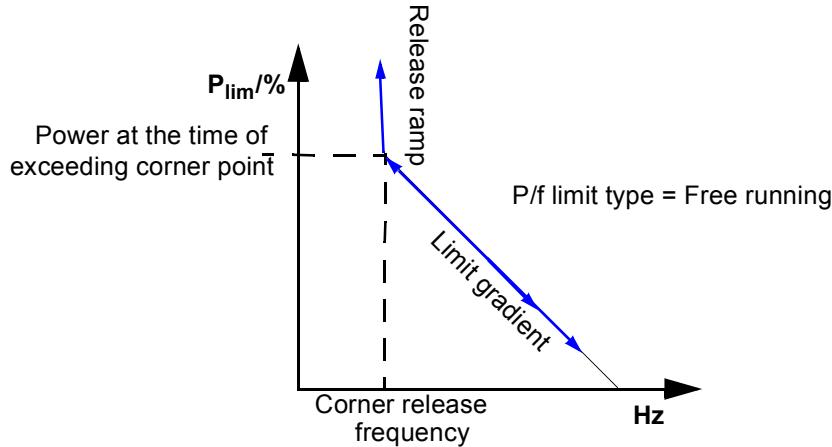


Figure 16. Free running P(f) limitation curve

Power gradient

The power gradient functionality limits the rise rate of active power to a predefined value. This can help to stabilize the grid as power is not changed too rapidly. The power gradient functionality can be enabled with parameter [130.92 Active power ramping](#) and the rise rate can be set with parameter [130.93 Active power ramp](#). If the power change is small, the rise rate limit follows the actual power closely. When active power starts to increase rapidly, the limit is activated until actual power stabilizes.

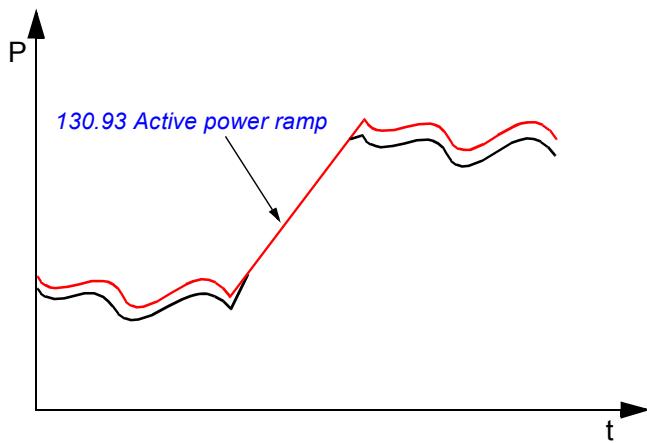


Figure 17. Power gradient: Active power ramp curve

For controlled stopping, a shut down ramp can be implemented with which power is reduced slowly to zero after which the grid relays are opened. The ramp can be defined with parameter [130.94 Shut down ramp](#). The internal limit follows the actual power and after the inverter operation is deactivated, the power limit ramps to zero. This does not affect grid disconnection time in case of faults or grid disturbance.

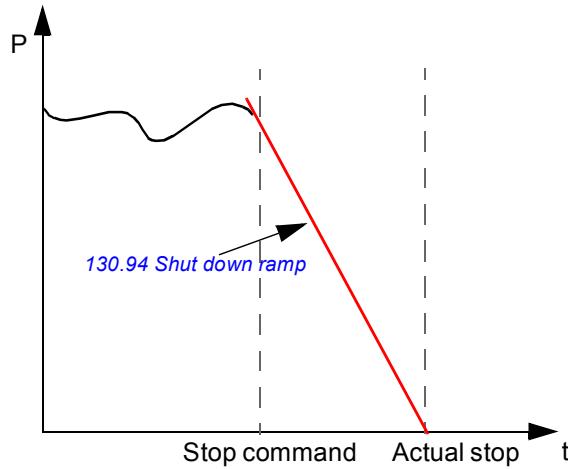


Figure 18. Power gradient: Shut down ramp curve

Settings

- [130.62 P\(f\) limit type](#)
- [130.63 P\(f\) corner frequency](#)
- [130.64 P\(f\) limit gradient](#)
- [130.65 P\(f\) release frequency](#)
- [130.66 P\(f\) release time](#)
- [130.67 P\(f\) release ramp](#)
- [130.68 P\(f\) release ramp ref](#)
- [130.70 Connect limit type](#)
- [130.71 Connect limit ramp](#)
- [130.72 Grid fault ramp](#)
- [130.75 External power limit](#)
- [130.76 P\(U\) limiter](#)
- [130.92 Active power ramping](#)
- [130.93 Active power ramp](#)
- [130.94 Shut down ramp](#)
- [130.98 External limit ramp up](#)
- [130.99 External limit ramp down](#)

DC input current monitoring (available with G417 option)

With the G417 option each DC input current is measured. This information is used for detecting DC input overcurrent, reverse DC input current, current deviations between DC inputs, and for detecting blown DC input fuses. DC inputs used in monitoring are configured using parameters [174.01...174.02](#) Connected DC inputs 1 to 24. DC input currents can be monitored from [174.31...174.54](#) DC input 1 to 24 current.

Settings

[174.01 Connected DC inputs 1-12](#)

[174.02 Connected DC inputs 13-24](#)

[174.31 DC input 1 current...174.54 DC input 24 current](#)

Overcurrent detection

The Overcurrent detection function can be enabled through parameter [174.05 Overcurrent detection](#). Detection can trigger either a delayed fault or an instantaneous fault depending on the current level and delay. The instant overcurrent trip limit is set to [174.06 Overcurrent instant limit](#). A smaller current limit with a delay can be inserted to [174.07 Overcurrent delayed limit](#) and time limit to [174.08 Overcurrent time delay](#).

Settings

[174.05 Overcurrent detection](#)

[174.06 Overcurrent instant limit](#)

[174.07 Overcurrent delayed limit](#)

[174.08 Overcurrent time delay](#)

Reverse current detection

The Reverse input current detection function can be enabled with parameter [174.09 Reverse current detection](#). If reverse current is detected, a fault is activated after the delay. The limit value is set to [174.10 Delayed Reverse current limit](#) and the delay to [174.11 Reverse current time delay](#).

Settings

[174.09 Reverse current detection](#)

[174.10 Delayed Reverse current limit](#)

[174.11 Reverse current time delay](#)

Current deviation detection

A faulty DC input, e.g., due to a high amount of shadowing or obstacles can be detected if the current in one DC input deviates significantly from other DC inputs. The current deviation function is enabled by default and the action is Warning. The action can be changed with parameter [174.14 Current deviation action](#). If the DC input currents deviate more than the current configuration limits, [174.14 Current deviation action](#) is activated after a delay defined by parameter [174.15 Current deviation delay](#). Configuration limits contain some more parameters which are described below.

The inverter can be configured to use either a relative or absolute comparison between DC input currents by setting parameter [174.16 Comparison mode](#) to the desired manner. The value that the individual currents are compared against is the reference value depending

on which type is selected by parameter [174.17 Reference type](#). The reference value can be selected to be either the maximum or the mean value of the connected DC inputs.

Relative comparison mode – individual DC input currents are compared against the reference value in percent. The limit is defined by parameter [174.19 Relative current limit](#). If a DC input current is more or less than the reference value an action is triggered after the delay. Additionally, the reference value must be more than what is defined in parameter [174.21 Relative threshold](#) to avoid nuisance trips at low currents.

Absolute mode – individual DC input currents are compared against the reference value in amperes. If the difference is greater than the value found in parameter [174.20 Absolute current limit](#) in amperes an action is triggered after the delay.

Settings

- [174.15 Current deviation action](#)
- [174.16 Comparison mode](#)
- [174.17 Reference type](#)
- [174.19 Relative current limit](#)
- [174.20 Absolute current limit](#)
- [174.21 Relative threshold](#)

Blown fuse detection

The Fuse monitor action can be enabled through parameter [174.22 Fuse monitor action](#). The default action is Warning.

A blown fuse can be detected if the DC input current is less than the value found in parameter [174.23 Blown fuse tolerance](#) and the mean DC input current is over [174.24 Blown fuse active boundary](#).

Settings

- [174.22 Fuse monitor action](#)
- [174.23 Blown fuse tolerance](#)
- [174.24 Blown fuse active boundary](#)

Temperature control

Temperature measurements

The inverter measures several system temperatures for temperature control and other diagnostic purposes.

Ambient temperature – is measured from the auxiliary cabinet door inlet. The corresponding measurement is read from parameter [211.01 Ambient temperature](#).

Control board temperature in the auxiliary cabinet – is measured and read from parameters [211.02 Control board temperature](#).

Internal board temperature for each power unit – is measured and read from parameters [211.08 PU1 board temperature](#), [211.14 PU2 board temperature](#), [211.20 PU3 board temperature](#), and [211.26 PU4 board temperature](#).

Modules power supply temperature for each power unit – is measured and read from parameters [211.06 PU1 PSU temperature](#), [211.12 PU2 PSU temperature](#), [211.18 PU3 PSU temperature](#), and [211.24 PU4 PSU temperature](#).

Cooling air temperature for each power unit – is measured and read from parameters [211.07 PU1 air temperature](#), [211.13 PU2 air temperature](#), [211.19 PU3 air temperature](#), and [211.25 PU4 air temperature](#).

Individual IGBT module temperatures of each power unit – can be read from following parameters:

- [211.03 PU1 IGBT T1](#)...[211.05 PU1 IGBT T3](#)
- [211.09 PU2 IGBT T1](#)...[211.11 PU2 IGBT T3](#)
- [211.15 PU3 IGBT T1](#)...[211.17 PU3 IGBT T3](#)
- [211.21 PU4 IGBT T1](#)...[211.23 PU4 IGBT T3](#).

An overtemperature warning is shown when temperature(s) exceed the set warning levels. An overtemperature fault is thrown when temperature(s) exceed the set fault levels, stopping the inverter operation.

Settings

See parameter group [211 Temperatures](#)

Temperature based grid current limitation

The grid current can be limited due to a high ambient temperature or high internal inverter temperatures. If the grid current is being limited by the temperature based current limitation, a status bit is set in the limitation status parameter [130.04 Limit word 4](#). Also, a corresponding status bit is set in parameter [130.06 Limit word 6](#) defining the temperature measurement that is the source of the limitation.

Settings

[130.04 Limit word 4](#), bit3

[130.06 Limit word 6](#), bit0...4

Temperature based operation inhibits

Inverter operation is inhibited if the ambient temperature exceeds the set maximum operational ambient temperature or is below the minimum operational ambient temperature. A corresponding status bit is set in parameter [173.05 Internal inverter inhibitors 1](#), when an inhibit is active. An inhibit bit is automatically removed when the ambient temperature returns within operational limits.

Settings

[173.05 Internal inverter inhibitors 1](#), bit4...6

Thermal protection switches

AC and DC cabinets have thermal protections switches. Their statuses are shown in parameter [211.41 Busbar thermal protection status](#). Parameter [173.06 Internal inverter inhibitors 2](#), bit 0 shows whether the thermal protection inhibits the starting.

- If the switch is open, inverter will stop and indicate a warning.
- If the switch returns to the Normal state, inverter will start automatically after a short cooling period.

Settings

[173.06 Internal inverter inhibitors 2](#), bit 0

[211.41 Busbar thermal protection status](#)

Fan control

The fans of the inverter are controlled based on the measured temperatures and the inverter state. Power unit fans are speed controlled and other fans are controlled with contactors.

The rotation speed of each power module fan is read from the following parameters:

- [202.21 Power module 1 fan](#)
- [202.22 Power module 2 fan](#)
- [202.23 Power module 3 fan](#)
- [202.24 Power module 4 fan](#)

AC cabinet and LCL fans – are controlled based on the ambient temperature and inverter current. The fans are

- switched on, if the inverter current is higher than the predefined limit or the ambient temperature is higher than the predefined limit.
- switched off, if the inverter is not connected to grid. If one power unit is disabled, its LCL fans are switched off because the control signal is masked with the main AC contactor control signal.

DC cabinet and AUX cabinet door fans – are controlled based on the measured ambient temperature. The fans are

- switched on at the predefined level
- switched off at the lower temperature to have some hysteresis and when the inverter is not connected to grid.

Note: Make sure the LCL fans rotation direction is correct. The fans are powered by three-phase auxiliary power which means that phase order must be correct.

If the main AC cables are connected normally when using

- internal auxiliary power, the inverter will measure the rotation direction and indicate a warning if the direction is different from the expected one. However, if the fans are rotating correctly, the warning can be ignored by reverting the value in parameter [202.25 Expected grid rotation](#).
- external auxiliary power, check the correct phase order of the fans and set correct value in parameter [202.25 Expected grid rotation](#). If the measured grid rotation is different from this parameter value, the inverter will not start.

Settings

See parameter group [202 Fan control](#).

Grounding and insulation resistance monitoring

■ Insulation resistance measurement

Insulation resistance measurement is an automatic feature of the inverter. The feature is preconfigured to prevent starting of the inverter when insulation resistance is low and notifies the problem using events.

Insulation resistance is measured using the MIRU board. The measurement can be activated based on the usage of the grounding feature.

- If grounding feature is not used, that is no grounding circuit is used, then insulation resistance measurement can be enabled with parameter [210.25 Insulation resistance measurement](#).
- If grounding feature is used, then insulation resistance measurement is activated internally by the grounding state machine regardless of the state of the parameter [210.25 Insulation resistance measurement](#).

When insulation resistance measurement is activated a valid measurement is formed only after some time has passed. Therefore an adjustable minimum measurement time must elapse before the measurement is ready. When measurement is valid the MIRU board signals by increasing the signal current from MIRU to BCU above 4 mA. The insulation resistance measurement can be considered valid when signal is above the 4 mA limit and minimum measurement time has elapsed.

Event setting

If a low insulation resistance measurement is configured to trigger a warning or fault then it also inhibits grid connection; otherwise it trips the inverter if it is connected to the grid and generating active power. An automatic recovery can be implemented using the warning event as a fail action. When insulation resistance increases above the limit defined in parameter [210.28 Insulation resistance limit](#), warning event disappears and the inverter connects to grid. If a fault was triggered, it must be reset before grid connection.

Self-test for grid connection

If grounding is not enabled, the MIRU board can be configured to run a self-test every day prior to grid connection. Self-test can be enabled through parameter [210.33 MIRU self-test](#). An input voltage level can be set with parameter [210.34 Self-test voltage](#), that must exceed before the test is run in the morning. The inverter will not connect to the grid unless the self-test is passed. If the test does not pass the inverter keeps running the self-test.

Settings

Parameters [210.25...210.34](#).

■ Grounding state machine

There are several options for grounding that can be selected using parameter [210.02](#)

Grounding device:

MGND-01 board – Using this board functional grounding can be performed from either the positive pole (option code +F282) or negative pole (option code +F283).

For details of the board, see the *PVS800-57B Hardware manual*.

Software control for grounding is identical regardless of grounding types. The following descriptions and parameters are valid for all types of grounding.

Grounding modes

A grounding mode can be selected through parameter [210.01 Grounding mode](#).

Off – Not grounded or grounding is open. In this mode, grounding circuit is not monitored.

Forced – Grounding is closed without measuring the insulation resistance. In this mode, grounding is opened (not grounded) if there is a high grounding voltage (fuse monitoring) or high grounding current. In this case, the state machine moves to the Failed Forcing state where it can be removed only by a fault and by setting the grounding mode to Off mode. This action is performed since the Forced mode is a test mode.

Automatic – In this mode, actual state machine runs independently based on the settings in parameters [210.03...210.11](#) and the internal states of the inverter. See parameter description on page [153](#).

Settings

Parameters [210.03...210.23](#).

Grounding state machine control and events

The figure below shows the grounding state machine controls.

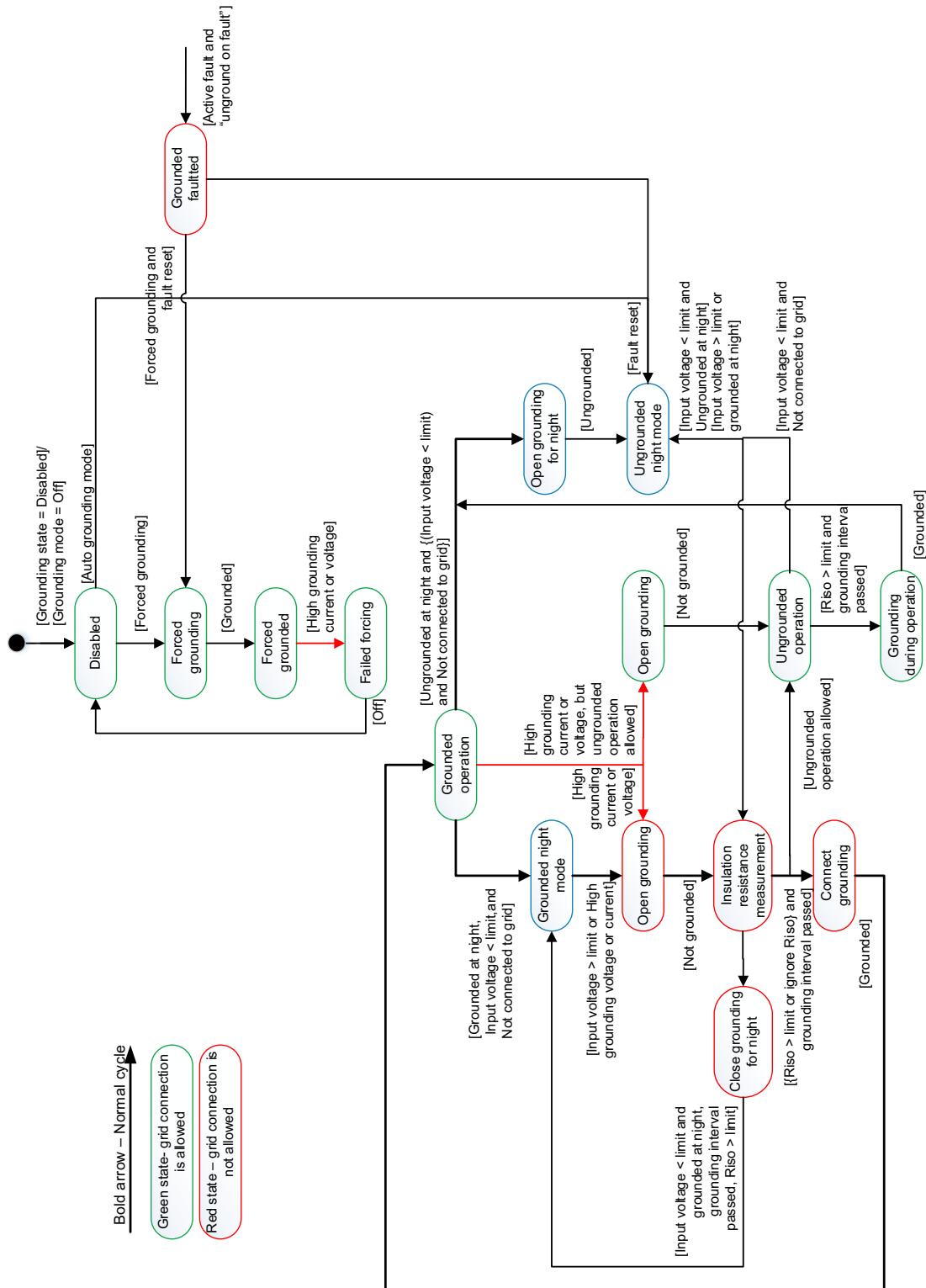


Figure 19. Grounding state machine controls

The grounding state machine controls the grounding boards and processes the measurements from the insulation resistance monitor. Several parameters are used to control the state transitions. Grid connection is enabled in some of the states while some of the states force the inverter to disconnect from the grid.

Grounding current is measured and resistive and rms currents are calculated based on this measurement. The grounding board has a feedback signal that detects a high grounding voltage which typically occurs when the grounding fuse is blown. Also grounding is removed to protect the grounding board.

Grounding is disabled when there is high grounding rms current or high grounding voltage. The event for current or voltage fail action can be set to either warning or fault using parameters [210.16 Grounding current fault action](#) and [210.12 Grounding circuit voltage fail action](#).

A sudden change in the resistive grounding current can be detected and the appropriate event can be triggered. Steps 1 and 2 can be configured to have a trigger level and a time delay. Step 3 current limit has an immediate effect. The sudden change ground current fault action or residual current fault action must be set to either warning or fault using parameter [210.18 Sudden change current fault action](#) to open (remove) grounding.

Status information

Typically, the inverter operates autonomously by starting and stopping until internal operating conditions are satisfied. The inverter can be remotely controlled to connect or disconnect from the grid. When a request for re-connection to the grid is sent, several internal conditions are checked before connection can take place. The operating states and operational status of the inverter can be seen through the variables in parameter group [173 Inverter status](#).

State machines

The inverter software has several state machines that control its operation. The most relevant state machines can be seen through parameters [173.02 Inverter main state](#) and [173.03 MPPT unit state](#).

- The first state parameter describes higher level operation such as, if the inverter is connecting to or disconnecting from the grid.
- The second state parameter describes the status of the MPPT unit. It indicates, for instance, if the power module is charged, running, or stopped.

Status words

The inverter indicates its main state in parameter [173.01 Main status word](#) by collecting the high level inverter information into this location. See the status word bit definitions in the parameter list on page [112](#).

The inverter can be controlled to stop externally. The states from these commands are collected into parameter [173.04 Start command SW](#). For instance, if the inverter is requested to stop remotely by SCADA. If all defined bits are set in parameter [173.04](#), then the inverter may start if internal operating conditions are fulfilled.

The inverter has several internal check conditions that may prevent it from starting. The state of these conditions can be seen from parameters [173.05 Internal inverter inhibitors 1](#) and [173.07 Internal MPPT inhibitors](#). If a bit is set in these parameters then the inverter will not start until the condition has stopped.

Parameter [173.05 Internal inverter inhibitors 1](#) – indicates inverter level information such as if the grid or configuration status is sufficient for the inverter to start and run.

Parameter [173.06 Internal inverter inhibitors 2](#) – indicates thermal protection and fan control status.

Parameter [173.07 Internal MPPT inhibitors](#) – indicates MPPT unit level status such as if the power module is ready or if input voltage is within the start limit.

Note: Some of the conditions that inhibit the inverter from starting are temporally constrained meaning the condition is fulfilled only after the time delay is passed. For some of these conditions there exist timers that can help debug issues.

Settings

Parameters [173.20](#)...[173.30](#).

Power production status

The status of power production can be monitored from parameter [173.11 Output power status](#). This parameter determines the limit that will not permit the usage of total available input power. Additionally, the parameter shows if the input voltage is limited or if the inverter is in test mode. The MPP tracking status indicates that the inverter is producing maximum available power.

■ Disconnection status

If the inverter disconnected from the grid, parameter [173.11](#) shows the Disconnected status.

Parameter [173.12 Disconnect trigger](#) shows the reason for disconnecting the inverter. When the reason is not apparent, this indication helps in determining the actual reason for disconnecting the inverter. Once the inverter reconnects, this parameter is reset to the Connected status.

Settings

Parameters [173.11 Output power status](#), [173.12 Disconnect trigger](#)

Customer external faults

There are three external faults which can be used to configure a customer-related feature using digital inputs. The configured external faults 1...3 can be connected to any customer digital input or inverter internal parameter.

Each configured feature has the following set of parameters:

Parameter type	Selection list
Source	Off [0]
	On [1]
	BCU DI1 [2]
	BCU DI6 [3]
	A500 DI1 [4]
	A512 DI0 [5]
	A512 DI3 [6]
	A512 DI4 [7]
	A512 DI5 [8]
	A512 DI6 [9]
Input action	No action [0]
	Delayed warning [1]
	Warning and delayed fault [2]
	Delayed fault [3]
Action delay	Delayed action defined in the above action parameters
Logic	Active low [0]
	Active high [1]

For example, if a customer fault signal is connected to the A500 DI1 connector, the following parameter selections can be used.

Source: set parameter [176.21 External fault 1 source](#) = A500 DI1 [4]

Input action: set parameter [176.22 External fault 1 action](#) = Delayed fault [3]

Action delay: set the required action with parameter [176.23 External fault 1 action delay](#)

Logic: set parameter [176.24 External fault 1 failure logic](#) to active low or high.

Settings

[176.21 External fault 1 source](#)... [176.34 External fault 3 failure logic](#)

MV station monitoring and control

Medium voltage station monitoring and control feature can be configured to protect the transformer and to control the medium voltage switchgear. The software features to IOs can be configured with parameters in group [177 MV Station](#). See the steps described in the below sections .

Digital inputs

There are six configurable protective digital input features for the medium voltage transformer and two for the medium voltage switchgear. See list below:

- Transformer temperature alarm
- Transformer temperature fault
- Transformer low oil level
- Transformer overpressure
- Transformer vacuum failure
- Transformer gas discharge fault
- Breaker opening
- Phase loss detection

Any of these features can be configured to use any of the customer interface digital inputs of the inverter.

For actual connections of the digital inputs, see the *Hardware manual*.

Each configured digital input feature has the following set of parameters:

Parameter type	Selection list
Source	Off [0]
	On [1]
	BCU DI1 [2]
	BCU DI6 [3]
	A500 DI1 [4]
	A512 DI0 [5]
	A512 DI3 [6]
	A512 DI4 [7]
	A512 DI5 [8]
	A512 DI6 [9]
Input action	No action [0]
	Delayed warning [1]
	Warning and delayed fault [2]
	Delayed fault [3]
	Fault and delayed MV breaker opening [4]
Action delay	Delayed action defined in the above action parameters
Limit	Current limit. This limit defines the maximum output current for the inverter when the input is active.
Logic	Active low [0]
	Active high [1]

To activate a certain MV station protection feature, select the correct source and settings. For example, if MV transformer overpressure signal is connected to the A500 DI1 connector, configure the following parameters:

Source: set parameter [177.26 MV overpressure source](#) = A500 DI1 [4]

Input action: set the required action in parameter [177.27 Transformer overpressure action](#)

Action delay: set a delay for the operation of the feature with parameter [177.28 Transformer overpressure delay](#)

Logic: set parameter [177.30 Transformer overpressure failure logic](#) to active low or high

Limit: In case of an event at a certain limit, the inverter can be set to reduce the grid current. Set this limit with parameter [177.29 Transformer overpressure current limit](#). If this limitation is not needed, set the limit above the maximum current.

Note: If the feature is configured to trigger a fault, inverter will stop feeding current.

Settings

[177.11 MV temperature alarm source...](#) [177.50 MV phase loss detection failure logic](#)

■ Analog inputs

There are two configurable analog input features for the medium voltage transformer:

- Oil temperature
- Coil temperature.

The inverter software reads the current signal from the selected input and scales it linearly to the temperature. Scaling can be selected independently for each measurement with two parameters, temperature at 4 mA and temperature at 20 mA. A linear curve fits in between the two points.

The inverter can be set to trigger events and limit the output current if the measured temperature rises above a defined level. Warning and fault levels can also be set independently for each measurement/feature. The inverter output current limit can be mapped by three points as shown in the figure below. The inverter output current limitation curve is based on the temperature.

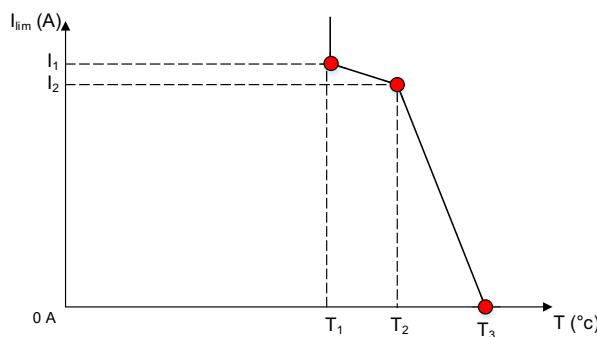


Figure 20. Inverter output current limitation curve

Both the analog inputs software feature has the following set of parameters:

Parameter type	Selection list
Source	Zero [0]
	Spare AI1
	Spare AI2
	Spare AI3
	Spare AI4
	Spare AI5
	PLC CPU AI2
Temperature	Shows the measured temperature
Temperatuue at 4 mA	Temperature sensor configuration. A linear scaling is assumed to be between the two current values.
Temperature at 20 mA	
Temperature warning limit	Temperature limits that triggers events
Temperature fault limit	
Current limit temperature 1 - 3	See $T_1 - T_3$ in the figure below.
Current limit current 1 - 2	See $I_1 - I_2$ in the figure below.

For example, if MV transformer oil temperature signal, which uses a Noveval HTB230 0/200 current sensor is connected to the Spare AI2 connector, configure the following parameters:

Source: set parameter [177.63 Transformer oil temperature source](#) = Spare AI2 [2]

Temperature at 4 mA: set parameter [177.65 Transformer oil temperature at 4 mA current](#) = 0°

Temperature at 20 mA: set parameter [177.66 Transformer oil temperature at 20 mA current](#) = 200 °C.

Rest of the parameters: configure current limitations of the temperature and the warnings and faults.

Settings

[177.51 Transformer coil temperature source](#)...[177.73 Transformer oil, current limit current 2](#)

Digital output

Inverter has several user configurable relay outputs. Their source signal can be set in parameters [177.11 MV temperature alarm source](#)...[177.20 Transformer temperature fault failure logic](#). Parameter names define which output is used. By default, parameter [176.11 PLC CPU RO 0 source](#) is set to MV switchgear breaker opening signal.

For the actual connection of the digital output, see *Hardware manual*.

DC input monitor

DC input monitor supervises DC input voltage and DC input current.

- The DC input voltage is the voltage measured on the panel side of the DC contactor. DC input voltage and power can be monitored with parameters [208.01 Input voltage](#) and [208.03 Input power](#).
- The measured DC input current is used for detecting DC input overcurrent and reverse DC input currents. The power module input currents can be monitored with parameter [208.04 Input current](#).

See also, [DC input current monitoring \(available with G417 option\)](#) on page [42](#).

■ DC input voltage monitor

The module monitors that the voltage on the DC input side is larger than the minimum limit and smaller than the maximum limit when the inverter starts to operate. The DC input voltage monitor also checks the polarity of the DC input voltage. If a large negative voltage is detected in the input a warning is displayed to indicate an improper connection of the DC cables.

Settings

[213.05 Min input voltage for wake-up](#)

[213.08 Min input voltage for first start](#)

■ DC current monitor

DC current monitor is enabled by default and can be disabled with parameter [208.09 Input current monitoring](#). The module monitors that DC current and reverse current are not exceeding the limits. Reverse current limit and activation delay limit are user configurable parameters.

Settings

[208.09 Input current monitoring](#)

[208.12 Reverse current limit](#)

[208.13 Reverse current delay](#)

User lock

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



WARNING! ABB will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. See [Cybersecurity disclaimer](#) Cybersecurity disclaimer (page 13).

To activate the user lock for the first time, follow the steps below:

1. Enter the default pass code, 10000000, into parameter [196.02 Passcode](#). This will make parameters [196.100...196.102](#) visible.
2. Enter a new pass code into parameter [196.100 Change user pass code](#). Always use eight digits; if using Drive composer, finish with **Enter**.
3. Confirm the new pass code in [196.101 Confirm user pass code](#).



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

4. In parameter [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).
5. Enter an invalid (random) pass code into parameter [196.02 Passcode](#).
6. Activate parameter [196.08 Control board boot](#), or cycle the power to the control unit.
7. Check that parameters [196.100...196.102](#) are hidden. If they are not, enter another random pass code into parameter [196.02](#).

To reopen the lock, enter your pass code into parameter [196.02 Passcode](#). This will again make parameters [196.100...196.102](#) visible.

Settings

Parameters [196.02 Passcode](#) (page 140) and [196.100...196.102](#).

4

Parameters

Contents of this chapter

This chapter describes the inverter's parameters. The parameters are either editable or read-only. The editable parameters can be used to change the inverter settings and they are saved periodically to permanent memory.

The read-only parameters (actual values) can be used to view the inverter status. An actual value is the result of a measurement or calculation by the inverter, or it contains status information.

Terms and abbreviations

Term	Definition
Bit list	Bit list
Data	Data parameter
Default	Default value for an editable parameter.
FbEq16b	(In the following table, shown on the same row as the parameter range, or for each selection) 16-bit fieldbus equivalent: The scaling between the value shown on the control unit and the integer used in fieldbus communication when a 16-bit value is selected. A dash (-) indicates that the parameter is not accessible in 16-bit format.
FbEq32b	(In the following table, shown on the same row as the parameter range, or for each selection) 32-bit fieldbus equivalent: The scaling between the value shown on the control unit and the integer used in fieldbus communication when a 32-bit value is selected.
List	Selection list.
No.	Parameter number.

60 Parameters

Term	Definition
Other	The value is taken from another parameter. Choosing "Other" Shows a parameter list in which the user can specify the source parameter.
Other [bit]	The value is taken from a specific bit in another parameter. The source is selected from a parameter list.
PB	Packed Boolean (bit list).
Real	Real number.
Type	Parameter type.

Summary of parameter groups

Group	Contents	Page
101 Actual values	<i>Basic signals for monitoring the inverter.</i>	63
104 Warnings and faults	<i>Information on warnings and faults.</i>	64
107 System info	<i>Inverter hardware and firmware information.</i>	65
114 Extension I/O module 1	<i>Configuration of I/O extension module 1.</i>	66
115 Extension I/O module 2	<i>Configuration of I/O extension module 2.</i>	67
116 Extension I/O module 3	<i>Configuration of I/O extension module 3.</i>	67
119 Operation mode	<i>Selection of external control locations sources and operating modes.</i>	68
121 Fast power off	<i>Emergency stop settings.</i>	69
123 DC voltage reference	<i>DC voltage reference selection, limitation and ramping.</i>	69
124 Reactive power reference	<i>Settings for reactive power reference selection, limitation and ramping.</i>	70
125 FRT support curve	<i>Settings for FRT support curve.</i>	74
126 FRT tripping curve	<i>Settings for FRT tripping curve.</i>	78
130 Limits	<i>Operation limits of the inverter.</i>	80
132 Autoreset	<i>Settings for Autoreset function.</i>	84
135 Grid monitoring	<i>Settings for grid monitoring.</i>	85
147 Data storage	<i>Parameters that can be written to and read from by using source and target settings of other parameters.</i>	93
149 Panel port communication	<i>Communication settings for control panel port.</i>	97
150 FBA	<i>General settings for fieldbus communication configuration.</i>	97
151 FBA A settings	<i>Fieldbus adapter A configuration.</i>	104
152 FBA A data in	<i>Selection of data to be transferred from Inverter to fieldbus controller through fieldbus adapter A.</i>	107
153 FBA A data out	<i>Selection of data to be transferred from fieldbus controller to inverter through fieldbus adapter A.</i>	107
154 FBA B settings	<i>Fieldbus adapter B configuration.</i>	108
155 FBA B data in	<i>Selection of data to be transferred from the inverter to fieldbus controller through fieldbus adapter B.</i>	110
156 FBA B data out	<i>Selection of data to be transferred from fieldbus controller to the inverter through fieldbus adapter B.</i>	110
164 SCADA configuration	<i>SCADA configuration.</i>	111
165 SCADA data in	<i>SCADA data in.</i>	111
166 SCADA data out	<i>SCADA data out.</i>	112
173 Inverter status	<i>Inverter control and status words.</i>	112
174 DC input current monitor	<i>DC input current monitor.</i>	115
176 Customer IOs	<i>Customer inputs and outputs.</i>	121

Group	Contents	Page
177 MV Station	<i>Medium voltage station parameters including MV transformer and MV switchgear.</i>	124
184 Energy metering	<i>Energy metering parameters.</i>	132
185 Health monitoring	<i>Health monitoring inhibits starting.</i>	133
189 Inverter control	<i>Inverter control settings.</i>	134
190 External measurements	<i>Settings for external measurements.</i>	136
195 HW configuration	<i>Various hardware-related settings.</i>	138
196 System	<i>Systems settings: Language selection, parameter save and restore, control unit reboot.</i>	140
202 Fan control	<i>Fan control related parameters.</i>	144
204 PLC Extension Inputs	<i>PLC extension inputs.</i>	145
205 PLC Extension Outputs	<i>PLC output signals.</i>	150
207 Thermal limitation	<i>Thermal limitation parameters.</i>	151
208 DC input monitor	<i>DC input voltage monitoring related parameter group.</i>	152
210 Grounding supervision	<i>Grounding supervision parameters.</i>	153
211 Temperatures	<i>Temperature monitoring related parameters.</i>	157
213 Wake-up monitor	<i>Parameters for wake-up/sleep monitor and state machine.</i>	159
214 Switch control	<i>Switch control parameters.</i>	161

Parameter listing

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
101 Actual values		Basic signals for monitoring the inverter. All parameters in this group are read-only unless otherwise noted.	
101.01	DC voltage	Measured intermediate circuit voltage.	- / <i>Real</i>
	0.00 ... 2000.00 V	Measured intermediate circuit voltage.	1 = 1 V/ 100 = 1 V
101.02	Line current	Calculated line current.	- / <i>Real</i>
	0.00 ... 30000.00 A	Calculated line current.	1 = 1 A/ 100 = 1 A
101.03	Line current %	Calculated line current in percent of the nominal current.	- / <i>Real</i>
	0.0 ... 1000.0 %	Calculated line current in percent of the nominal current.	1 = 1 %/ 10 = 1 %
101.04	Active current	Calculated active current.	- / <i>Real</i>
	-30000.00 ... 30000.00 A	Calculated active current.	1 = 1 A/ 100 = 1 A
101.05	Active current %	Active current in percent of the nominal value.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Active current in percent of the nominal value.	1 = 1 %/ 10 = 1 %
101.06	Reactive current	Calculated reactive current.	- / <i>Real</i>
	-30000.00 ... 30000.00 A	Calculated reactive current.	1 = 1 A/ 100 = 1 A
101.07	Reactive current %	Reactive current in percent of the nominal value.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Reactive current in percent of the nominal value.	1 = 1 %/ 10 = 1 %
101.08	Frequency	Calculated grid frequency. If parameter 91.1 <i>Bamu enable</i> = ON, then line frequency is calculated from measured grid voltage.	- / <i>Real</i>
	0.00 ... 100.00 Hz	Measured grid frequency.	100 = 1 Hz
101.09	Grid voltage	Estimated or measured grid voltage. Grid voltage is measured when parameter 91.1 <i>Bamu enable</i> = ON.	- / <i>Real</i>
	0.00 ... 2000.00 V	Average line-to-line grid voltage	1 = 1 V/ 100 = 1 V
101.10	Apparent power	Apparent output power of the inverter.	- / <i>Real</i>
	-30000.00 ... 30000.00 kVA	Apparent output power of the inverter.	1 = 1 kVA/ 100 = 1 kVA
101.11	Apparent power %	Apparent output power of the inverter in percent of the nominal output power.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Apparent output power of the inverter.	1 = 1 %/ 10 = 1 %

64 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
101.12	Power	Calculated grid-side converter power. Positive = power flow from intermediate circuit to supply network Negative = power flow from supply network to intermediate circuit	- / <i>Real</i>
	-30000.00 ... 30000.00 kW	Grid-side converter power.	1 = 1 kW/ 100 = 1 kW
101.13	Power %	Input power in percent of the nominal value.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Input power in percent of the nominal value.	1 = 1 %/ 10 = 1 %
101.14	Reactive power	Calculated reactive power. Positive = capacitive Negative = inductive	- / <i>Real</i>
	-30000.00 ... 30000.00 kVAr	Calculated reactive power.	1 = 1 kVAr/ 100 = 1 kVAr
101.15	Reactive power %	Calculated reactive power in percent of nominal power.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Calculated reactive power in percent of nominal power.	1 = 1 %/ 10 = 1 %
101.16	CosPhi	Power factor.	- / <i>Real</i>
	-1.00 ... 1.00	Power factor.	100 = 1
101.20	Converter current	Measured converter current.	- / <i>Real</i>
	0.00 ... 30000.00 A	Measured converter current.	1 = 1 A/ 100 = 1 A
101.64	Nominal power	Nominal power of the converter.	- / <i>Real</i>
	0 ... 30000 kW	Nominal power.	1 = 1 kW
104 Warnings and faults		Information on warnings and faults. For description of individual warning and fault codes, see chapter Troubleshooting on page 163. All parameters in this group are read-only unless otherwise noted.	
104.01	Tripping fault	First active fault. This fault causes the inverter to trip when it arrived at the trip register.	- / <i>Data</i>
104.02	Active fault 2	Second active fault in the trip register.	- / <i>Data</i>
104.03	Active fault 3	Third active fault in the trip register.	- / <i>Data</i>
104.04	Active fault 4	Fourth active fault in the trip register.	- / <i>Data</i>
104.05	Active fault 5	Fifth active fault in the trip register.	- / <i>Data</i>
104.06	Active warning 1	First active warning in the warning register.	- / <i>Data</i>
104.07	Active warning 2	Second active warning in the warning register.	- / <i>Data</i>
104.08	Active warning 3	Third active warning in the warning register.	- / <i>Data</i>
104.09	Active warning 4	Fourth active warning in the warning register.	- / <i>Data</i>

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
104.10	Active warning 5	Fifth active warning in the warning register.	- /Data
104.11	Latest fault	First fault in the trip log store. Latest fault in the trip log store. The trip log store is loaded with active faults in the order they occur.	- /Data
104.12	2nd latest fault	Second fault in the trip log store.	- /Data
104.13	3rd latest fault	Third fault in the trip log store.	- /Data
104.14	4th latest fault	Fourth fault in the trip log store.	- /Data
104.15	5th latest fault	Fifth fault in the trip log store.	- /Data
104.16	Latest warning	First warning in the trip log store. Latest warning in the warning log store. The warning log store is loaded with active warnings in the order they occur.	- /Data
104.17	2nd latest warning	Second warning in the trip log store.	- /Data
104.18	3rd latest warning	Third warning in the trip log store.	- /Data
104.19	4th latest warning	Fourth warning in the trip log store.	- /Data
104.20	5th latest warning	Fifth warning in the trip log store.	- /Data
107 System info		Inverter hardware and firmware information. All parameters in this group are read-only.	
107.03	Rating id	Shows type of the inverter/inverter unit.	- / Real
107.04	Firmware name	Shows inverter firmware name.	- / Data
107.05	Firmware ver	Shows inverter firmware version number.	- / Data
107.06	Loading package name	Shows firmware loading package name.	- / Data
107.07	Loading package version	Shows firmware loading package version number.	- / Data
107.08	Bootloader version	Shows version number of the firmware bootloader.	- / Data
107.09	Preboot version	Shows version number of the pre-bootloader.	- / Data
107.10	Safety critical hash	Shows 32-bit hash code computed from the safety critical source code. This parameter is read-only.	0x0000/ Data
	0x0000...0xffff	32-bit hash code	-
107.11	Cpu usage	Shows CPU usage.	- / Real
	0 ... 100 %	CPU usage in percent.	1 = 1 %
107.12	PU logic version name	Shows version name of PU FPGA logic.	- / Data
107.13	PU logic version number	Shows version number of PU FPGA logic.	- / Data
107.17	PLC HW variant	Shows PLC hardware variant version. This number indicates what IO blocks are connected to the PLC.	- / Real
	0 ... 65535	Version number.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type
107.18	PLC SW version	Shows PLC software version number.	- / Data
110 Standard DI, RO		Configuration of digital inputs and relay outputs.	
110.02	DI delayed status	Shows status of digital inputs DIIL (bit 15) and DI1...DI8 (bits 0...7). Note: This word is updated only after the activation/deactivation delay. This parameter is read-only.	0b0000/ Bit list
	b0: DI1	Delayed status of digital input 1.	
	b1: DI2	Delayed status of digital input 2.	
	b2: DI3	Delayed status of digital input 3.	
	b3: DI4	Delayed status of digital input 4.	
	b4: DI5	Delayed status of digital input 5.	
	b5: DI6	Delayed status of digital input 6.	
	b6 ... b14	Reserved	
	b15: DIIL	Delayed status of the DIIL input.	
110.21	RO status	Status of relay outputs. Bit 0 corresponds to RO1.	0b0000/ Bit list
	b0 RO1	Status of relay output 1.	
	b1 RO2	Status of relay output 2.	
	b2 RO3	Status of relay output 3.	
	b3 ... b15	Reserved	
114 Extension I/O module 1		Configuration of I/O extension module 1. Note: Contents of this parameter group vary according to the selected I/O extension module type.	
114.01	Module 1 type	Activates (and specifies the type of) I/O extension module 1.	None/ List
	None	Inactive.	0
	FIO-01	FIO-01.	1
	FIO-11	FIO-11.	2
	FAIO-01	FAIO-01.	3
114.02	Module 1 location	Specifies node number (1...3) on the control unit into which the I/O extension module is installed. (Node 1 = slot 1, node 2 = slot 2, node 3 = slot 3). Alternatively, specifies the node ID of the slot on an FEA-0x extension adapter.	Slot 1/ List
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3
114.03	Module 1 status	Shows status of I/O extension module 1. This parameter is read-only.	No option/ List
	No option	No module detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1
	FEN-01	An FEN-01 module is detected and is active.	2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	FEN-11	An FEN-11 module is detected and is active.	3
	FEN-21	An FEN-21 module is detected and is active.	4
	FIO-11	An FIO-11 module is detected and is active.	5
	FEN-31	An FEN-31 module is detected and is active.	6
	FAIO-01	An FAIO-01 module is detected and is active.	7
115 Extension I/O module 2		Configuration of I/O extension module 2. See also section Programmable I/O extensions. Note: Contents of this parameter group vary according to the selected I/O extension module type.	
115.01	Module 2 type	Selects option module 2 type.	None/ List
	None	Inactive	0
	FIO-01	FIO-01	1
	FIO-11	FIO-11	2
	FAIO-01	FIO-01	3
115.02	Module 2 location	Selects option module 2 location	Slot 1/ List
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3
115.03	Module 2 status	Shows the status of I/O extension module 2. This parameter is read-only.	No option/ List
	No option	No module is detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1
	FIO-11	An FIO-11 module is detected and is active.	5
	FAIO-01	An FAIO-01 module is detected and is active.	7
116 Extension I/O module 3		Configuration of I/O extension module 3. See also section Programmable I/O extensions. Note: The contents of the parameter group vary according to the selected I/O extension module type.	
116.01	Module 3 type	Selects option module 3 type.	None/ List
	None	Inactive.	0
	FIO-01	FIO-01	1
	FIO-11	FIO-11	2
	FAIO-01	FIO-01	3
116.02	Module 3 location	Selects option module 3 location.	Slot 1/ List
	Not selected		0
	Slot 1		1
	Slot 2		2
	Slot 3		3
116.03	Module 3 status	Shows the status of I/O extension module 2.	No option/ List
	No option	No module is detected in the specified slot.	0
	FIO-01	An FIO-01 module is detected and is active.	1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	FIO-11	An FIO-11 module is detected and is active.	5
	FAIO-01	An FAIO-01 module is detected and is active.	7
119 Operation mode		Selection of external control locations sources and operating modes.	
119.01	Actual operation mode	Shows the operation mode currently in use. This parameter is read-only.	DC control/ List
	DC control	DC control.	0
	Power control	Active power control	1
	DC control with power balancing	DC control with power balancing.	2
119.11	Ext1/Ext2 sel	Selects source for external control location EXT1/EXT2 selection.	EXT1/ List
	EXT1	EXT1	0
	EXT2	EXT2	1
	FBA A MCW bit 11	Parameter 106.01 Main control word, bit 11.	2
	DI1	Digital input DI1(110.02 DI delayed status, bit 0).	3
	DI2	Digital input DI2(110.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3(110.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4(110.02 DI delayed status, bit 3).	6
	DI5	Digital input DI5(110.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6(110.02 DI delayed status, bit 5).	8
	DIO1	Digital input/output DIO1 (111.02 D/O delayed status, bit 0).	11
	DIO2	Digital input/output DIO2 (111.02 D/O delayed status, bit 2).	12
	EFB MCW bit 11	-	32
119.12	Ext1 ctrl mode1	Selects operating mode 1 for external control location EXT1.	DC control/ List
	DC control	DC control.	0
	Power control	Active power control.	1
	DC control with power balancing	DC control with power balancing.	2
119.14	Ext2 ctrl mode1	Selects operating mode 1 for external control location EXT2.	Power control/ List
	DC control	DC control.	0
	Power control	Active power control.	1
	DC control with power balancing	DC control with power balancing.	2
119.16	Local ctrl mode	Selects control mode for local control. Note: This parameter cannot be changed while the inverter is running	Power control/ List
	DC control	DC control.	0
	Power control	Active power control.	1
	DC control with power balancing	DC control with power balancing.	2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
119.17	Local ctrl disable	Enables/disables local control. If you disabled local control, the Loc/Rem key of the panel cannot be used for changing to local control.  WARNING! Before disabling local control, make sure that the control panel is not needed for stopping the inverter.	Yes/ List
	No	Local control enabled.	0
	Yes	Local control disabled.	1
121 Fast power off		Emergency stop settings.	
121.01	Fast power off mode	Selects fast power off (FPO) mode.	Fault/ List
	Stop and warning		0
	Warning		1
	Fault		2
121.02	Fast power off source	Sets input used as source for FPO signal.	DI2/ List
	Active (false)	0.	0
	Inactive (true)	1.	1
	DI1	Digital input DI1 (110.02 DI delayed status , bit 0).	2
	DI2	Digital input DI2 (110.02 DI delayed status , bit 1).	3
	DI3	Digital input DI3 (110.02 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.	4
	DI4	Digital input DI4 (110.02 DI delayed status , bit 3).	5
	DI5	Digital input DI5 (110.02 DI delayed status , bit 4).	6
	DI6	Digital input DI6 (110.02 DI delayed status , bit 5).	7
123 DC voltage reference		DC voltage reference selection, limitation and ramping.	
123.01	User DC voltage ref	Allows writing DC voltage reference value.	800.00 V/ Real
	0.00...2000.00 V	DC voltage reference.	100 = 1 V
123.02	DC ref sel	Selects control location for DC voltage reference.	MPPT/ List
	User ref		0
	AI1 scaled		1
	AI2 scaled		2
	FB A ref1		3
	FB A ref2		4
	DDCS ctrl ref1		5
	DDCS ctrl ref2		6
	MPPT		7
	Other	See Terms and abbreviations on page 59.	-
123.03	DC voltage ref 1	Shows DC voltage reference from parameter 123.01 User DC voltage ref or 123.02 DC ref sel . This parameter is read-only.	-/ Real
	0.00...2000.00 V		100 = 1 V

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
124 Reactive power reference		Settings for reactive power reference selection, limitation and ramping.	
124.01	User Qref	Writes reactive power reference value. The unit is selected with parameter 124.06 Q power ref type .	- / Real
	-	Reactive power reference value	1 = 1 %/ 100 = 1 %
124.02	Q power ref selection	Selects control location for reactive power reference.	User ref/ List
	User ref	Value of parameter 124.01 User Qref .	0
	AI1 scaled	Parameter 112.12 AI1 scaled value .	1
	AI2 scaled	Parameter 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	Parameter 103.11 DDCS controller ref 1 .	5
	DDCS ctrl ref2	Parameter 103.12 DDCS controller ref 2 .	6
124.03	Qref 1	Shows reactive power reference selected by 124.01 User Qref or 124.02 Q power ref selection . This parameter is read-only.	- / Real
	-	Reactive power reference value	1 = 1 kVAr/ 100 = 1 kVAr
124.04	Q ref scale	Defines scaling factor for 124.03 Qref 1 .	1.00 / Real
	-1000.00 ... 1000.00	Scaling factor.	1 = 1/ 100 = 1
124.05	Qref 2	Shows reactive power reference value (124.03 Qref 1) after scaling. This parameter is read-only.	- / Real
	-3464.10...3464.10 kVAr	Reactive power reference value	1 = 1 kVAr/ 100 = 1 kVAr
124.06	Q power ref type	Selects reactive power reference type and unit. Note: The contents of the parameter group vary according to the selected power reference type.	Qref [kVAr]/ List
	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 = 1 degree.	4
	CosPhi	Reactive power reference in cosphi 0.9 = 0.9 capacitive.	5
	AC volt ref [V]	Voltage reference for the AC voltage control in Volts.	6
	AC volt ref [%]	Voltage reference for the AC voltage control in %.	7
	Q(x) regulation curve	Q(x) regulation curve.	8
124.07	Ireact ref %	Shows reactive current reference in percent. This parameter is read-only.	- / Real
	-1000.0 ... 1000.0 %	Reactive current reference in percent.	1 = 1 %/ 10 = 1 %

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
124.08	Ireact ref	Shows reactive current reference in Amperes. This parameter is read-only.	- / <i>Real</i>
	-	Reactive current reference.	1 = 1 A/ 100 = 1 A
124.09	Q power ref %	Shows reactive power reference in percent of the nominal power. This parameter is read-only.	- / <i>Real</i>
	-1000.0 ... 1000.0 %	Reactive power reference in percent.	1 = 1 %/ 10 = 1 %
124.10	Q power ref	Shows reactive power reference in kVAr. This parameter is read-only.	- / <i>Real</i>
	-	Reactive power reference in kVAr.	1 = 1 kVAr/ 10 = 1 kVAr
124.11	Ireact ref max %	Defines maximum limit for the reactive power reference in percent.	120.0 %/ <i>Real</i>
	0.0 ... 200.0 %	Maximum reactive current reference in percent.	1 = 1 %/ 10 = 1 %
124.12	Ireact ref min %	Defines minimum limit for the reactive power reference in percent.	-120.0 %/ <i>Real</i>
	-200.0 ... 0.0 %	Minimum reactive current reference in percent.	10 = 1 %
124.13	Ireact ref lim %	Shows output reactive power reference limitation. Limitation is based on 124.11 Ireact ref max % and 124.12 Ireact ref min % values. This parameter is read-only.	- / <i>Real</i>
	-200.0 ... 200.0 %	Output value of reactive power reference limitation.	10 = 1 %
124.14	Ireact ref ramp up	Defines reactive current ramp up time (time from zero to nominal current).	1000 ms / <i>Real</i>
	0 ... 60000 ms	Reactive current ramp up time in milliseconds.	1 = 1 ms
124.15	Ireact ref ramp down	Defines reactive current ramp down time (time from nominal current to zero).	1000 ms / <i>Real</i>
	0 ... 60000 ms	Reactive current ramp down time in milliseconds.	1 = 1 ms
124.16	Ireact ref out %	Shows percent of output reactive current reference for the controller. This parameter is read-only.	- / <i>Real</i>
	-200.0 ... 200.0 %	Output value of reactive current reference in %.	1 = 1 %/ 10 = 1 %
124.17	Ireact ref out	Shows output 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. This parameter is read-only.	- / <i>Real</i>
	-	Output value of reactive current reference in Amperes.	1 = 1 A/ 100 = 1 A

72 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
124.18	Q power ref out %	Shows output value of reactive power reference in percent of the nominal power for the controller. This parameter is read-only.	- / <i>Real</i>
	-200.0 ... 200.0 %	Output value of reactive power reference.	1 = 1 %/ 10 = 1 %
124.19	Q power ref out	Shows output value of reactive power reference in kVAr for the controller. This parameter is read-only.	- / <i>Real</i>
	-	Output value of reactive power reference.	1 = 1 kVAr/ 10 = 1 kVAr
124.20	AC control gain	Defines relative gain of the AC voltage controller used in the reactive power reference chain.	10.0 / <i>Real</i>
	0.0 ... 100.0	Relative gain of the AC voltage controller.	10 = 1
124.21	AC control integ time	Defines integration time of the AC voltage controller used in the reactive power reference chain.	100 ms / <i>Real</i>
	0 ... 30000 ms	Integration time of the AC voltage controller.	1 = 1 ms
124.22	AC diff max %	Defines maximum limit for AC voltage difference (reference - actual) used in the reactive power reference chain.	10.0 % / <i>Real</i>
	0.0 ... 30.0 %	Maximum limit of AC control input.	1 = 1 %/ 10 = 1 %
124.23	AC diff min %	Defines minimum limit for the AC voltage difference (reference - actual) used in the reactive power reference chain.	-10.0 % / <i>Real</i>
	-30.0 ... 0.0 %	Minimum limit of AC control input.	1 = 1 %/ 10 = 1 %
124.27	AC control base grid voltage	Defines AC control base value for grid voltage estimate. The value of this parameter is used to convert voltages to power unit.	400 V / <i>Real</i>
	100 ... 1000 V	AC control base value for grid voltage estimate.	1 = 1 V
124.30	Q(x) curve	Selects input signal used in Q(x) regulation curve.	Q(U) / <i>List</i>
	Q(U)	Input: grid AC voltage Output: reactive power reference	0
	Q(P)	Input: actual power Output: reactive power reference	1
	CosPhi(P)	Input: actual power Output: cos phi	2
124.31	Lock-in level	Defines lock-in level above which the Q(x) regulation curve is activated.	20.0 % / <i>Real</i>
	0.0 ... 200.0 %	Lock-in level.	1 = 1 %/ 10 = 1 %
124.32	Lock-out level	Defines 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 % / <i>Real</i>
	0.0 ... 200.0 %	Lock-out level.	1 = 1 %/ 10 = 1 %

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
124.33	Q(x) input level 1	Defines 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 %/ Real
	-	First input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.34	Q(x) input level 2	Defines second input value for the Q(x) regulation curve.	0.0 %/ Real
	-	Second input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.35	Q(x) input level 3	Defines third input value for the Q(x) regulation curve.	0.0 %/ Real
	-	Third input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.36	Q(x) input level 4	Defines fourth input value for the Q(x) regulation curve.	0.0 %/ Real
	-	Fourth input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.37	Q(x) input level 5	Defines fifth input value for the Q(x) regulation curve.	0.0 %/ Real
	-	Fifth input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.38	Q(x) input level 6	Defines sixth input value for the Q(x) regulation curve.	0.0 %/ Real
	-	Sixth input value for the Q(x) regulation curve.	1 = 1 %/ 10 = 1 %
124.39	Q(x) output level 1	Defines 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.	0.0 % / Real
	-	First reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %
124.40	Q(x) output level 2	Defines second reference output value for the Q(x) regulation curve.	0.0 % / Real
	-	Second reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %
124.41	Q(x) output level 3	Defines third reference output value for the Q(x) regulation curve.	0.0 % / Real
	-	Third reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %
124.42	Q(x) output level 4	Defines fourth reference output value for the Q(x) regulation curve.	0.0 % / Real
	-	Fourth reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %
124.43	Q(x) output level 5	Defines fifth reference output value for the Q(x) regulation curve.	0.0 % / Real
	-	Fifth reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %

74 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
124.44	Q(x) output level 6	Defines sixth reference output value for the Q(x) regulation curve.	0.0 % / Real
	-	Sixth reference output value for the Q(x) regulation curve.	1 = 1 % / 100 = 1 %
124.45	Q(U) activation delay	Defines activation delay time for Q(U) regulation curve.	0 ms/ Real
	0...30000 ms	Delay time	1 = 1 ms
124.46	Q(U) activation level low	Defines minimum activation level for Q(U) regulation curve.	100 %/ Real
	0...200 %	Delay time	1 = 1 %
124.47	Q(U) activation level high	Defines maximum activation level for Q(U) regulation curve.	100 %/ Real
	0...200 %	Delay time	1 = 1 %
125 FRT support curve		Settings for FRT support curve.	
125.01	Grid support	Selects Grid support mode.	Disable/ List
	Disabled	Grid support is disabled.	0
	No support	Grid support current is set to zero.	1
	K-factor	Grid support current is defined by starting point (P1) and grid support gains.	2
	Curve points	Grid support current is defined by curve points.	3
125.02	Gs symm sig	Selects grid support voltage signal of symmetric dip.	Max phase rms voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
125.03	Gs asymm sig	Selects grid support voltage signal of asymmetric dip.	Max phase rms voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
125.04	Lv Gs trig U %	Defines low voltage grid support trigger level.	90 %/ Real
	0 ... 100 %	Low voltage grid support trigger level.	1 = 1 %
125.05	Lv Gs K-factor	Defines low voltage grid support gain for capacitive reactive current.	1.00 / Real
	0.00 ... 10.00	Low voltage grid support gain for capacitive reactive current.	100 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
125.06	Lv Gs P1 volt %	Defines low voltage grid support level 1. When the voltage falls below given level, the grid is supported by feeding capacitive reactive current.	90 %/Real
	0 ... 100 %	Low voltage grid support level 1	1 = 1 %
125.07	Lv Gs P1 cur %	Defines capacitive reactive current for low voltage grid support level 1.	25 %/Real
	0 ... 100 %	Capacitive reactive current for low voltage grid support level 1.	1 = 1 %
125.08	Lv Gs P2 volt %	Defines low voltage grid support level 2. When the voltage falls below given level, the grid is supported by feeding capacitive reactive current.	80 %/Real
	0 ... 100 %	Low voltage grid support level 2	1 = 1 %
125.09	Lv Gs P2 cur %	Defines capacitive reactive current for low voltage grid support level 2.	50 %/ Real
	0 ... 100 %	Capacitive reactive current for low voltage grid support level 2	1 = 1 %
125.10	Lv Gs P3 volt %	Defines low voltage grid support level 3. When the voltage falls below given level, the grid is supported by feeding capacitive reactive current.	60 %/ Real
	0 ... 100 %	Low voltage grid support level 3.	1 = 1 %
125.11	Lv Gs P3 cur %	Defines capacitive reactive current for low voltage grid support level 3.	80 %/ Real
	0 ... 100 %	Capacitive reactive current for low voltage grid support level 3	1 = 1 %
125.12	Lv Gs P4 volt %	Defines low voltage grid support level 4. When the voltage falls below given level, the grid is supported by feeding capacitive reactive current.	25 %/ Real
	0 ... 100 %	Low voltage grid support level 4	1 = 1 %
125.13	Lv Gs P4 cur %	Defines capacitive reactive current for low voltage grid support level 4.	100 %/ Real
	0 ... 100 %	Capacitive reactive current for low voltage grid support level 4.	1 = 1 %
125.14	Lv Gs P5 volt %	Defines low voltage grid support level 5. When the voltage falls below given level, the grid is supported by feeding capacitive reactive current.	0 %/ Real
	0 ... 100 %	Low voltage grid support level 5.	1 = 1 %
125.15	Lv Gs P5 cur %	Defines capacitive reactive current for low voltage grid support level 5.	100 %/ Real
	0 ... 100 %	Capacitive reactive current for low voltage grid support level 5.	1 = 1 %
125.18	Hv Gs trig U %	Defines high voltage grid support trigger level.	110 %/ Real
	100 ... 150 %	High voltage grid support trigger level.	1 = 1 %

76 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
125.19	Hv Gs K-factor	Sets high voltage grid support gain for inductive reactive current.	1.00 / <i>Real</i>
	0.00 ... 10.00	High voltage grid support gain for inductive reactive current.	100 = 1
125.20	Hv Gs P1 volt %	Defines high voltage grid support level 1. When the voltage rises above given level, the grid is supported by feeding inductive reactive current.	110 %/ <i>Real</i>
	90 ... 150 %	High voltage grid support level 1.	1 = 1 %
125.21	Hv Gs P1 cur %	Defines inductive reactive current for high voltage grid support level 1.	-10 %/ <i>Real</i>
	-100 ... 0 %	Inductive reactive current for high voltage grid support level 1.	1 = 1 %
125.22	Hv Gs P2 volt %	Defines high voltage grid support level 2. When the voltage rises above given level, the grid is supported by feeding inductive reactive current.	125 %/ <i>Real</i>
	90 ... 150 %	High voltage grid support level 2.	1 = 1 %
125.23	Hv Gs P2 cur %	Defines inductive reactive current for high voltage grid support level 2.	-30 %/ <i>Real</i>
	-100 ... 0 %	Inductive reactive current for high voltage grid support level 2.	1 = 1 %
125.24	Hv Gs P3 volt %	Defines high voltage grid support level 3. When the voltage rises above given level, the grid is supported by feeding inductive reactive current.	150 %/ <i>Real</i>
	90 ... 150 %	High voltage grid support level 3.	1 = 1 %
125.25	Hv Gs P3 cur %	Defines inductive reactive current for high voltage grid support level 3.	-50 %/ <i>Real</i>
	-100 ... 0 %	Inductive reactive current for high voltage grid support level 3.	1 = 1 %
125.28	Frt Ireact ref ramp up	Defines FRT reactive current ramp up time.	10 ms/ <i>Real</i>
	0 ... 1000 ms	FRT reactive current ramp up time.	1 = 1 ms
125.29	Frt Ireact ref ramp down	Defines FRT reactive current ramp down time.	10 ms/ <i>Real</i>
	0 ... 1000 ms	FRT reactive current ramp down time.	1 = 1 ms
125.30	Frt Ipow ref ramp up	Defines FRT active current ramp up time.	10 ms/ <i>Real</i>
	0 ... 1000 ms	FRT active current ramp up time.	1 = 1 ms
125.31	Frt Ipow ref ramp down	Defines FRT active current ramp down time.	10 ms/ <i>Real</i>
	0 ... 1000 ms	FRT active current ramp down time.	1 = 1 ms
125.32	Frt Ireact ref %	Shows FRT reactive current reference. This parameter is read-only.	-/ <i>Real</i>
	-200.0 ... 200.0 %	FRT reactive current reference.	1 = 1 %/ 10 = 1 %
125.33	Frt Ireact ref out %	Shows ramped FRT reactive current reference. This parameter is read-only.	-/ <i>Real</i>
	-200.0 ... 200.0 %	Ramped FRT reactive current reference.	1 = 1 %/ 10 = 1 %

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
125.34	FrIpow ref %	Shows FRT active current reference. This parameter is read-only.	- / Real
	-200.0 ... 200.0 %	FRT active current reference.	1 = 1 %/ 10 = 1 %
125.35	FrIpow ref out %	Shows ramped FRT active current reference. This parameter is read-only.	- / Real
	-200.0 ... 200.0 %	Ramped FRT active current reference.	1 = 1 %/ 10 = 1 %
125.36	Gs after dip time	Defines duration of grid support after reaching the normal voltage region.	500 ms/ Real
	0 ... 300000 ms	Duration of grid support.	- / 1 = 1 ms
125.37	FrImax %	Defines total current limit in percentage of nominal current at FRT function.	100 %/ Real
	0 ... 200 %	Total current limit in percentage of nominal current at FRT function.	1 = 1 %
125.49	Gs prefault average time	Defines averaging window time for grid support reference voltage and grid support base current.	60 s/ Real
	1 ... 300 s	Averaging window time	1 = 1 s
125.50	Gs base current	Selects base level for the reactive current calculated by the grid support function.	Prefault average current/ List
	Zero	Base current is zero.	0
	Prefault average current	Base current is sliding average of reactive current. Average time is determined by parameter 125.49 Gs <i>prefault average time</i> .	2
125.51	Gs reference voltage	Selects reference level for the AC voltage for the grid support function.	Prefault average voltage/ List
	Nominal voltage	Nominal voltage is used to calculate the fault ride through (FRT) grid support current.	0
	Prefault average voltage	Sliding average for AC voltage used in grid support. Time for average is determined in parameter 125.49 GS <i>prefault average time</i> .	2
125.52	Gs average voltage	Selects grid support averaging voltage selection. When reference voltage is set as 60 s average, this parameter defines which voltage is used to calculate the average voltage.	Pos seq voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
125.53	Gs active power reserve	Defines active power reserve in fault ride through.	0 %/ Real
	0 ... 100 %	Active power reserve in fault ride through.	1 = 1 %

No.	Bit/Name/Value/ Range	Description	Def/Type
125.54	Gs max reserve current	Defines maximum active current reserve in fault ride through. This limits reserve current because scaling between power and current may be complicated when grid voltage is very low.	10 %/ Real
	0 ... 100 %	Maximum active current reserve in fault ride through.	1 = 1 %
126 FRT tripping curve		Settings for FRT tripping curve.	
126.01	FRT enable	Enables FRT function.	No/ List
	No	FRT function disabled.	0
	Yes	FRT function enabled.	1
126.02	Lv Rt symm sig	Selects voltage signal of low voltage symmetric dip.	Pos seq voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.03	Lv Rt asymm sig	Selects voltage signal of low voltage asymmetric dip.	Pos seq voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.04	Hv Rt symm sig	Selects voltage signal of high voltage symmetric dip.	Max phase rms voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4
126.05	Hv Rt asymm sig	Selects voltage signal of high voltage asymmetric dip.	Max phase rms voltage/ List
	Max LL rms voltage	Maximum rms value of line-to-line voltage.	0
	Min LL rms voltage	Minimum rms value of line-to-line voltage.	1
	Max phase rms voltage	Maximum rms value of phase voltage.	2
	Min phase rms voltage	Minimum rms value of phase voltage.	3
	Pos seq voltage	Positive sequence component of voltage.	4

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
126.06	Asymm/symm limit	Defines asymmetric dip limit. (Uneg_seq/Upos_seq) > limit.	3 %/ <i>Real</i>
	0 ... 100 %	Asymmetric dip limit	1 = 1 %
126.10	Lv Rt trig U %	Enables LVRT function if mains voltage is below trig level.	85 %/ <i>Real</i>
	0 ... 100 %	LVRT trigger level	1 = 1 %
126.11	Lv Rt recover hyst U %	Defines LVRT function recover hysteresis. Note: If mains voltage is above limit (Lv Rt trig U % + Lv Rt recover hyst U %) LVRT function is disabled.	5 %/ <i>Real</i>
	0 ... 20 %	LVRT function recover hysteresis.	1 = 1 %
126.12	Lv Rt sec 1 time	Defines LVRT section 1 duration.	600 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section 1 duration.	1 = 1 ms
126.13	Lv Rt sec 2 time	Defines LVRT section 2 duration.	600 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section 2 duration.	1 = 1 ms
126.14	Lv Rt sec 3 time	Defines LVRT section 3 duration.	600 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section 3 duration.	1 = 1 ms
126.15	Lv Rt sec 4 time	Defines LVRT section 4 duration.	600 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section 4 duration.	1 = 1 ms
126.16	Lv Rt sec 5 time	Defines LVRT section 5 duration.	600 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section 5 duration.	1 = 1 ms
126.17	Lv Rt ext time	Defines LVRT section extended time. If time is greater than 0, LVRT section extended is enabled.	0 ms/ <i>Real</i>
	0 ... 300000 ms	LVRT section extended time.	1 = 1 ms
126.18	Lv Rt S1 start U %	Defines starting voltage level of section 1.	0 %/ <i>Real</i>
	0 ... 100 %	Starting voltage level of the section 1.	1 = 1 %
126.19	Lv Rt S1 end U %	Defines final voltage level of section 1.	0 %/ <i>Real</i>
	0 ... 100 %	Final voltage level of the section 1.	1 = 1 %
126.20	Lv Rt S2 start U %	Defines starting voltage level of section 2.	0 %/ <i>Real</i>
	0 ... 100 %	Starting voltage level of the section 2.	1 = 1 %
126.21	Lv Rt S2 end U %	Defines final voltage level of section 2.	20 %/ <i>Real</i>
	0 ... 100 %	Final voltage level of the section 2.	1 = 1 %
126.22	Lv Rt S3 start U %	Defines starting voltage level of section 3.	20 %/ <i>Real</i>
	0 ... 100 %	Starting voltage level of the section 3.	1 = 1 %
126.23	Lv Rt S3 end U %	Defines final voltage level of section 3.	40 %/ <i>Real</i>
	0 ... 100 %	Final voltage level of the section 3	1 = 1 %
126.24	Lv Rt S4 start U %	Defines starting voltage level of section 4.	40 %/ <i>Real</i>
	0 ... 100 %	Starting voltage level of the section 4.	1 = 1 %
126.25	Lv Rt S4 end U %	Defines final voltage level of section 4.	60 %/ <i>Real</i>
	0 ... 100 %	Final voltage level of the section 4.	1 = 1 %

80 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
126.26	Lv Rt S5 start U %	Defines starting voltage level of section 5.	60 %/ <i>Real</i>
	0 ... 100 %	Starting voltage level of the section 5.	1 = 1 %
126.27	Lv Rt S5 end U %	Defines final voltage level of section 5.	80 %/ <i>Real</i>
	0 ... 100 %	Final voltage level of the section 5.	1 = 1 %
126.28	Lv Rt ext U %	Defines voltage level of extended section.	80 %/ <i>Real</i>
	0 ... 100 %	Voltage level of extended section.	1 = 1 %
126.30	Hv Rt trig U %	Defines HVRT trigger level. If mains voltage is above trigger level, HVRT function is enabled.	115 %/ <i>Real</i>
	0 ... 150 %	HVRT trigger level.	1 = 1 %
126.31	Hv Rt recover hyst U %	Defines HVRT function recover hysteresis. If mains voltage is below limit (Hv Rt trig U % - Hv Rt recover hyst U %), HVRT function is disabled.	5 %/ <i>Real</i>
	0 ... 20 %	HVRT function recover hysteresis.	1 = 1 %
126.32	Hv Rt sec 1 time	Defines HVRT section 1 duration.	100 ms/ <i>Real</i>
	0 ... 5000 ms	HVRT section 1 duration.	1 = 1 ms
126.33	Hv Rt sec 2 time	Defines HVRT section 2 duration.	400 ms/ <i>Real</i>
	0 ... 5000 ms	HVRT section 2 duration.	1 = 1 ms
126.34	Hv Rt sec 3 time	Defines HVRT section 3 duration.	2000 ms/ <i>Real</i>
	0 ... 5000 ms	HVRT section 3 duration.	1 = 1 ms
126.37	Hv Rt S1 start U %	Defines starting voltage level of section 1.	130 %/ <i>Real</i>
	0 ... 150 %	Starting voltage level of the section 1.	1 = 1 %
126.38	Hv Rt S1 end U %	Defines final voltage level of section 1.	130 %/ <i>Real</i>
	0 ... 150 %	Final voltage level of the section 1.	1 = 1 %
126.39	Hv Rt S2 start U %	Defines starting voltage level of section 2.	120 %/ <i>Real</i>
	0 ... 150 %	Starting voltage level of the section 2.	1 = 1 %
126.40	Hv Rt S2 end U %	Defines final voltage level of section 2.	120 %/ <i>Real</i>
	0 ... 150 %	Final voltage level of the section 2.	1 = 1 %
126.41	Hv Rt S3 start U %	Defines starting voltage level of section 3.	115 %/ <i>Real</i>
	0 ... 150 %	Starting voltage level of the section 3.	1 = 1 %
126.42	Hv Rt S3 end U %	Defines final voltage level of section 3.	115 %/ <i>Real</i>
	0 ... 150 %	Final voltage level of the section 3.	1 = 1 %
130 Limits		Operation limits of the inverter.	
130.01	Limit word 1	Shows active power limitation status. This parameter is read-only.	0x0000/ <i>Bit list</i>
	b0:P reference max		
	b1: P reference min		
	b2: User P max	Parameter 130.49 <i>User power limit min %</i> is limiting.	
	b3: User P min		
	b4: Reserved		

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b5: Power ramp gradient		
	b6: Stop ramp		
	b7: P(f)		
	b8: Grid restore ramp		
	b9: Grid connect ramp		
	b10: External P limit		
	b11: FRT recovery ramp		
	b12: P(U)		
	b13: Flat-top		
	b14: Input current		
	b15: Grid current		
130.02	Limit word 2	Shows reactive power limitation status. This parameter is read-only.	0x0000/ Bit list
130.04	Limit word 4	Shows current based limitation status. This parameter is read-only.	0x0000/ Bit list
	b0...b1: Reserved		
	b2: I max user		
	b3: Iout Temperature		
	b4: MV Station limit		
	b5...b6: Reserved		
	b7: Nominal power		
	b8 ... b15: Reserved		
130.05	Limit word 5	Shows temperature based input current limitation status. This parameter is read-only.	0x0000/ Bit list
	b0: Idc CS temperature		
	b1: Idc PS temperature		
	b2: Idc IGBT temper- ature		
	b3: Idc LCL temperature		
	b4: Idc ambient temper- ature		
	b5: Power section 1		
	b6: Power section 2		
	b7: Power section 3		
	b8: Power section 4		
	b9 ... b15: Reserved		
130.06	Limit word 6	Shows temperature based grid current limitation status. This parameter is read-only.	0x0000/ Bit list
	b0: Iout CS temperature		
	b1: Iout PS temperature		
	b2: Iout IGBT temper- ature		

82 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
	b3: lout LCL temper- ature		
	b4: lout ambient temperature		
	b5...b15: Reserved		
130.11	Active power limit to grid	Shows maximum allowed active power to grid. This parameter is read-only.	-/ <i>Real</i>
	-		1 = 1 kW
130.13	Reactive power limit	Shows maximum allowed reactive power. This parameter is read-only.	-/ <i>Real</i>
	-		1 = 1 kVAr
130.62	P(f) limit type	Selects P(f) limiter type.	Disabled/ <i>List</i>
	Disabled		0
	Free running		1
	Incremental		2
130.63	P(f) corner frequency	Defines corner frequency where limitation started.	0.20 Hz/ <i>Real</i>
	0.00...30.00 Hz	P(f) corner frequency	100 = 1 Hz
130.64	P(f) limit gradient	Sets limit gradient in percent of corner power or Hz.	40.0 %/Hz/ <i>Real</i>
	0.0...200.0 %/Hz	Limit gradient in percent of corner power or Hz.	10 = 1 %/Hz
130.65	P(f) release frequency	Defines frequency where limitation is release and ramping the limit up is started.	0.20 Hz/ <i>Real</i>
	0.00...30.00 Hz	Release frequency	100 = 1 Hz
130.66	P(f) release time	Defines delay time after frequency dropped below release frequency before ramping the limit up is started.	0 s/ <i>Real</i>
	0...600 s	Delay time	1 = 1 s
130.67	P(f) release ramp	Defines P(f) limit ramp used after releasing the limit.	10 %/min/ <i>Real</i>
	0...600 %/min	Release ramp	1 = 1 %/min
130.68	P(f) release ramp ref	Selects release ramp reference of the P(f) limiter.	Nominal/ <i>List</i>
	Nominal		1
	Corner power		2
	Pdelta		3
130.69	P(f) activation delay	Sets delay time before activating the functionality.	0 ms/ <i>Real</i>
	0...5000 ms	Delay time	1 = 1 ms
130.70	Connect limit type	Selects connect limit type.	Off/ <i>List</i>
	Off		0
	After grid fault		1
	Always		2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
130.71	Connect limit ramp	Sets active power ramp used after connecting to grid.	10%/min/ <i>Real</i>
	0...600 %/min	Active power ramp.	1 = 1 %/min
130.72	Grid fault ramp	Sets ramp used in reconnection after grid fault.	10%/min/ <i>Real</i>
	0...600 %/min	Ramp	1 = 1 %/min
130.75	External power limit	Defines external active power limit, e.g., from fieldbus.	200%/ <i>Real</i>
	0...200 %	External power limit.	1 = 1 %
130.76	P(U) limiter	Selects P(U) limiter type.	Disable/ <i>List</i>
	Disable		0
	Constant limit		1
	Droop limit		2
130.77	P(U) trigger level	Defines P(U) trigger level.	110%/ <i>Real</i>
	0...200 %	P(U) trigger level.	1 = 1 %
130.78	P(U) release level	Defines P(U) release level.	110%/ <i>Real</i>
	0...200 %	P(U) release level.	1 = 1 %
130.79	P(U) limit level	Defines P(U) limit level.	20%/ <i>Real</i>
	0...100 %	P(U) limit level.	1 = 1 %
130.80	P(U) limit ramp	Defines P(U) limit ramp.	50%/min/ <i>Real</i>
	0...100 %	P(U) limit ramp.	1 = 1 %/min
130.81	P(U) release ramp	Defines P(U) release ramp.	20%/min/ <i>Real</i>
	0...100 %/min	P(U) release ramp.	1 = 1 %/min
130.82	P(U) end level	Sets voltage level where power limitation reached maximum limitation.	115%/ <i>Real</i>
	0...200 %	P(U) end level.	1 = 1 %
130.83	P(U) filtering time constant	Sets time constant for P(U) voltage filtering.	1 s/ <i>Real</i>
	0...90 s	P(U) voltage filtering time constant.	1 = 1 s
130.84	P(U) used power	Sets used power for P(U) limitation. When trigger limit is exceeded, used power is either nominal power or active power.	Trigger level power/ <i>List</i>
	Trigger level power		0
	Nominal power		1
130.90	Flat-top limit	Sets a fixed power limit. The setting can be used to limit the capability of active power production.	200%/ <i>Real</i>
	0...200 %	Flat-top limit	1 = 1 %
130.92	Active power ramping	Enables active power ramping.	Disable/ <i>List</i>
	Disable	Active power ramping disabled.	0
	Enable	Active power ramping enabled.	1

84 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
130.93	Active power ramp	Defines active power ramp value.	100 %/min/ <i>Real</i>
	0...6000 %/min	Active power ramp	1 = 1 %/min
130.94	Shut down ramp	Defines shut down ramp value.	100%/s/ <i>Real</i>
	1...1000 %/s	Shut down ramp	1 = 1 %/s
130.95	Active power margin	Defines active power margin.	1.0%/ <i>Real</i>
	0.0...5.0 %	Active power margin.	10 = 1 %
130.98	External limit ramp up	Defines external limit ramp up value.	1000 ms/ <i>Real</i>
	0...60000 ms	External limit ramp up	1 = 1 ms
130.99	External limit ramp down	Defines external limit ramp down value.	1000 ms/ <i>Real</i>
	0...60000 ms	External limit ramp down	1 = 1 ms
130.101	Limit priority	Defines priority of active current or reactive current when current must be limited.	Active current/ <i>List</i>
	Active current		0
	Reactive current		1
132 Autoreset		Settings for Autoreset function.	
132.01	Autoreset counter	Shows number of autoresets. This parameter is read-only. Note: Counter can be cleared to allow better monitoring.	0 / <i>Real</i>
	0...4294967295	Number of autoresets.	1 = 1
132.03	Overcurrent trials	Defines number of overcurrent fault autoreset trials.	0/ <i>Real</i>
	0 ... 20	Number of overcurrent fault autoreset trials.	1 = 1
132.04	Overcurrent reset delay	Defines delay time for overcurrent fault autoreset.	10 s/ <i>Real</i>
	1 ... 3000 s	Overcurrent fault autoreset delay.	1 = 1 s
132.06	Short circuit current reset delay	Defines delay time for short circuit fault autoreset.	10 s/ <i>Real</i>
	1 ... 3000 s	Short circuit fault autoreset delay.	1 = 1 s
132.07	Ground impedance trials	Defines number of ground impedance fault autoreset trials.	0/ <i>Real</i>
	0 ... 100	Number of ground impedance fault autoreset trials.	1 = 1
132.08	Ground impedance reset delay	Defines delay time for ground impedance fault autoreset.	900 s/ <i>Real</i>
	1 ... 7200 s	Ground impedance fault autoreset delay.	1 = 1 s

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
135 Grid monitoring		Settings for grid monitoring.	
135.01	Grid code	Selects installation grid code. Changing this value sets default and/or mandatory values for all other grid parameters. This value is initially set by first start assistant.	Not selected/ List
	Not selected	Grid code not selected	0
	Custom		6
	Dubai		10
	Egypt		11
	ERCOT		12
	Germany		16
	HECO		17
	IEEE 1547		18
	Italy		20
	Jordan IRR-TIC		21
	Jordan IRR-DCC-MV		22
	Romania		25
	Rule 21		26
	South Africa		28
	Turkey		37
	WECC		39
135.02	Nominal LL voltage	Defines nominal line-to-line voltage.	400 V/ Real
	100...1000 V	Nominal line-to-line voltage.	1 = 1 V
135.04	Nominal frequency	Selects nominal grid frequency.	50 Hz/ List
	50 Hz		0
	60 Hz		1
135.10	Initial connection delay	Defines delay time for initial grid connection.	5 s/ Real
	5...300 s	Time delay for initial grid connection.	1 = 1 s
135.11	Reconnection delay	Defines delay time for reconnection.	60 s/ Real
	3...300 s	Reconnection time delay.	1 = 1 s
135.12	Quick disturbance limit	Defines limit for quick disturbance protection.	0 s/ Real
	0...300 s	Quick disturbance protection limit.	1 = 1 s
135.13	Quick reconnection delay	Defines delay time for quick reconnection.	5 s/ Real
	0...300 s	Quick reconnection time delay	1 = 1 s
135.16	External trip	Defines signal for external grid monitoring trip. Inverter is disconnected from the AC grid.	0 / Real
	0 ... 1	Signal for external grid monitoring trip.	1 = 1
135.19	Zero cross monitor enable	Enables zero cross detection in grid monitoring.	1 / Real
	0...1	Zero cross detection in grid monitoring	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
135.20	Connect underfrequency type	Selects connection type for under frequency protection.	Discon-nected/ <i>List</i>
	Disabled	Under frequency protection disabled.	0
	Disconnected	Under frequency disconnected.	1
	Reconnection	Under frequency reconnected.	2
135.21	Connect underfrequency limit	Defines underfrequency limit used only when connected to grid. When the inverter is connected this limit is disabled. See also parameter 135.20 Connect underfrequency type.	-2.00 Hz/ <i>Real</i>
	-30.00...0.00 Hz	Underfrequency connection limit.	1 = 1 Hz/ 100 = 1 Hz
135.22	Connect overfrequency type	Selects connection type for overfrequency protection.	Discon-nected/ <i>List</i>
	Disabled	Limit is disabled.	0
	Disconnected	Limit is enabled when the inverter is disconnected from the grid.	1
	Reconnection	Limit is enabled when inverter trips to overfrequency.	2
135.23	Connect overfrequency limit	Defines overfrequency limit that is used only when connected to the grid. When the inverter is connected this limit is disabled. See also parameter 135.22 Connect overfrequency type.	2.00 Hz/ <i>Real</i>
	0.00...30.00 Hz	Overfrequency connection limit.	1 = 1 Hz/ 100 = 1 Hz
135.24	Connect undervoltage type	Enables undervoltage protection. Defines how 135.25 Connect undervoltage limit behaves.	Disable/ <i>List</i>
	Disable	Undervoltage protection disabled. Does not check the limit defined in parameter 135.25 Connect undervoltage limit.	0
	Enable	Undervoltage protection enabled. Connection to grid is allowed only when grid voltage is above the limit defined in parameter 135.25 Connect undervoltage limit.	1
135.25	Connect undervoltage limit	Defines undervoltage limit that is used only when the inverter is not connected. The limit is disabled when inverter is connected. The purpose is to allow different connection and disconnection limits. See also parameter 135.24 Connect undervoltage type.	80 %/ <i>Real</i>
	0...100 %	Undervoltage connection limit.	1 = 1 %
135.26	Connect overvoltage type	Enables overvoltage protection. Defines how 135.27 Connect overvoltage limit behaves.	Disable/ <i>List</i>
	Disable	Overvoltage protection disabled. Does not check the limit defined in parameter 135.27 Connect overvoltage limit.	0
	Enable	Overvoltage protection enabled. Connection to grid is allowed only when grid voltage is below the limit defined in parameter 135.27 Connect overvoltage limit.	1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
135.27	Connect overvoltage limit	Defines overvoltage limit that is used only when the inverter is not connected. The limit is disabled when inverter is connected. The purpose is to allow different connection and disconnection limits. See also parameter 135.26 Connect overvoltage type.	120 %/ Real
	100...130 %	Overvoltage connection limit.	1 = 1 %
135.30	Underfrequency enable 1	Enables underfrequency protection.	1 / Real
	0...1	0 - Underfrequency protection disabled 1 - Underfrequency protection enabled	1 = 1
135.31	Underfrequency limit 1	Defines limit for underfrequency protection.	-1.0 Hz/ Real
	-30.0...0.0 Hz	Underfrquency protection limit.	1 = 1 Hz/ 10 = 1 Hz
135.32	Underfrequency time 1	Defines trip time for underfrequency protection.	100 ms/ Real
	100...600000 ms	Underfrequency trip time.	1 = 1 ms
135.33	Underfrequency enable 2	Enables underfrequency protection.	1 / Real
	0...1	0 - Underfrequency protection disabled 1 - Underfrequency protection enabled	1 = 1
135.34	Underfrequency limit 2	Defines limit for underfrequency protection.	-1.0 Hz/ Real
	-30.0...0.0 Hz	Underfrquency protection limit.	1 = 1 Hz/ 10 = 1 Hz
135.35	Underfrequency time 2	Defines trip time for underfrequency protection.	100 ms/ Real
	100...600000 ms	Underfrequency trip time.	1 = 1 ms
135.40	Overfrequency enable 1	Enables overfrequency protection.	1 / Real
	0...1	0 - Overfrequency protection disabled 1 - Overfrequency protection enabled	1 = 1
135.41	Overfrequency limit 1	Defines limit for overfrequency protection.	1.0 Hz/ Real
	0.0...30.0 Hz	Overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.42	Overfrequency time 1	Defines trip time for overfrequency protection.	100 ms/ Real
	100...600000 ms	Overfrequency trip time.	1 = 1 ms
135.43	Overfrequency enable 2	Enables overfrequency protection.	1 / Real
	0...1	0 - Overfrequency protection disabled 1 - Overfrequency protection enabled	1 = 1
135.44	Overfrequency limit 2	Defines limit for overfrequency protection.	1.0 Hz/ Real
	0.0...30.0 Hz	Overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.45	Overfrequency time 2	Defines trip time for overfrequency protection.	100 ms/ Real
	100...600000 ms	Overfrequency trip time 2.	1 = 1 ms
135.50	Undervoltage enable 1	Enables undervoltage condition 1.	1 / Real
	0...1	0 - Undervoltage condition 1 disabled. 1 - Undervoltage condition 1 enabled.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
135.51	Undervoltage limit 1	Defines limit for undervoltage condition 1.	80 %/ <i>Real</i>
	0...100 %	Undervoltage limit in %.	1 = 1 %
135.52	Undervoltage time 1	Defines tripping time for undervoltage condition 1.	100 ms/ <i>Real</i>
	100...600000 ms	Undervoltage trip time.	1 = 1 ms
135.53	Undervoltage enable 2	Enables undervoltage condition 2.	0/ <i>Real</i>
	0...1	0 - Undervoltage condition 2 disabled. 1 - Undervoltage condition 2 enabled.	1 = 1
135.54	Undervoltage limit 2	Defines limit for undervoltage condition 2.	80 %/ <i>Real</i>
	0...100 %	Undervoltage limit in %.	1 = 1 %
135.55	Undervoltage time 2	Defines tripping time for undervoltage condition 2.	100 ms/ <i>Real</i>
	100...600000 ms	Undervoltage trip time.	1 = 1 ms
135.56	Undervoltage enable 3	Enables undervoltage condition 3.	0 / <i>Real</i>
	0...1	0 - Undervoltage condition 3 disabled. 1 - Undervoltage condition 3 enabled.	1 = 1
135.57	Undervoltage limit 3	Defines limit for undervoltage condition 3.	80 %/ <i>Real</i>
	0...100 %	Undervoltage limit in %.	1 = 1 %
135.58	Undervoltage time 3	Defines tripping time for undervoltage condition 3.	100 ms/ <i>Real</i>
	100...600000 ms	Undervoltage trip time.	1 = 1 ms
135.59	Undervoltage enable 4	Enables undervoltage condition 4.	0 / <i>Real</i>
	0...1	0 - Undervoltage condition 4 disabled. 1 - Undervoltage condition 4 enabled.	1 = 1
135.60	Undervoltage limit 4	Defines limit for undervoltage condition 4.	80 %/ <i>Real</i>
	0...100 %	Undervoltage limit in %.	1 = 1 %
135.61	Undervoltage time 4	Defines tripping time for undervoltage condition 4.	100 ms/ <i>Real</i>
	100...600000 ms	Undervoltage trip time.	1 = 1 ms
135.63	Overvoltage enable 1	Enables overvoltage protection.	1 / <i>Real</i>
	0...1	0 - Overvoltage protection disabled. 1 - Overvoltage protection enabled.	1 = 1
135.64	Overvoltage limit 1	Defines limit for overvoltage protection.	110 %/ <i>Real</i>
	100...200 %	Overvoltage limit in %.	1 = 1 %
135.65	Overvoltage time 1	Defines trip time for overvoltage protection.	0 ms/ <i>Real</i>
	100...600000 ms	Overvoltage time.	1 = 1 ms
135.66	Overvoltage enable 2	Enables overvoltage protection.	1/ <i>Real</i>
	0...1	0 - Overvoltage protection disabled. 1 - Overvoltage protection enabled.	1 = 1
135.67	Overvoltage limit 2	Defines limit for overvoltage protection.	120 %/ <i>Real</i>
	100...200 %	Overvoltage limit in %.	1 = 1 %
135.68	Overvoltage time 2	Defines trip time for overvoltage protection.	100 ms/ <i>Real</i>
	100...600000 ms	Overvoltage time.	1 = 1 ms

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
135.69	Overvoltage enable 3	Enables overvoltage protection.	1 / <i>Real</i>
	0...1	0 - Overvoltage protection disabled. 1 - Overvoltage protection enabled.	1 = 1
135.70	Overvoltage limit 3	Defines limit for overvoltage protection.	130 % / <i>Real</i>
	100...200 %	Overvoltage limit in %.	1 = 1 %
135.71	Overvoltage time 3	Defines trip time for overvoltage protection.	100 ms / <i>Real</i>
	100...600000 ms	Overvoltage time.	1 = 1 ms
135.72	Overvoltage enable 4	Enables overvoltage protection.	0 / <i>Real</i>
	0...1	0 - Overvoltage protection disabled. 1 - Overvoltage protection enabled.	1 = 1
135.73	Overvoltage limit 4	Defines limit for overvoltage protection.	130 % / <i>Real</i>
	100...200 %	Overvoltage limit in %.	1 = 1 %
135.74	Overvoltage time 4	Defines trip time for overvoltage protection.	100 ms / <i>Real</i>
	100...600000 ms	Overvoltage time.	1 = 1 ms
135.75	Sliding overvoltage enable	Enables sliding overvoltage protection.	0 / <i>Real</i>
	0...1	0 - Sliding overvoltage protection disabled. 1 - Sliding overvoltage protection enabled.	1 = 1
135.76	Sliding overvoltage limit	Defines limit for sliding overvoltage protection.	120 % / <i>Real</i>
	100...200 %	Sliding overvoltage limit in %.	1 = 1 %
135.77	Sliding overvoltage time	Defines trip time for sliding overvoltage protection.	100 ms / <i>Real</i>
	100...600000 ms	Sliding overvoltage time.	1 = 1 ms
135.80	Combinatory trip	Enables combinatory protection.	0 / <i>Real</i>
	0...1	0 - Combinatory protection disabled. 1 - Combinatory protection enabled.	1 = 1
135.81	Combinatory trip time	Sets trip time for combinatory protection.	100 ms / <i>Real</i>
	100...600000 ms	Combinatory trip time.	1 = 1 ms
135.84	Comb pos seq voltage limit	Defines positive sequence voltage limit in percentage of nominal line-to-line AC voltage for combinatory protection.	130 % / <i>Real</i>
	0...200 %	Positive sequence voltage limit in %.	1 = 1 %
135.85	Comb neg seq voltage limit	Defines negative sequence voltage limit in percentage of nominal line-to-line AC voltage for combinatory protection.	10 % / <i>Real</i>
	0...200 %	Negative sequence voltage limit in %.	1 = 1 %
135.86	Comb underfrequency limit	Defines limit for combinatory underfrequency protection.	-5.0 Hz / <i>Real</i>
	-30.0...0.0 Hz	Combinatory underfrequency limit.	1 = 1 Hz / 10 = 1 Hz

90 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
135.87	Comb overfrequency limit	Defines limit for combinatory overfrequency protection.	5.0 Hz/ <i>Real</i>
	0.0...30.0 Hz	Combinatory overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.100	Anti-islanding	Enables anti-islanding (AI) function.	0 / <i>Real</i>
	0...1	0 - Anti-islanding disabled. 1 - Anti-islanding enabled.	1 = 1
135.101	AI underfrequency enable	Enables anti-islanding underfrequency protection. Note: When anti-islanding underfrequency limit is exceeded, inverter trips instantly without any time delay.	0 / <i>Real</i>
	0...1	0 - Anti-islanding underfrequency protection disabled. 1 - Anti-islanding underfrequency protection enabled.	1 = 1
135.102	AI underfrequency limit	Defines limit for anti-islanding underfrequency protection.	-5.0 Hz/ <i>Real</i>
	-30.0...0.0 Hz	anti-islanding underfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.103	AI overfrequency enable	Enables anti-islanding overfrequency protection. Note: When anti-islanding overfrequency limit is exceeded, inverter trips instantly without any time delay.	0 / <i>Real</i>
	0...1	0 - Anti-islanding overfrequency protection disabled. 1 - Anti-islanding overfrequency protection enabled.	1 = 1
135.104	AI overfrequency limit	Defines limit for anti-islanding overfrequency protection.	5.0 Hz/ <i>Real</i>
	0.0...30.0 Hz	Anti-islanding overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.105	AI undervoltage enable	Enables anti-islanding undervoltage protection. Instant tripping without time delay occurs when anti-islanding undervoltage limit is exceeded.	0 / <i>Real</i>
	0...1	0 - Anti-islanding undervoltage protection disabled. 1 - Anti-islanding undervoltage protection enabled.	1 = 1
135.106	AI undervoltage limit	Defines limit for anti-islanding undervoltage protection.	7 %/ <i>Real</i>
	0...100 %	Anti-islanding undervoltage limit.	1 = 1 %
135.107	AI overvoltage enable	Enables anti-islanding overvoltage protection. Instant tripping without time delay occurs when anti-islanding overvoltage limit is exceeded.	0 / <i>Real</i>
	0...1	0 - Anti-islanding overvoltage protection disabled. 1 - Anti-islanding overvoltage protection enabled.	1 = 1
135.108	AI overvoltage limit	Defines limit for anti-islanding overvoltage protection.	130 %/ <i>Real</i>
	100...200 %	Anti-islanding overvoltage protection.	1 = 1 %
135.110	Rate of change of freq enable	Enables rate of change of frequency limit.	0 / <i>Real</i>
	0...1	0 - Rate of change of frequency limit disabled. 1 - Rate of change of frequency limit enabled.	1 = 1
135.111	Rate of change of freq limit	Defines rate in which frequency is allowed to change.	1.0 / <i>Real</i>
	0.0...10.0	Rate of change of frequency limit.	1 = 1 / 10 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
135.131	Overfrequency enable 3	Enables overfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Overfrequency protection disabled. 1 - Overfrequency protection enabled.	1 = 1
135.132	Overfrequency limit 3	Defines limit for overfrequency condition.	1.0 Hz/ <i>Real</i>
	0.0...30.0 Hz	Overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.133	Overfrequency time 3	Defines time for overfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Overfrequency time.	1 = 1 ms
135.134	Overfrequency enable 4	Enables overfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Overfrequency protection disabled. 1 - Overfrequency protection enabled.	1 = 1
135.135	Overfrequency limit 4	Defines limit for overfrequency condition.	1.0 Hz/ <i>Real</i>
	0.0...30.0 Hz	Overfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.136	Overfrequency time 4	Defines time for overfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Overfrequency time.	1 = 1 ms
135.137	Underfrequency enable 3	Enables underfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Underfrequency protection disabled. 1 - Underfrequency protection enabled.	1 = 1
135.138	Underfrequency limit 3	Defines limit for underfrequency condition.	-1.0 Hz/ <i>Real</i>
	-30.0...0.0 Hz	Underfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.139	Underfrequency time 3	Defines time for underfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Underfrequency time.	1 = 1 ms
135.140	Underfrequency enable 4	Enables underfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Underfrequency protection disabled. 1 - Underfrequency protection enabled.	1 = 1
135.141	Underfrequency limit 4	Defines limit for underfrequency condition.	-1.0 Hz/ <i>Real</i>
	-30.0...0.0 Hz	Underfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.142	Underfrequency time 4	Defines time for underfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Underfrequency time.	1 = 1 ms
135.143	Underfrequency enable 5	Enables underfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Underfrequency protection disabled. 1 - Underfrequency protection enabled.	1 = 1
135.144	Underfrequency limit 5	Defines limit for underfrequency condition.	-1.0 Hz/ <i>Real</i>
	-30.0...0.0 Hz	Underfrequency limit.	1 = 1 Hz/ 10 = 1 Hz

92 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
135.145	Underfrequency time 5	Defines time for underfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Underfrequency time.	1 = 1 ms
135.146	Underfrequency enable 6	Enables underfrequency protection. Range depends on the installation grid selected.	0/ <i>Real</i>
	0...1	0 - Underfrequency protection disabled. 1 - Underfrequency protection enabled.	1 = 1
135.147	Underfrequency limit 6	Defines limit for underfrequency condition.	-1.0 Hz/ <i>Real</i>
	-30.0...0.0 Hz	Underfrequency limit.	1 = 1 Hz/ 10 = 1 Hz
135.148	Underfrequency time 6	Defines time for underfrequency condition.	100 ms/ <i>Real</i>
	100...600000 ms	Underfrequency time.	1 = 1 ms
135.250	Grid monitoring SW1	Grid monitoring status word 1. This parameter is read-only.	0x0000/ <i>Bit list</i>
	b0: Grid stable	Grid is stable.	
	b1: Parameters	Grid monitoring settings are loaded successfully.	
	b2 ... b15: Reserved		
135.251	Grid monitoring SW2	Grid monitoring status word 2. This parameter is read-only.	0x0000/ <i>Bit list</i>
	b0: Connect underfrequency	Connect underfrequency is not within limit.	
	b1: Connect overfrequency	Connect overfrequency is not within limit.	
	b2 :Connect undervoltage	Connect undervoltage is not within limit.	
	b3: Connect overvoltage	Connect overvoltage is not within limit.	
	b4: Underfrequency 1	Underfrequency 1 is not within limit.	
	b5: Underfrequency 2	Underfrequency 2 is not within limit.	
	b6: Overfrequency 1	Overfrequency 1 is not within limit.	
	b7: Overfrequency 2	Overfrequency 2 is not within limit.	
	b8: Undervoltage 1	Undervoltage 1 is not within limit.	
	b9: Undervoltage 2	Undervoltage 2 is not within limit.	
	b10: Undervoltge 3	Undervoltge 3 is not within limit.	
	b11: Undervoltage 4	Undervoltage 4 is not within limit.	
	b12: Overvoltage 1	Overvoltage 1 is not within limit.	
	b13: Overvoltage 2	Overvoltage 2 is not within limit.	
	b14: Overvoltage 3	Overvoltage 3 is not within limit.	
	b15: Overvoltage 4	Overvoltage 4 is not within limit.	
135.252	Grid monitoring SW3	Grid monitoring status word 3. This parameter is read-only.	0x0000/ <i>Bit list</i>
	b0: Reserved		
	b1: Sliding overvoltage	Sliding voltage in not within limit	
	b2 :Combinatory limit	Combinatory limit is not within limit	
	b3: Extreme AC overvoltage	Internal AC overvoltage	

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b4: RoCoF	Rate of change of frequency is too high.	
	b5: Anti-islanding under-frequency	Anti-islanding underfrequency is not within limit.	
	b6: Anti-islanding overfrequency	Anti-islanding overfrequency is not within limit.	
	b7: Anti-islanding undervoltage	Anti-islanding undervoltage is not within limit.	
	b8: Anti-islanding overvoltage	Anti-islanding overvoltage is not within limit.	
	b9: Anti-islanding	Anti-islanding signal is too high.	
	b10: Underfrequency 3	Underfrequency 3 is not within limit.	
	b11: Underfrequency 4	Underfrequency 4 is not within limit.	
	b12: Underfrequency 5	Underfrequency 5 is not within limit.	
	b13: Underfrequency 6	Underfrequency 6 is not within limit.	
	b14: Overfrequency 3	Overfrequency 3 is not within limit.	
	b15: Overfrequency 4	Overfrequency 4 is not within limit.	
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.	
147.01	Data storage 1 real32	Data storage parameter 1.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.02	Data storage 2 real32	Data storage parameter 2.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.03	Data storage 3 real32	Data storage parameter 3.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.04	Data storage 4 real32	Data storage parameter 4.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.05	Data storage 5 real32	Data storage parameter 5.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.06	Data storage 6 real32	Data storage parameter 6.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.07	Data storage 7 real32	Data storage parameter 7.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1
147.08	Data storage 8 real32	Data storage parameter 8.	-/ Real
	-2147483.000... 2147483.000	32-bit real type data.	1 = 1/ 1000 = 1

94 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
147.11	Data storage 1 int32	Data storage parameter 9.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.12	Data storage 2 int32	Data storage parameter 10.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.13	Data storage 3 int32	Data storage parameter 11.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.14	Data storage 4 int32	Data storage parameter 12.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.15	Data storage 5 int32	Data storage parameter 13.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.16	Data storage 6 int32	Data storage parameter 14.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.17	Data storage 7 int32	Data storage parameter 15.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.18	Data storage 8 int32	Data storage parameter 16.	-/ <i>Real</i>
	-2147483648 ... 2147483647	32-bit integer type data.	1 = 1
147.21	Data storage 1 int16	Data storage parameter 17.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.22	Data storage 2 int16	Data storage parameter 18.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.23	Data storage 3 int16	Data storage parameter 19.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.24	Data storage 4 int16	Data storage parameter 20.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.25	Data storage 5 int16	Data storage parameter 21.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.26	Data storage 6 int16	Data storage parameter 22.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.27	Data storage 7 int16	Data storage parameter 23.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1
147.28	Data storage 8 int16	Data storage parameter 24.	-/ <i>Real</i>
	-32768 ... 32767	16-bit integer type data.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
147.31	Data storage 1 real32 type	Defines scaling of parameter 147.01 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 <i>162 DDCS receive</i>), or when the data storage parameter is the source of transmitted 16-bit data (defined in parameter group <i>161 DDCS transmit</i>). The setting also defines the visible range of the storage parameter.	Unscaled/ List
	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
	Voltage	The scaling is defined by parameter 146.04 UDC voltage scaling .	3
	Active power	The scaling is defined by parameter 146.01 Power scaling .	4
	Reactive power	The scaling is defined by parameter 146.02 Reactive power scaling .	5
147.32	Data storage 2 real32 type	Defines 16-bit scaling of parameter 147.02 Data storage 2 real32 .	Unscaled/ List
	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
	Voltage	The scaling is defined by parameter 146.04 UDC voltage scaling .	3
	Active power	The scaling is defined by parameter 146.01 Power scaling .	4
	Reactive power	The scaling is defined by parameter 146.02 Reactive power scaling .	5
147.33	Data storage 3 real32 type	Defines 16-bit scaling of parameter 147.03 Data storage 3 real32 .	Unscaled/ List
	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
	Voltage	The scaling is defined by parameter 146.04 UDC voltage scaling .	3
	Active power	The scaling is defined by parameter 146.01 Power scaling .	4
	Reactive power	The scaling is defined by parameter 146.02 Reactive power scaling .	5
147.34	Data storage 4 real32 type	Defines 16-bit scaling of parameter 147.04 Data storage 4 real32 .	Unscaled/ List
	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

96 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type
	Voltage	The scaling is defined by parameter <i>146.04 UDC voltage scaling</i> .	3
	Active power	The scaling is defined by parameter <i>146.01 Power scaling</i> .	4
	Reactive power	The scaling is defined by parameter <i>146.02 Reactive power scaling</i> .	5
147.35	Data storage 5 real32 type	Defines 16-bit scaling of parameter <i>147.05 Data storage 5 real32</i> .	Unscaled/ <i>List</i>
	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
	Voltage	The scaling is defined by parameter <i>146.04 UDC voltage scaling</i> .	3
	Active power	The scaling is defined by parameter <i>146.01 Power scaling</i> .	4
	Reactive power	The scaling is defined by parameter <i>146.02 Reactive power scaling</i> .	5
147.36	Data storage 6 real32 type	Defines 16-bit scaling of parameter <i>147.06 Data storage 6 real32</i> .	Unscaled/ <i>List</i>
	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
	Voltage	The scaling is defined by parameter <i>146.04 UDC voltage scaling</i> .	3
	Active power	The scaling is defined by parameter <i>146.01 Power scaling</i> .	4
	Reactive power	The scaling is defined by parameter <i>146.02 Reactive power scaling</i> .	5
147.37	Data storage 7 real32 type	Defines 16-bit scaling of parameter <i>147.07 Data storage 7 real32</i> .	Unscaled/ <i>List</i>
	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
	Voltage	The scaling is defined by parameter <i>146.04 UDC voltage scaling</i> .	3
	Active power	The scaling is defined by parameter <i>146.01 Power scaling</i> .	4
	Reactive power	The scaling is defined by parameter <i>146.02 Reactive power scaling</i> .	5
147.38	Data storage 8 real32 type	Defines 16-bit scaling of parameter <i>147.08 Data storage 8 real32</i> .	Unscaled/ <i>List</i>
	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

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Voltage	The scaling is defined by parameter <i>146.04 UDC voltage scaling</i> .	3
	Active power	The scaling is defined by parameter <i>146.01 Power scaling</i> .	4
	Reactive power	The scaling is defined by parameter <i>146.02 Reactive power scaling</i> .	5
149 Panel port communication		Communication settings for control panel port.	
149.01	Node ID	Defines unique node identification in the communication network.	1 / Real
	1 ... 32	Node ID.	1 = 1
149.03	Baud rate	Selects maximum communication baud rate for the inverter. Note: Reliability of the communication may require lower setting depending on the electrical characteristics of the wiring.	230.4 kbps/ List
	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
149.06	Refresh settings	Applies parameter <i>149.01...149.03</i> settings. Note: Refreshing may cause a communication break, so reconnecting may be required.	Done/ List
	Done	Refresh done or not requested.	0
	Configure	Refresh parameters <i>149.01...149.03</i> . The value reverts automatically to <i>Done</i> .	1
150 FBA		General settings for fieldbus communication configuration.	
150.01	FBA A Enable	Enables communication between the inverter and fieldbus adapter A, and specifies the slot the adapter is installed into.	Option slot 2/ List
	Disable	Communication between inverter and fieldbus adapter A disabled.	0
	Option slot 1	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 1.	1
	Option slot 2	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 2.	2
	Option slot 3	Communication between inverter and fieldbus adapter A enabled. The adapter is in slot 3.	3
150.02	FBA A comm loss func	Selects how the inverter should react when fieldbus communication breaks. The time delay is defined by parameter <i>150.03 FBA A comm loss t out</i> .	No action/ List
	No action	Communication break does not cause any actions.	0
	Fault	Inverter trips on the PANEL LOSS (FFFF) fault and the inverter coasts to stop.	1
	Fault always	Inverter trips on fault and the inverter coasts to stop always, when communication lost is noticed.	2

98 Parameters

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Warning	Inverter generates only warning, no other actions are taken due to comm loss.	3
150.03	FBA A comm loss t out	Defines time delay before the action defined by parameter 150.02 FBA A comm loss func is taken. Time count starts when the communication link fails to update the message.	0.3 s / Real
	0.3 ... s	Time delay.	10 = 1 s
150.04	FBA A ref1 type	Selects type and scaling of reference 1 received from fieldbus adapter A.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.05	FBA A ref2 type	Selects type and scaling of reference 2 received from fieldbus adapter A.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.06	FBA A SW sel	Selects source of status word to be sent to the fieldbus network through fieldbus adapter A.	Auto/ List
	Auto	Source of Status word is chosen automatically.	0
	Transparent mode	Source selected by parameter 150.09 FBA A SW tr src is transmitted as Status word to the fieldbus network through fieldbus adapter A.	1
150.07	FBA A act1 type	Selects type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
150.08	FBA A act2 type	Selects type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter A.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.09	FBA A SW tr src	Selects source for fieldbus status word when parameter 150.06 is set to <i>Transparent</i> mode.	NULL/ List
	NULL	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
150.10	FBA A act1 transparent source	Selects source for fieldbus actual value 1 when parameter 150.07 is set to <i>Transparent</i> mode.	Not selected/ List
	Not selected	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
150.11	FBA A act2 transparent source	Selects source for fieldbus actual value 2 when parameter 150.08 is set to <i>Transparent</i> mode.	Not selected/ List
	Not selected	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
150.12	FBA A debug mode	Enables display of raw (unmodified) data received from and sent to fieldbus adapter A in parameters 150.13...150.18 . This functionality should only be used for debugging.	Disable/ List
	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 inverter.	1
150.13	FBA A Control Word	Shows control word sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ Data
150.14	FBA A Reference REF1	Shows raw reference REF1 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ Real
	-2147483648... 2147483647	Fieldbus adapter A reference value 1.	1 = 1
150.15	FBA A Reference REF2	Shows raw reference REF2 sent by the master (PLC) to fieldbus adapter A. This parameter is read-only.	-/ Real
	-2147483648... 2147483647	Fieldbus adapter A reference value 2.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type															
150.16	FBA A Status Word	Shows status word sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ <i>Data</i>															
150.17	FBA A Actual value 1	Shows raw actual value ACT1 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ <i>Real</i>															
	-2147483648... 2147483647	Fieldbus adapter A actual value 1.	1 = 1															
150.18	FBA A Actual value 2	Shows raw actual value ACT2 sent by fieldbus adapter A to the master (PLC). This parameter is read-only.	-/ <i>Real</i>															
	-2147483648... 2147483647	Fieldbus adapter A actual value 2.	1 = 1															
150.21	FBA A Timelevel sel	<p>Selects 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.</p> <table border="1"> <thead> <tr> <th>Selection</th> <th>Cyclic*</th> <th>Acyclic**</th> </tr> </thead> <tbody> <tr> <td>Monitoring</td> <td>10 ms</td> <td>10 ms</td> </tr> <tr> <td>Normal</td> <td>2 ms</td> <td>10 ms</td> </tr> <tr> <td>Fast</td> <td>500 µs</td> <td>2 ms</td> </tr> <tr> <td>Very fast</td> <td>250 µs</td> <td>2 µs</td> </tr> </tbody> </table> <p>*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 155 FBA B data in and 156 FBA B data out.</p>	Selection	Cyclic*	Acyclic**	Monitoring	10 ms	10 ms	Normal	2 ms	10 ms	Fast	500 µs	2 ms	Very fast	250 µs	2 µs	Fast/ <i>List</i>
Selection	Cyclic*	Acyclic**																
Monitoring	10 ms	10 ms																
Normal	2 ms	10 ms																
Fast	500 µs	2 ms																
Very fast	250 µs	2 µs																
	Monitoring	Low speed. Optimized for PC tool communication and monitoring usage.	0															
	Normal	Normal speed.	1															
	Fast	Fast speed.	2															
	Very fast	Very fast speed.	3															
150.31	FBA B Enable	Enables communication between the inverter and fieldbus adapter B, and specifies the slot the adapter is installed into.	Disable/ <i>List</i>															
	Disable	Communication between inverter and fieldbus adapter B disabled.	0															
	Option slot 1	Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 1.	1															
	Option slot 2	Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 2.	2															
	Option slot 3	Communication between inverter and fieldbus adapter B enabled. The adapter is in slot 3.	3															
150.32	FBA B comm loss func	Selects how the inverter reacts in a fieldbus communication break. The time delay is defined by parameter 50.03 Comm loss t out.	No action/ <i>Real</i>															
	No action	Communication break does not cause any actions.	0															

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Fault	Inverter trips on fault PANEL LOSS (FFFF) and the inverter coasts to stop.	1
	Fault always	Inverter trips on fault and the inverter coasts to stop always, when communication lost is noticed.	2
	Warning	Inverter generates only warning, no other actions are taken due to comm loss.	3
150.33	FBA B comm loss t out	Defines time delay before the action defined by parameter 50.02 Comm loss func is taken. Time count starts when the link fails to update the message.	0.3 s/ Real
	0.3 ... s	Time delay.	10 = 1 s
150.34	FBA B ref1 type	Selects type and scaling of reference 1 received from fieldbus adapter B.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.35	FBA B ref2 type	Selects type and scaling of reference 2 received from fieldbus adapter B.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.36	FBA B SW sel	Selects source of the Status word to be sent to the fieldbus network through fieldbus adapter B.	Auto/ List
	Auto	Source of the Status word is chosen automatically.	0
	Transparent mode	Source selected by parameter 150.39 FBA B SW tr src is transmitted as the Status word to the fieldbus network through fieldbus adapter B.	1
150.37	FBA B act1 type	Selects type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
150.38	FBA B act2 type	Selects type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Voltage or power/ List
	Voltage or power	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	Reserved.	3
	Active power	Reserved.	4
	Reactive power	Reserved.	5
150.39	FBA B SW tr src	Selects source of fieldbus status word when parameter 150.36 FBA B SW sel is set to <i>Transparent</i> .	NULL/ List
	NULL	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
150.40	FBA B act1 transparent source	When parameter 150.37 FBA B act1 type is set to <i>Transparent</i> mode, this parameter selects the type of actual value 1 transmitted to the fieldbus network through fieldbus adapter B.	Not selected/ List
	Not selected	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
150.41	FBA B act2 transparent source	Selects type of actual value 2 transmitted to the fieldbus network through fieldbus adapter B.	Not selected/ List
	Not selected	No source selected.	0
	<i>Other</i>	See Terms and abbreviations on page 59.	
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 . This functionality should only be used for debugging.	Disable/ List
	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 inverter.	1
150.43	FBA B Control Word	Shows 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.	-/ Data
150.44	FBA B Reference REF1	Shows 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.	-/ Real
	-2147483648... 2147483647	Fieldbus adapter B reference value 1.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32															
150.45	FBA B Reference REF2	Shows 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.	-/ Real															
	-2147483648... 2147483647	Fieldbus adapter B reference value 2.	1 = 1															
150.46	FBA B Status Word	Shows 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.	-/ Data															
150.47	FBA B Actual value 1	Shows 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.	-/ Real															
	-2147483648... 2147483647	Fieldbus adapter B actual value 1.	1 = 1															
150.48	FBA B Actual value 2	Shows 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.	-/ Real															
	-2147483648... 2147483647	Fieldbus adapter B reference value 2.	1 = 1															
150.51	FBA B Timelevel sel	<p>Selects 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.</p> <table border="1"> <thead> <tr> <th>Selection</th> <th>Cyclic*</th> <th>Acyclic**</th> </tr> </thead> <tbody> <tr> <td>Monitoring</td> <td>10 ms</td> <td>10 ms</td> </tr> <tr> <td>Normal</td> <td>2 ms</td> <td>10 ms</td> </tr> <tr> <td>Fast</td> <td>500 µs</td> <td>2 ms</td> </tr> <tr> <td>Very fast</td> <td>250 µs</td> <td>500 µs</td> </tr> </tbody> </table> <p>*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 155 FBA B data in and 156 FBA B data out.</p>	Selection	Cyclic*	Acyclic**	Monitoring	10 ms	10 ms	Normal	2 ms	10 ms	Fast	500 µs	2 ms	Very fast	250 µs	500 µs	Normal/ List
Selection	Cyclic*	Acyclic**																
Monitoring	10 ms	10 ms																
Normal	2 ms	10 ms																
Fast	500 µs	2 ms																
Very fast	250 µs	500 µs																
	Monitoring	Low speed. Optimized for PC tool communication and monitoring usage.	0															
	Normal	Normal speed.	1															
	Fast	Fast speed.	2															
	Very fast	Very fast speed.	3															

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
151 FBA A settings		Fieldbus adapter A configuration. Note: FBA A is reversed for internal communication. We recommend not to modify these parameters.	
151.01	FBA type	Shows the type of connected fieldbus adapter module. 0 = Module is not found or is not properly connected, or is disabled by parameter 150.01 FBA A Enable ; 1 = FPBA; 32 = FCAN; 37 = FDNA; 128 = FENA-11/21; 132 = PROFINET IO; 135 = FECA; 136 = FEPL; 485 = FSCA; 62944 = FSEA.	None/ List
	None	Module is not found or is not properly connected, or is disabled with parameter 150.01 FBA A Enable .	0
	Profibus-DP		1
	LonWorks		2
	CANopen		3
	DeviceNet		4
	ControlNet		5
	Ethernet		6
	PROFINet IO		7
	EtherCAT		8
	ETH Pwrlink		9
	CCLink		10
	RS-485 comm		11
	Macro		12
	J1939		13
	Fieldbus		14
	SERCOS		15
	Sercos III		16
151.02	FBA Par2	Parameters 151.02 ... 151.26 are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily in use.	-/ Real
	0...3		1 = 1
151.03	FBA Par3	See parameter 151.02 FBA Par2 .	-/ Real
	1...247		1 = 1
151.04	FBA Par4	See parameter 151.02 FBA Par2 .	-/ Real
	0...5		1 = 1
151.05	FBA Par5	See parameter 151.02 FBA Par2 .	-/ Real
	0...3		1 = 1
151.06	FBA Par6	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.07	FBA Par7	See parameter 151.02 FBA Par2 .	-/ Real
	0...2		1 = 1
151.08	FBA Par8	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
151.09	FBA Par9	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.10	FBA Par10	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.11	FBA Par11	See parameter 151.02 FBA Par2 .	-/ Real
	0...1		1 = 1
151.12	FBA Par12	See parameter 151.02 FBA Par2 .	-/ Real
	0...3		1 = 1
151.13	FBA Par13	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.14	FBA Par14	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.15	FBA Par15	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.16	FBA Par16	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.17	FBA Par17	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.18	FBA Par18	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.19	FBA Par19	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.20	FBA Par20	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.21	FBA Par21	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.22	FBA Par22	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.23	FBA Par23	See parameter 151.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
151.24	FBA Par24	See parameter 151.02 FBA Par2 .	-/ Real
	1		1 = 1
151.25	FBA Par25	See parameter 151.02 FBA Par2 .	-/ Real
	0...5		1 = 1
151.26	FBA Par26	See parameter 151.02 FBA Par2 .	-/ Real
	-		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
151.27	FBA par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to <i>Done</i> . Note: This parameter cannot be changed while the inverter is running.	Done/ List
	Done	Refreshing done.	0
	Configure	Refreshing.	1
151.28	Par table ver	Shows parameter table revision of the fieldbus adapter module mapping file stored in the memory of the inverter. In format axyz, where a = major revision number; xy = minor revision number; z = correction number. This parameter is read-only.	-/ Data
151.29	Drive type code	Shows the type code of fieldbus adapter module mapping file stored in the memory of the inverter. This parameter is read-only.	-/ Real
151.30	Mapping file ver	Shows fieldbus adapter module mapping file revision stored in the memory of the inverter in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	-/ Real
151.31	D2FBA comm sta	Shows status of fieldbus adapter module communication.	Idle/ List
	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 inverter.	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 comm SW ver) or mapping file upload has failed more than three times.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5
	Reset	Adapter is performing a hardware reset.	6
151.32	FBA comm SW ver	Shows 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.	-/ Data
151.33	FBA appl SW ver	Shows 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.	-/ Data

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
152 FBA A data in		Selection of data to be transferred from Inverter to fieldbus controller through fieldbus adapter A. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
152.01	FBA data in1	Parameters 152.01 ... 152.12 select data to be transferred from the inverter to the fieldbus controller through fieldbus adapter A.	None/ List
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	SW 16bit	Virtual address for 16bit status word.	4
	Act1 16bit	Virtual address for 16bit actual value 1.	5
	Act2 16bit	Virtual address for 16bit actual value 2.	6
	CW 32bit	Virtual address for 32bit control word.	7
	Ref1 32bit	Virtual address for 32bit reference 1.	8
	Ref2 32bit	Virtual address for 32bit reference 2.	9
	SW 32bit	Virtual address for 32bit status word.	10
	Act1 32bit	Virtual address for 32bit actual value 1.	11
	Act2 32bit	Virtual address for 32bit actual value 2.	12
	<i>Other</i>	See Terms and abbreviations on page 59 .	
...	
152.12	FBA data in12	See parameter 152.01 FBA data in1 .	None/ List
153 FBA A data out		Selection of data to be transferred from fieldbus controller to inverter through fieldbus adapter A. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
153.01	FBA data out1	Parameters 153.01 ... 153.12 select data to be transferred from the fieldbus controller to the inverter through fieldbus adapter A. Transfer speed can be set with parameter 150.21 FBA A Timelevel sel .	None/ List
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	CW 32bit	Virtual address for 32bit control word.	4
	Ref1 32bit	Virtual address for 32bit reference 1.	5
	Ref2 32bit	Virtual address for 32bit reference 2.	6
	<i>Other</i>	See Terms and abbreviations on page 59 .	
...	
153.12	FBA data out12	See parameter 153.01 FBA data out1 .	None/ List

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
154 FBA B settings		Fieldbus adapter B configuration.	
154.01	FBA type	Shows the type of connected fieldbus adapter module. 0 = Fieldbus module is not found, or it is not properly connected, or parameter 150.01 FBA A Enable is set to <i>Disable</i> , 1 = FPBA-xx PROFIBUS-DP adapter module, 32 = FCAN-xx CANopen adapter module, 37 = FDNA-xx DeviceNet adapter module.	None/ List
	None	Module is not found or is not properly connected, or is disabled with parameter 150.31 FBA B Enable .	0
	Profibus-DP		1
	CANopen		2
	DeviceNet		3
	Ethernet		4
	PROFINet IO		5
	EtherCAT		6
	ETH Pwrlink		7
	RS-485 comm		8
	SERCOS		9
	LonWorks		10
	ControlNet		11
	CCLink		12
	Macro		13
	J1939		14
	Fieldbus		15
	Sercos III		16
154.02	FBA Par2	Parameters 154.02...154.26 are adapter module-specific. For more information, see the documentation of fieldbus adapter module. Note that not all of these parameters are necessarily in use.	-/ Real
	0...65535		1 = 1
...
154.26	FBA Par26	See parameter 154.02 FBA Par2 .	-/ Real
	0...65535		1 = 1
154.27	FBA par refresh	Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to <i>Done</i> . Note: This parameter cannot be changed while the inverter is running.	Done/ List
	Done	Refreshing done.	0
	Configure	Refreshing.	1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
154.28	Par table ver	Shows parameter table revision of the fieldbus adapter module mapping file stored in the inverter memory in format <i>axyz</i> , where <i>a</i> = major revision number <i>xy</i> = minor revision number <i>z</i> = correction number. This parameter is read-only.	-/ Data
154.29	Drive type code	Shows the inverter type code of the fieldbus adapter module mapping file stored in the memory of the inverter. This parameter is read-only.	-/ Real
	0..65535	I type code of fieldbus adapter module mapping file.	1 = 1
154.30	Mapping file ver	Shows fieldbus adapter module mapping file revision stored in the memory of the inverter in decimal format. Example: Integer 263 -> 0x107 = revision 1.07 This parameter is read-only.	-/ Real
	0..65535	Mapping file revision.	1 = 1
154.31	D2FBA comm sta	Shows the status of fieldbus adapter module communication.	Idle/ List
	Idle	Adapter is not configured.	0
	Exec.init	Adapter is initializing.	1
	Time out	A timeout has occurred in the communication between adapter and inverter.	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 51.32 FBA comm sw ver) or mapping file upload has failed more than three times.	3
	Off-line	Adapter is off-line.	4
	On-line	Adapter is on-line.	5
	Reset	Adapter is performing a hardware reset.	6
154.32	FBA comm SW ver	Shows common program revision of the adapter module in format <i>axyz</i> , where <i>a</i> = major revision number, <i>xy</i> = minor revision numbers, <i>z</i> = correction letter. Example: 190A = revision 1.90A.	-/ Data
154.33	FBA appl SW ver	Shows application program revision of the adapter module in format <i>axyz</i> , where <i>a</i> = major revision number, <i>xy</i> = minor revision numbers, <i>z</i> = correction letter. Example: 190A = revision 1.90A.	-/ Data

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
155 FBA B data in		Selection of data to be transferred from the inverter to fieldbus controller through fieldbus adapter B. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
155.01	FBA data in1	Parameters 155.01...155.12 select data to be transferred from the inverter to the fieldbus controller through fieldbus adapter B.	None/ List
	None	None.	0
	CW 16bit	Virtual address for 16bit control word.	1
	Ref1 16bit	Virtual address for 16bit reference 1.	2
	Ref2 16bit	Virtual address for 16bit reference 2.	3
	SW 16bit	Virtual address for 16bit status word.	4
	Act1 16bit	Virtual address for 16bit actual value 1.	5
	Act2 16bit	Virtual address for 16bit actual value 2.	6
	CW 32bit	Virtual address for 32bit control word.	7
	Ref1 32bit	Virtual address for 32bit reference 1.	8
	Ref2 32bit	Virtual address for 32bit reference 2.	9
	SW 32bit	Virtual address for 32bit status word.	10
	Act1 32bit	Virtual address for 32bit actual value 1.	11
	Act2 32bit	Virtual address for 32bit actual value 2.	12
...	
155.12	FBA data in12	See parameter 155.01 FBA data in1	None/ List
156 FBA B data out		Selection of data to be transferred from fieldbus controller to the inverter through fieldbus adapter B. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
156.01	FBA B data out1	Parameters 156.01...156.12 select data to be transferred from the fieldbus controller to the inverter through fieldbus adapter B. Transfer speed can be set with parameter 150.51 FBA B Timelevel sel.	None/ List
	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)	4
	Ref1 32bit	Reference Ref1 (32 bits)	5
	Ref2 32bit	Reference Ref2 (32 bits)	6
	<i>Other</i>	See Terms and abbreviations on page 59 .	-
...	
156.12	FBA B data out12	See parameter 156.01 FBA B data out1 .	None/ List

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
164 SCADA configuration		SCADA configuration.	
164.01	Enable	Enables SCADA operation. Activates parameters in group 165 SCADA data in to receive input data and group 166 SCADA data out to echo the inverter status.	Disable/ List
	Disabled		0
	Enable		1
	Monitoring only		2
164.02	Profile	Defines how input/output data is mapped to SCADA parameters.	Profile 2/ List
	Profile 1		0
	Profile 2		1
	Profile 3		2
164.04	Power scale	Defines active power limit scaling value.	2000.0 kW/ Real
	0.0...5000.0 kW		10 = 1 kW
164.10	Communication loss event	Selects the event to trigger when SCADA communication is lost.	Warning/ List
	No action		0
	Warning		1
	Fault		2
	Pure event		3
164.11	Communication loss timeout	Defines time period for which SCADA communication should stay in timeout state after communication has returned. During timeout, control commands are frozen.	120.00 s/ Real
	0.00...3600.00 s		1 = 1 s
164.12	Heartbeat max interval	Defines time interval for which heartbeat echo should return to the inverter. Otherwise communication is interpreted to be lost.	5 s/ Real
	1...60 s		1 = 1 s
164.13	First start delay	Defines the time the alarms and control commands from SCADA must be active during the inverter startup when communication link is not yet established. Zero value disables the feature.	60 s/ Real
	0...600 s		1 = 1 s
165 SCADA data in		SCADA data in.	
165.01 ... 165.15	Data in 1 ... Data in 15	SCADA interface data in.	-/ Real
	0...65535		1 = 1
165.50 ... 165.56	Data in 50 ... Data in 56	SCADA interface data in.	-/ Real
.	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
166 SCADA data out		SCADA data out.	
166.01	Data out 1	SCADA interface data out.	-/ Real
...	...		
166.11	Data out 11		
	0...65535		1 = 1
166.50	Data out 50	SCADA interface data out.	-/ Real
...	...		
166.160	Data out 160		
	0...65535		1 = 1
173 Inverter status		Inverter control and status words.	
173.01	Main status word	Main status word of the inverter.	0b0000/ Bit list
	b0: Ready	Ready to operate	
	b1: Faulted	Faulted	
	b2: Warning	Warning active	
	b3: MPPT enabled	MPPT enabled	
	b4: Grid stable	Grid stable	
	b5: DC voltage within range	DC voltage is within the range	
	b6: Inhibits	Start is inhibited	
	b7: Reduced run	Reduced run active	
	b8: Redundant run	Redundant run active	
	b9: Q-compensation	Q-compensation or night Q production is active	
	b10: Limited	Active or reactive power is limited	
	b11: Grid connected	Grid is connected	
	b12...b15: Reserved	-	
173.02	Inverter main state	Shows main state of the inverter.	Initialize/ List
	Initialize	Initializing	0
	Service mode	Service mode	1
	Commissioning mode	Commissioning mode	2
	Disconnected	Disconnected from the grid	3
	Disconnecting	Running disconnect routines	4
	Connecting	Running connect routines	5
	Connected	Connected to grid	6
173.03	MPPT unit state	Shows the state of MPPT unit.	Disabled/ List
	Disabled	Run or start disabled.	0
	Ready on	MPPT unit is ready to start. No active faults.	1
	Ready run	MPPT unit is ready to start modulating. DC voltage is up.	2
	Starting	Grid current controller is starting.	3
	Running	Inverter is producing power and following reactive current reference.	4
	Reserved	State is reserved for future usage.	5
	Stopping	Grid current controller is stopped.	6

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Faulted	Fault is active. MPPT unit is waiting for reset.	7
173.04	Start command SW	Start command status word. 1 = Start command is on. Note: To start, all start commands must be on.	0b0000/ <i>Bit list</i>
	b0: Inverter enabled	Inverter operation status.	
	b1: Transfer trip IO	Transfer trip status from IO.	
	b2: Transfer trip SCADA	Transfer trip status from SCADA.	
	b3: Shutdown IO	Shutdown status from IO.	
	b4: Shutdown SCADA	Shutdown status from SCADA.	
	b6...b15: Reserved		
173.05	Internal inverter inhibitors 1	Shows which of the internal conditions inhibit inverter from connecting to grid.	0b0000/ <i>Bit list</i>
	b0: Enabled		
	b1: External signal		
	b2: Fault		
	b3: Configuration		
	b4: Too low ambient temperature		
	b5: Too low power section temperature		
	b6: Too high ambient temperature		
	b7: Excess humidity		
	b8: PLC link		
	b9: Health monitoring		
	b10: MV breaker open command		
	b11: Country code		
	b12: Service mode		
	b13: Commissioning mode		
	b14: Grid unstable		
	b15: Grid delay		
173.06	Internal inverter inhibitors 2	Shows which of the internal conditions inhibit inverter from connecting to grid.	0b0000/ <i>Bit list</i>
	b0: Thermal protection		
	b1: Fan control		
	b2...b15: Reserved		
173.07	Internal MPPT inhibitors	Shows which of the internal conditions inhibit MPPT unit from starting.	0b0000/ <i>Bit list</i>
	b0: Power module		
	b1: Low input voltage		
	b2: High input voltage		
	b3: Wake-up monitor		
	b4: Grounding		

No.	Bit/Name/Value/ Range	Description	Def/Type
	b5: Insulation resistance		
	b6: AC disconnection device		
	b7...b15: Reserved		
173.11	Output power status	Shows the status of power production.	Discon- nected/ List
	Disconnected	Inverter is disconnected from the grid.	0
	Starting	Inverter is running start routines	1
	MPP tracking	Inverter is tracking MPP.	2
	Minimum DC voltage	MPPT is running against minimum DC voltage.	3
	Maximum DC voltage	MPPT is running against maximum DC voltage.	4
	Active power limit	Active power is limited.	5
	Reactive power limit	Reactive power is limited.	6
	Both limits	Both active and reactive powers are limited.	7
	Power reference	Inverter is in power reference mode (test mode).	8
	User DC reference	Inverter is in user reference mode (test mode).	9
	Q compensation	Inverter is in Q compensation mode.	10
173.12	Disconnect trigger	Shows reason for the latest disconnection.	Connected/ List
	Connected		0
	Grid unstable		1
	External command		2
	Power too low		3
	Too high DC voltage		4
	Not enabled		5
	Active fault		6
	Other		7
	No disconnection		8
173.20	Grid monitoring ready in	Shows remaining time before connecting by grid monitoring.	-/ Real
	0 ... 10000 s	Grid monitoring ready time.	1 = 1 s
173.21	Start logic ready in	Shows remaining time before connecting by start and wake-up monitor.	-/ Real
	0 ... 10000 s	Start and wake-up monitor time.	1 = 1 s
173.23	PU ready in	Shows remaining time before connecting by power unit.	-/ Real
	0 ... 10000 s	Power unit ready time.	1 = 1 s
173.30	Start logic stopping in	Shows time before disconnection by start/stop logic.	-/ Real
	0 ... 10000 s	Start logic stop time.	1 = 1 s

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
174 DC input current monitor		DC input current monitor. Parameter 174.31...174.104 are read-only. Note: Variant dependent. Information may not be available in all variants.	
174.01	Connected DC inputs 1-12	Connection setup for DC inputs 1 to 12. When DC input is configured, the connected supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ <i>Bit list</i>
	b0: DC input 1		
	b1: DC input 2		
	b2: DC input 3		
	b3: DC input 4		
	b4: DC input 5		
	b5: DC input 6		
	b6: DC input 7		
	b7: DC input 8		
	b8: DC input 9		
	b9: DC input 10		
	b10: DC input 11		
	b11: DC input 12		
	b12...b15: Reserved		
174.02	Connected DC inputs 13-24	Connection setup for DC inputs 13 to 24. When DC input is configured, the connected supervision features (e.g., Current sanity check, Overcurrent, Reverse current, Fuse monitoring and Current deviation) are activated. True = DC input connected. False = DC input not connected.	0b0000/ <i>Bit list</i>
	b0: DC input 13		
	b1: DC input 14		
	b2: DC input 15		
	b3: DC input 16		
	b4: DC input 17		
	b5: DC input 18		
	b6: DC input 19		
	b7: DC input 20		
	b8: DC input 21		
	b9: DC input 22		
	b10: DC input 23		
	b11: DC input 24		
	b12...b15: Reserved		
174.05	Overcurrent detection	Enables DC input overcurrent detection.	Enable/ <i>List</i>
	Disable		0
	Enable		1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
174.06	Overcurrent instant limit	Defines instant DC input overcurrent limit that causes a fault.	200.0 A/ <i>Real</i>
	0.0 ... 2000.0 A		1 = 1 A/ 10 = 1 A
174.07	Overcurrent delayed limit	Defines delayed DC input overcurrent limit that causes a fault after the current is over the value for a long time.	180.0 A/ <i>Real</i>
	0.0 ... 2000.0 A		1 = 1 A/ 10 = 1 A
174.08	Overcurrent time delay	Defines delay time for the DC input overcurrent fault. The fault occurs when current is over the limit for the duration of the delay.	10.0 s/ <i>Real</i>
	0.0...999.0 s	Delay time	1 = 1 s/ 10 = 1 s
174.09	Reverse current detection	Enables reverse current detection.	Enable/ <i>List</i>
	Disable		0
	Enable		1
174.10	Delayed Reverse current limit	Defines delayed input reverse current limit that causes a fault after the current is below the value for a long time.	-10.0 / <i>Real</i>
	-100.0...0.0 A	Reverse current limit.	1 = 1 A/ 10 = 1 A
174.11	Reverse current time delay	Defines delay time for the DC input reverse current fault. The fault occurs when current is below the limit for the duration of the delay.	10.0 s/ <i>Real</i>
	0.0...999.0 s	Reverse current delay time.	1 = 1 s/ 10 = 1 s
174.14	Current deviation action	Selects how the inverter reacts when a difference is observed in the DC input currents.	Warning/ <i>List</i>
	No	No action selected.	0
	Warning		1
	Fault		2
174.15	Current deviation delay	Defines the time the fault must be active until the defined action of the current deviation is triggered. If fault is cleared, the corresponding counter resets.	1 min/ <i>Real</i>
	0...1440 min	Current deviation delay time.	1 = 1 min
174.16	Comparison mode	Selects comparison mode of the DC input current deviation detection.	Relative/ <i>List</i>
	Absolute		1
	Relative		2
174.17	Reference type	Selects mean and maximum values of DC input currents calculated within one module or using all existing modules (global). These values are used in current deviation supervision	Mean/ <i>List</i>
	Max		1
	Mean		2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
174.19	Relative current limit	Defines relative current limit.	30 %/ Real
	0...100 %	Relative current limit in %,	1 = 1 %
174.20	Absolute current limit	Defines absolute current limit.	30.0 A/ Real
	0.0...100.0 A	Absolute current limit in ampere.	1 = 1 A/ 10 = 1 A
174.21	Relative threshold	Defines relative DC input current threshold. If current is below this value, relative difference detection is disabled.	20.0 A/ Real
	0.0...100.0 A	Relative DC input current threshold.	1 = 1 A/ 10 = 1 A
174.22	Fuse monitor action	Selects action for detecting blown fuse. The detection is based on current measurement.	Warning/ List
	No	No action selected.	0
	Warning		1
	Fault		2
174.23	Blown fuse tolerance	Defines tolerance limit to detect a blown fuse.	2.0 A/ Real
	0.0...100.0 A	Blown fuse tolerance limit.	1 = 1 A/ 10 = 1 A
174.24	Blown fuse active boundary	Defines the boundary for detecting a blown fuse. If mean current of the corresponding input is below this value, then blown fuse detection function is disabled.	20.0 A/ Real
	0.0...100.0 A	Blown fuse detection limit.	1 = 1 A/ 10 = 1 A
174.25	Current sanity check action	Selects how the inverter should react when measured DC input current is beyond limits.	Warning/ List
	No	No action selected.	0
	Warning		1
	Fault		2
174.26	Current meas range	Defines DC input current measurement range. • In inverters with 10 or more DC inputs, the nominal value is 200 A. • In inverters with 8 DC inputs the value is 400 A.	400.0 A/ Real
	0.0...2000.0 A	DC input current measurement range.	1 = 1 A/ 10 = 1 A
174.27	Current range selection 1-12	Connection setup for DC input current measurement range selection 1-12. 0 = 200 A 1 = User selection (default is 400 A)	0b0000/ Bit list
	b0: Input 1 current range		
	b1: Input 2 current range		
	b2: Input 3 current range		
	b3: Input 4 current range		

No.	Bit/Name/Value/ Range	Description	Def/Type
	b4: Input 5 current range		
	b5: Input 6 current range		
	b6: Input 7 current range		
	b7: Input 8 current range		
	b8: Input 9 current range		
	b9: Input 10 current range		
	b10: Input 11 current range		
	b11: Input 12 current range		
	b12...b15: Reserved		
174.28	Current range selection 13-24	Connection setup for DC input current measurement range selection 13-24. 0 = 200 A 1 = User selection (default is 400 A)	0b0000/ <i>Bit list</i>
	b0: Input 13 current range		
	b1: Input 14 current range		
	b2: Input 15 current range		
	b3: Input 16 current range		
	b4: Input 17 current range		
	b5: Input 18 current range		
	b6: Input 19 current range		
	b7: Input 20 current range		
	b8: Input 21 current range		
	b9: Input 22 current range		
	b10: Input 23 current range		
	b11: Input 24 current range		
	b12...b15: Reserved		
174.31	DC input 1 current	Shows DC input 1 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
174.32	DC input 2 current	Shows DC input 2 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.33	DC input 3 current	Shows DC input 3 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.34	DC input 4 current	Shows DC input 4 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.35	DC input 5 current	Shows DC input 5 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.36	DC input 6 current	Shows DC input 6 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.37	DC input 7 current	Shows DC input 7 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.38	DC input 8 current	Shows DC input 8 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.39	DC input 9 current	Shows DC input 9 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.40	DC input 10 current	Shows DC input 10 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.41	DC input 11 current	Shows DC input 11 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.42	DC input 12 current	Shows DC input 12 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.43	DC input 13 current	Shows DC input 13 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.44	DC input 14 current	Shows DC input 14 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.45	DC input 15 current	Shows DC input 15 current.	-/ Real
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
174.46	DC input 16 current	Shows DC input 16 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.47	DC input 17 current	Shows DC input 17 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.48	DC input 18 current	Shows DC input 18 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.49	DC input 19 current	Shows DC input 19 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.50	DC input 20 current	Shows DC input 20 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.51	DC input 21 current	Shows DC input 21 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.52	DC input 22 current	Shows DC input 22 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.53	DC input 23 current	Shows DC input 23 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.54	DC input 24 current	Shows DC input 24 current.	-/ <i>Real</i>
	-200.0 ... 500.0 A		1 = 1 A/ 10 = 1 A
174.81	Current meas status 1-12	Status of input current measurement range selection 1-12. True = Measurement is faulty. False = Not found faulty.	0b0000/ <i>Bit list</i>
	b0: Input 1 measurement status		
	b1: Input 2 measurement status		
	b2: Input 3 measurement status		
	b3: Input 4 measurement status		
	b4: Input 5 measurement status		
	b5: Input 6 measurement status		
	b6: Input 7 measurement status		

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b7: Input 8 measurement status		
	b8: Input 9 measurement status		
	b9: Input 10 measurement status		
	b10: Input 11 measurement status		
	b11: Input 12 measurement status		
	b12...b15: Reserved		
174.82	Current meas status 13- 24	Status of input current measurement range selection 13- 24. True = Measurement is faulty. False = Not found faulty.	0b0000/ Bit list
	b0: Input 13 measurement status		
	b1: Input 14 measurement status		
	b2: Input 15 measurement status		
	b3: Input 16 measurement status		
	b4: Input 17 measurement status		
	b5: Input 18 measurement status		
	b6: Input 19 measurement status		
	b7: Input 20 measurement status		
	b8: Input 21 measurement status		
	b9: Input 22 measurement status		
	b10: Input 23 measurement status		
	b11: Input 24 measurement status		
	b12...b15: Reserved		
176 Customer IOs		Customer inputs and outputs. Analog inputs are with 32-bit unit values for pointed value usage.	
176.01	Spare AI1	Analog input, Spare 1 value as a 32-bit unit.	- / Real
	0...4294967295		1 = 1
176.11	PLC CPU RO 0 source	Selects source for customer relay output x20.8.	MV breaker status/ List
	Not connected		0

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Connected		1
	Grounding status		2
	Insulation resistance status		3
	MV breaker status		4
	<i>Other</i>	See Terms and abbreviations on page 59.	-
176.12	PCC CPU RO 1 source	Selects source for spare relay output 2.	Not connected/ List
	Not connected		0
	Connected		1
	Grounding status		2
	Insulation resistance status		3
	MV breaker status		4
	<i>Other</i>	See Terms and abbreviations on page 59.	-
176.21	External fault 1 source	Selects source for customer IO external fault 1 signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
176.22	External fault 1 action	Customer IO external fault 1 action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
176.23	External fault 1 action delay	Customer IO external fault 1 action delay.	0 s/ List
	0...3600 s		1 = 1 s
176.24	External fault 1 failure logic	Selects customer IO external fault 1 failure logic as active high or active low.	Active High/ List
	Activfe Low		0
	Activfe High		1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
176.26	External fault 2 source	Selects source for customer IO external fault 2 signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
176.27	External fault 2 action	Customer IO external fault 2 action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
176.28	External fault 2 action delay	Customer IO external fault 2 action delay.	0 s/ List
	0...3600 s		1 = 1 s
176.29	External fault 2 failure logic	Selects customer IO external fault 2 failure logic as active high or active low.	Active High/ List
	Activfe Low		0
	Activfe High		1
176.31	External fault 3 source	Selects source for customer IO external fault 3 signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
176.32	External fault 3 action	Customer IO external fault 3 action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Delayed fault		3
176.33	External fault 3 action delay	Customer IO external fault 3 action delay.	0 s/ List
	0...3600 s		1 = 1 s
176.34	External fault 3 failure logic	Selects customer IO external fault 3 failure logic as active high or active low.	Active High/ List
	Activfe Low		0
	Activfe High		1
177 MV Station		Medium voltage station parameters including MV transformer and MV switchgear.	
177.11	MV temperature alarm source	Selects source for medium voltage transformer overtemperature alarm.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	Other	See Terms and abbreviations on page 59.	-
177.12	Transformer temperature alarm action	Selects medium voltage transformer overtemperature alarm action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.13	Transformer temperature alarm delay	Defines delay time for medium voltage transformer overtemperature alarm action.	0 / Real
	0...3600 s	Delay time	1 = 1 s
177.14	Transformer temperature alarm current	Defines current limit for medium voltage transformer overtemperature alarm. The limit is active with all actions, except the "no action".	10000 A/ Real
	0....10000 A	Transformer overtemperature alarm current limit.	1 = 1 A

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
177.15	Transformer temperature alarm failure logic	Selects medium voltage transformer overtemperature alarm failure logic.	Active High/ List
	Active Low		0
	Active High		1
177.16	MV temperature fault source	Sets source for medium voltage transformer overtemperature fault.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	Other	See Terms and abbreviations on page 59.	-
177.17	Transformer temperature fault action	Selects medium voltage overtemperature fault action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.18	Transformer temperature fault delay	Defines delay time for medium voltage transformer overtemperature fault action.	0 s/ Real
	0...3600 s	Delay time	1 = 1 s
177.19	Transformer temperature fault current limit	Defines current limit for medium voltage transformer overtemperature fault. The limit is active with every other action, except "no action".	10000 A/ Real
	0....10000 A	Transformer overtemperature fault current limit.	1 = 1 A
177.20	Transformer temperature fault failure logic	Selects the logic for medium voltage transformer overtemperature fault failure. The fault is active high or active low.	Active High/ List
	Active Low		0
	Active High		1
177.21	MV low oil level source	Selects source for medium voltage transformer low oil level signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
177.22	Transformer low oil level action	Selects medium voltage transformer low oil level action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.23	Transformer low oil level delay	Defines delay time for medium voltage transformer low oil level action.	0 s/ Real
	0...3600 s		1 = 1 s
177.24	Transformer low oil level current limit	Defines current limit for medium voltage transformer low oil level. The limit is active with every action, except "no action".	10000 A/ Real
	0....10000 A		1 = 1 A
177.25	Transformer low oil level failure logic	Selects failure logic for medium voltage transformer low oil level. The alarm is active high or active low.	Active High/ List
	Active Low		0
	Active High		1
177.26	MV overpressure source	Selects source for medium voltage transformer overpressure signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
177.27	Transformer overpressure action	Selects medium voltage transformer overpressure action.	No action/ List
	No action		0
	Delayed warning		1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.28	Transformer overpressure delay	Defines delay time for medium voltage transformer overpressure action.	0 s/ <i>Real</i>
	0...3600 s		1 = 1 s
177.29	Transformer overpressure current limit	Defines current limit for medium voltage transformer overpressure. The limit is active with all actions, except for "no action".	10000 A/ <i>Real</i>
	0....10000 A		1 = 1 A
177.30	Transformer overpressure failure logic	Selects failure logic for medium voltage transformer overpressure. The alarm is active high or active low.	Active High/ <i>List</i>
	Active Low		0
	Active High		1
177.31	MV vacuum failure source	Selects source for medium voltage transformer vacuum failure signal.	Off/ <i>List</i>
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See <i>Terms and abbreviations</i> on page 59.	-
177.32	Transformer vacuum failure action	Defines medium voltage transformer vacuum failure action.	No action/ <i>List</i>
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.33	Transformer vacuum failure delay	Defines delay time for medium voltage transformer vacuum failure action.	0 s/ <i>Real</i>
	0...3600 s	Transformer vacuum failure delay time.	1 = 1 s
177.34	Transformer vacuum failure current limit	Defines current limit for medium voltage transformer vacuum failure. The limit is active with all actions, except the "no action".	10000 A/ <i>Real</i>

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	0....10000 A	Transformer vacuum failure current limit.	1 = 1 A
177.35	Transformer vacuum failure logic	Defines failure logic for medium voltage transformer vacuum. The alarm is active high or active low.	Active High/ List
	Active Low		0
	Active High		1
177.36	MV gas discharge source	Selects source for medium voltage transformer gas discharge signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	Other	See Terms and abbreviations on page 59.	-
177.37	Transformer gas discharge action	Selects medium voltage transformer gas discharge action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.38	Transformer gas discharge delay	Defines delay time for medium voltage transformer gas discharge action.	0 s/ Real
	0...3600 s	Transformer gas discharge delay time.	1 = 1 s
177.39	Transformer gas discharge current limit	Defines current limit for medium voltage transformer gas discharge. The limit is active with all actions, except the "no action".	10000 A/ Real
	0....10000 A	Transformer gas discharge current limit.	1 = 1 A
177.40	Transformer gas discharge failure logic	Selects logic for medium voltage transformer gas discharge failure.	Active High/ List
	Active Low		0
	Active High		1
177.41	MV breaker opening source	Selects source for medium voltage breaker opening alarm signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
177.42	MV breaker feedback action	Selects medium voltage breaker opening signal action.	No action/ List
	No action		0
	Delayed warning		1
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.43	MV breaker feedback action delay	Defines delay time for medium voltage breaker opening action.	0 s/ Real
	0...3600 s	Breaker opening action delay time.	1 = 1 s
177.44	MV breaker feedback power limit	Defines power limit for medium voltage breaker opening. The limit is active with all actions, except the "no action".	1000 A/ Real
	0....10000 A	Breaker opening power limit.	1 = 1 A
177.45	MV breaker feedback failure logic	Selects how the inverter should react to a medium voltage breaker opening failure.	Active High/ List
	Active Low	Alarm is active low.	0
	Active High	Alarm is active high.	1
177.46	MV side phase lost source	Selects source for medium voltage side phase lost signal.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
177.47	MV phase loss detection action	Selects medium voltage side phase lost signal action.	No action/ List
	No action		0
	Delayed warning		1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	Warning and delayed fault		2
	Delayed fault		3
	Fault and delayed MV breaker opening		4
177.48	MV phase loss detection action delay	Defines delay time for medium voltage side phase lost action.	0 s/ <i>Real</i>
	0...3600 s	Phase lost action delay time.	1 = 1 s
177.49	MV phase loss detection power limit	Defines limit for medium voltage side phase lost power. The limit is active with all actions, except the "no action".	1000 A/ <i>Real</i>
	0....10000 A	Phase lost power limit.	1 = 1 A
177.50	MV phase loss detection failure logic	Selects logic for medium voltage side phase lost failure. The alarm is active high or active low.	Active High/ <i>List</i>
	Active Low		0
	Active High		1
177.51	Transformer coil temperature source	Selects analog input source for the MV transformer coil temperature signal.	Zero/ <i>List</i>
	Zero		0
	PLC CPU AI2		1
	<i>Other</i>	See <i>Terms and abbreviations</i> on page 59.	-
177.52	Transformer coil temperature	Shows medium voltage transformer coil temperature. This parameter is read-only.	-/ <i>Real</i>
	-100.0...400.0 °C	Transformer coil temperature.	1 = 1 °C/ 10 = 1 °C
177.53	Transformer coil temperature at 4 mA current	Sets medium voltage transformer coil temperature when the temperature sensor current is 4 mA.	0 °C/ <i>Real</i>
	-200...400 °C		1 = 1 °C
177.54	Transformer coil temperature at 20 mA current	Sets medium voltage transformer coil temperature when the temperature sensor current is 20 mA.	200 °C/ <i>Real</i>
	-200...400 °C		1 = 1 °C
177.55	Transformer coil temperature warning limit	Defines limit for medium voltage transformer coil temperature warning.	90 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.56	Transformer coil temperature fault limit	Defines limit for medium voltage transformer coil temperature fault.	100 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.57	Transformer coil, current limit temperature 1	Defines temperature 1 of the MV transformer coil temperature related current limitation curve. In this temperature the current is limited to point 1 value. The inverter shows a warning to indicate this temperature.	90 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
177.58	Transformer coil, current limit temperature 2	Defines temperature 2 of the MV transformer coil temperature related current limitation curve. In this temperature the current is limited to point 2 value.	95 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.59	Transformer coil, current limit temperature 3	Defines temperature 3 of the MV transformer coil temperature related current limitation curve. In this temperature the current is limited to 0 %. Also a fault is triggered.	100 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.60	Transformer coil, current limit current 1	Defines current 1 value of the MV transformer coil temperature related current limitation curve. This is the limited current when temperature is at limit 1.	3600 A/ <i>Real</i>
	0....10000 A		-/ 1 = 1 A
177.61	Transformer coil, current limit current 2	Defines current 2 value of the MV transformer coil temperature related current limitation curve. This is the limited current when temperature is at limit 2.	1000 A/ <i>Real</i>
	0....10000 A		-/ 1 = 1 A
177.63	Transformer oil temperature source	Selects analog input source for the MV transformer oil temperature signal.	Zero/ <i>List</i>
	Zero		0
	PLC CPU AI1		1
	<i>Other</i>	See <i>Terms and abbreviations</i> on page 59.	-
177.64	Transformer oil temperature	Shows the temperature of medium voltage transformer oil. This parameter is read-only.	-/ <i>Real</i>
	-100.0...400.0 °C		1 = 1 °C / 10 = 1 °C
177.65	Transformer oil temperature at 4 mA current	Defines the temperature of medium voltage transformer oil, when temperature sensor current is 4 mA.	0 °C/ <i>Real</i>
	-200...400 °C		1 = 1 °C
177.66	Transformer oil temperature at 20 mA current	Defines the temperature of medium voltage transformer oil, when temperature sensor current is 20 mA.	200 °C/ <i>Real</i>
	-200...400 °C		1 = 1 °C
177.67	Transformer oil temperature warning limit	Defines limit to indicate a warning when medium voltage transformer oil temperature is more than this value.	90 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.68	Transformer oil temperature fault limit	Defines limit to trigger a fault when medium voltage transformer oil temperature is above this value.	100 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.69	Transformer oil, current limit temperature 1	Defines temperature 1 value of the MV transformer oil temperature related current limitation curve. At this temperature current is limited to point 1 value. A warning is indicated at this temperature.	90 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
177.70	Transformer oil, current limit temperature 2	Defines temperature 2 value of the MV transformer oil temperature related current limitation curve. At this temperature current is limited to point 2 value.	95 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.71	Transformer oil, current limit temperature 3	Defines temperature 3 value of the MV transformer oil temperature related current limitation curve. At this temperature current is limited to 0 %. A fault is triggered at this temperature.	100 °C/ <i>Real</i>
	0...200 °C		1 = 1 °C
177.72	Transformer oil, current limit current 1	Defines current 1 value of the MV transformer oil temperature related current limitation curve. This is the limited current when temperature is at limit 1.	3600 A/ <i>Real</i>
	0...10000 A		-/ 1 = 1 A
177.73	Transformer oil, current limit current 2	Defines current 2 value of the MV transformer oil temperature related current limitation curve. This is the limited current when temperature is at limit 2.	1000 A/ <i>Real</i>
	0...10000 A		-/ 1 = 1 A
177.81	MV breaker opening status	Shows status of MV breaker opening. This parameter is an interface for relay output source. This parameter is read-only.	-/ <i>Bit list</i>
	b0: MV breaker open command	When MV breaker is controlled to open, this bit is set accordingly. Actual relay output source can be pointed to this bit.	
	b1...b15: Reserved		
184 Energy metering		Energy metering parameters.	
184.01	Startup date	Shows start up date for the starting year of energy logging. Days starts from 01.01.1980. This parameter is read-only.	0 day/ <i>Real</i>
	0 ... 43440 days	Start up date.	1 = 1 day
184.02	Last Boot Time, Days	Shows the date saved at the time of power failure to update loggers accordingly in next power-up. This parameter is read-only.	0 day/ <i>Real</i>
	0 ... 65500 days	Last boot time date	1 = 1 day
184.03	Last Boot Time, Ticks	Shows time saved at the time of power failure to update energy loggers accordingly in next power-up. This parameter is read-only.	0 / <i>Real</i>
	0 ... 864000000	Last boot time	1 = 1
184.06	Total energy	Shows total energy produced. This parameter is read-only.	-/ <i>Real</i>
	0...4294967295 kWh	Energy in kWh	-/ 1 = 1 kWh
184.07	Total energy frac	Shows total energy. This parameter is read-only.	-/ <i>Real</i>
	0...65535 W	Energy in Watts	1 = 1 W

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
184.09	Total kVAh supplied	Shows total kVAh supplied. This parameter is read-only.	-/ <i>Real</i>
	0...4294967295 kVAh	Energy in kVAh.	-/ 1 = 1 kVAh
184.10	Total kVAh supplied Frac	Shows total energy supplied in kVAh. This parameter is read-only.	-/ <i>Real</i>
	0...65535	kVAh supplied.	1 = 1
184.12	Energy counter, resettable	Shows total energy produced since the last reset. Writing 0 resets the counter. This parameter is read-only.	-/ <i>Real</i>
	0.00... 4294967.30 kWh	Energy produced in kWh.	1 = 1 kWh/ 100 = 1 kWh
184.13	kVAh Energy counter, resettable	Shows total energy produced in kVAh since the last reset. Writing 0 resets the counter. This parameter is read-only.	-/ <i>Real</i>
	0.00... 4294967.30 kVAh	Energy produced in kVAh.	1 = 1 kVAh/ 100 = 1 kVAh
184.14	Daily kWh supplied	Shows kWh energy produced in current day. This parameter is read-only.	-/ <i>Real</i>
	0.0...4294967.3 kWh	Energy produced in kWh.	1 = 1 kWh/ 10 = 1 kWh
184.15	Daily kVAh supplied	Shows kVAh energy produced in current day. This parameter is read-only.	-/ <i>Real</i>
	0.0...4294967.3 kVAh	Energy produced in kVAh.	1 = 1 kVAh/ 10 = 1 kVAh
185 Health monitoring		Health monitoring inhibits starting. All active modules must have healthy power supply and buffer status. 0 = Run 1 = Inhibited	
185.01	Main circuit SPD status	Shows main circuit SPD status.	0b0000/ <i>Bit list</i>
	b0: SPD	Shows status of SPD circuit	
	b1 ... b15: Reserved	-	
185.02	DC input fuse status	Shows DC input fuse status.	0b0000/ <i>Bit list</i>
	b0: Module 1	Fuse status of module 1	
	b1 ... b15: Reserved	-	
185.03	48 V power supply status	Shows 48 V power supply status.	0b0000/ <i>Bit list</i>
	b0: Module 1	Shows status of 48 V power supply of module 1.	
	b1 ... b15: Reserved	-	

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
185.04	48 V buffer status	Shows 48 V buffer status.	0b0000/ <i>Bit list</i>
	b0: Module 1	48 V buffer status of module 1.	
	b1 ... b15: Reserved		
185.05	24 V buffer status	Shows 24 V buffer status.	0b0000/ <i>Bit list</i>
	b0: 24 V buffer	24 V buffer status.	
	b1 ... b15: Reserved	-	
185.11	LCL overheat sensor status	Shows status of LCL overheat sensor.	0b0000/ <i>Bit list</i>
	b0: Module 1	Monitored status of module 1 LCL overheat sensor.	
	b1: Module 2	-	
	b2 ... b15: Reserved	-	
185.24	24 V buffer action delay	Defines delay time for 24 V buffer action.	3.0 s/ <i>Real</i>
	0.0...60.0 s	Delay time	10 = 1 s
185.25	48 V power supply action delay	Defines delay time for 48 V power supply action.	1.5 s/ <i>Real</i>
	0.0...60.0 s	Delay time	10 = 1 s
185.26	48 V buffer action delay	Defines delay time for 48 V buffer action.	45.0 s/ <i>Real</i>
	0.0...60.0 s	Delay time	10 = 1 s
185.27	Buffer charge delay	Defines delay time for buffer charging.	60 s/ <i>Real</i>
	0...1000 s	Delay time	1 = 1 s
189 Inverter control		Inverter control settings.	
189.01	Inverter operation	Enables inverter operation.	Disable/ <i>List</i>
	Disable	Inverter operation is disabled. Inverter disconnects from AC grid.	0
	Enable	Inverter operation enabled.	1
189.02	Start switch source	Sets source for start switch.	On/ <i>List</i>
	Off	0.	0
	On	1.	1
	DI1	Digital input DI1 (as indicated by DI delayed status bit 0)	2
	DI2	Digital input DI2 (as indicated by DI delayed status bit 1)	3
	DI3	Digital input DI3 (as indicated by DI delayed status bit 2)	4
	DI4	Digital input DI4 (as indicated by DI delayed status bit 3)	5
	DI5	Digital input DI5 (as indicated by DI delayed status bit 4)	6
	DI6	Digital input DI6 (as indicated by DI delayed status bit 5)	7
	Other	See <i>Terms and abbreviations</i> on page 59.	-
189.03	IO transfer trip source	Selects source for IO transfer trip.	Off/ <i>List</i>
	Off	0.	0
	On	1.	1
	BCU DI1		2
	BCU DI6		3

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
189.04	SCADA transfer trip	Activates and sets source for SCADA transfer trip.	Deactive/ List
	Deactive	SCADA transfer trip deactivated.	0
	Active	SCADA transfer trip activated.	1
189.05	Transfer trip event	Sets event for transfer trip.	No action/ List
	No action		0
	Warning		1
	Fault		2
	Pure event		3
189.06	IO shutdown source	Sets source for IO shutdown.	Off/ List
	Off		0
	On		1
	BCU DI1		2
	BCU DI6		3
	A500 DI1		4
	A512 DI0		5
	A512 DI3		6
	A512 DI4		7
	A512 DI5		8
	A512 DI6		9
	<i>Other</i>	See Terms and abbreviations on page 59.	-
189.07	SCADA shutdown	Sets source for SCADA shutdown.	Deactive/ List
	Deactive		0
	Active		1
189.08	Shutdown event	Sets event for shutdown.	No action/ List
	No action		0
	Warning		1
	Fault		2
	Pure event		3
189.11	Reset active faults	Resets active faults of the inverter.	0 / Real
	0 ... 1		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
190 External measurements		Settings for external measurements. All parameters in this group are read-only, otherwise noted.	
190.01	Phase voltage U1	Shows rms value of phase voltage U1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	U1 phase voltage.	1 = 1 V/ 100 = 1 V
190.02	Phase voltage V1	Shows rms value of phase voltage V1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	V1 phase voltage.	1 = 1 V/ 100 = 1 V
190.03	Phase voltage W1	Shows rms value of phase voltage W1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	W1 phase voltage.	1 = 1 V/ 100 = 1 V
190.04	Phase voltage 1 max	Shows maximum rms value of phase voltage 1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Maximum phase voltage 1.	1 = 1 V/ 100 = 1 V
190.05	Phase voltage 1 min	Shows minimum rms value of phase voltage 1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Minimum phase voltage 1.	1 = 1 V/ 100 = 1 V
190.06	Main voltage U1-V1	Shows rms value of line-to-line voltage U1-V1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	U1-V1 line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.07	Main voltage V1-W1	Shows rms value of line-to-line voltage V1-W1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	V1-W1 line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.08	Main voltage W1-U1	Shows rms value of line-to-line voltage W1-U1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	W1-U1 line-to-line voltage.	1 = 1 V/ 100 = 1 V
190.09	Main voltage 1 max	Shows maximum rms value of line-to-line voltage 1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Maximum line-to-line voltage 1.	1 = 1 V/ 100 = 1 V
190.10	Main voltage 1 min	Shows minimum rms value of line-to-line voltage 1.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Minimum line-to-line voltage 1.	1 = 1 V/ 100 = 1 V
190.11	Phase voltage 1 pos seq	Shows rms value of phase voltage 1 positive sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Phase voltage 1 positive sequence.	1 = 1 V/ 100 = 1 V
190.12	Phase voltage 1 neg seq	Shows rms value of phase voltage 1 negative sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Phase voltage 1 negative sequence.	1 = 1 V/ 100 = 1 V

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
190.13	Main voltage 1 pos seq	Shows rms value of line-to-line voltage 1 positive sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Line-to-line voltage 1 positive sequence.	1 = 1 V/ 100 = 1 V
190.14	Main voltage 1 neg seq	Shows rms value of line-to-line Voltage 1 negative sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V	Line-to-line voltage 1 negative sequence.	1 = 1 V/ 100 = 1 V
190.15	Frequency 1	Shows estimated frequency of the measured voltage 1.	-/ <i>Real</i>
	0.00 ... 100.00 Hz	Estimated frequency of measured voltage 1.	1 = 1 Hz/ 100 = 1 Hz
190.20	Phase voltage U2	Shows the rms value of phase voltage U2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.21	Phase voltage V2	Shows rms value of phase voltage V2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.22	Phase voltage W2	Shows rms value of phase voltage W2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.25	Main voltage U2-V2	Shows rms value of line-to-line voltage U2-V2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.26	Main voltage V2-W2	Shows rms value of line-to-line voltage V2-W2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.27	Main voltage W2-U2	Shows rms value of line-to-line voltage W2-U2.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.30	Phase voltage 2 pos seq	Shows rms value of phase voltage 2 positive sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.31	Phase voltage 2 neg seq	Shows rms value of phase voltage 2 negative sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.32	Main voltage 2 pos seq	Shows rms value of line-to-line voltage 2 positive sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
190.33	Main voltage 2 neg seq	Shows rms value of line-to-line voltage 2 negative sequence.	-/ <i>Real</i>
	0.00 ... 2000.00 V		1 = 1 V/ 100 = 1 V
190.34	Frequency 2	Shows estimated frequency of measured voltage 2.	-/ <i>Real</i>
	0.00 ... 100.00 Hz		1 = 1 Hz/ 100 = 1 Hz
190.40	Phase current U1	Shows rms value of U phase current.	-/ <i>Real</i>
	-		1 = 1 A/ 100 = 1 A
190.41	Phase current V1	Shows rms value of V1 phase current.	-/ <i>Real</i>
	-		1 = 1 A/ 100 = 1 A
190.42	Phase current W1	Shows rms value of W1 phase current.	-/ <i>Real</i>
	-		1 = 1 A/ 100 = 1 A
190.43	Current 1 pos seq	Shows the magnitude of current positive sequence component that are calculated using rms values.	-/ <i>Real</i>
	-		1 = 1 A/ 100 = 1 A
190.44	Current 1 neg seq	Shows the magnitude of current negative sequence component that are calculated using rms values.	-/ <i>Real</i>
	-		1 = 1 A/ 100 = 1 A
195 HW configuration		Various hardware-related settings.	
195.04	Control board supply	Specifies how the inverter control unit is powered from an external power supply.	External 24V/ <i>List</i>
	Internal 24V	The inverter control unit is powered from the inverter power unit it is mounted on. This is the default setting.	0
	External 24V	The inverter control unit is powered from an external power supply.	1
	Redundant external 24V	The inverter control unit is powered from redundant external power supply.	2
195.14	Connected modules	Connected and found modules of parallel connection (bit field). This parameter is read-only.	0b0000/ <i>Bit list</i>
	b0: Module 1		
	b1: Module 2		
	b2: Module 3		
	b3: Module 4		
	b4: Module 5		
	b5: Module 6		
	b6: Module 7		
	b7: Module 8		

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b8: Module 9		
	b9: Module 10		
	b10: Module 11		
	b11: Module 12		
	b12...b15: Reserved		
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.	0b0000/ <i>Bit list</i>
	b0... b1: Reserved	-	
	b2: Internally charged	Internal charging in use.	
	b3: RO2 for -07 cabinet cooling fan	Sets parameter 110.27 RO2 source write protected.	
	b4 Internally powered control unit	1 = Yes. Sets parameter <i>195.04 Control board supply</i> = Internal 24 V.	
	b5 ... b7: Reserved	-	
	b8: Service switch	Service switch is wired to DI6. Sets parameter 131.01 <i>External event 1 source</i> 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 <i>Run enable 1</i> to parameter 110.01 <i>DI status</i> , 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 ... b13: Reserved	-	
	b14: DOL fan control		
	b15: Reserved	-	
195.25	LCL filter parameter source	Selects source for LCL filter parameter.	Copy from database/ <i>List</i>
	Copy from database		0
	User values		1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
196 System		Systems settings: Language selection, parameter save and restore, control unit reboot.	
196.01	Language	Selects language of the parameter interface and other displayed information.	Not selected/ <i>List</i>
	Not selected	Default value of the parameter and means that language has not been selected.	0
	English	English (United States)	1
196.02	Passcode	<p>Pass codes can be entered into this parameter to activate further access levels, for example additional parameters, parameter lock, etc. See parameter 196.03 Access level status.</p> <p>Entering “358” toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool.</p>	-/ <i>Real</i>
196.03	Access level status	<p>Shows which access levels are activated by pass codes entered into parameter 196.02 Passcode.</p> <p>This parameter is read-only.</p>	0x0000/ <i>Bit list</i>
	b0: User level		
	b1: Maintenance		
	b2: Engineer		
	b3: ABB engineer		
	b4: ABB specialist		
	b5...b10: Reserved		
	b11: OEM access level 1		
	b12: OEM access level 2		
	b13: OEM access level 3		
	b14: Parameter lock		
	b15: Reserved.		
196.06	Param restore	<p>Restores original settings of the application, i.e. parameter factory default values.</p> <p>Note: This parameter cannot be changed while the inverter is running.</p>	Done/ <i>List</i>
	Done	Restoring is completed.	0
	Restore defs	<p>All editable parameter values are restored to default values, except</p> <ul style="list-style-type: none"> • I/O extension module settings • control panel/PC communication settings • fieldbus adapter settings 	1
	Clear all	<p>All editable parameter values are restored to default values, except</p> <ul style="list-style-type: none"> • control panel/PC communication settings • fieldbus adapter settings <p>PC tool communication is interrupted during the restoring.</p>	2

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
196.07	Param save	Saves valid parameter values to the permanent memory. Note: A new parameter value is saved automatically when changed from the PC tool or panel but not when altered through a fieldbus connection.	Done/ List
	Done	Save completed.	0
	Save	Save in progress.	1
196.08	Control board boot	Changing the value of this parameter to 1 reboots the control unit. The value reverts to 0 automatically.	-/ Real
	0 ... 1	1 = Reboot control unit.	1 = 1
196.10	User set status	Shows status of the user parameter sets. This parameter is read-only.	n/a/ List
	n/a	No user parameter sets were saved.	0
	Loading	A user set is loaded.	1
	Saving	A user set is saved.	2
	Faulted	Invalid or empty parameter set.	3
	User set 1	User set 1 is loaded.	4
	User set 2	User set 2 is loaded.	5
	User set 3	User set 3 is loaded.	6
	User set 4	User set 4 is loaded.	7
	User set 5	User set 5 is loaded.	8
	User set 6	User set 6 is loaded.	9
	User set 7	User set 7 is loaded.	10
	User set 8	User set 8 is loaded.	11
196.11	User set save/load	Stores current parameter settings. The setting that was in use before powering down the inverter is in use after the next power-up. Notes: <ul style="list-style-type: none"> Some hardware configuration settings, such as I/O extension module and fieldbus configuration parameters (groups 114...116, 147, and 150...156) 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. 	No action/ List
	No action	Load or save operation complete; normal operation.	0
	IO mode	Load user parameter set using parameters 196.12 User set IO sel in1 and 196.13 User set IO sel in2 .	1
	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 macro. Stores the current parameter settings. Note: There are parameters that are not included in the macros.	6
	Save to set 2	Save user parameter set 2.	7

No.	Bit/Name/Value/ Range	Description	Def/Type															
	Save to set 3	Save user parameter set 3.	8															
	Save to set 4	Save user parameter set 4.	9															
196.12	User set IO sel in1	<p>When parameter 196.11 User set save/load is set to <i>IO mode</i>, selects the user parameter set together with parameter 196.13 User set IO sel in2 as follows:</p> <table border="1"> <thead> <tr> <th>Status of source defined by par. 196.12</th> <th>Status of source defined by par. 196.13</th> <th>User parameter set selected</th> </tr> </thead> <tbody> <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> </tbody> </table>	Status of source defined by par. 196.12	Status of source defined by par. 196.13	User parameter set selected	0	0	Set 1	1	0	Set 2	0	1	Set 3	1	1	Set 4	Off/ List
Status of source defined by par. 196.12	Status of source defined by par. 196.13	User parameter set selected																
0	0	Set 1																
1	0	Set 2																
0	1	Set 3																
1	1	Set 4																
	Off	0.	0															
	On	1.	1															
	DI1	Digital input DI1 (as indicated by DI delayed status bit 0)	2															
	DI2	Digital input DI2 (as indicated by DI delayed status bit 1)	3															
	DI3	Digital input DI3 (as indicated by DI delayed status bit 2)	4															
	DI4	Digital input DI4 (as indicated by DI delayed status bit 3)	5															
	DI5	Digital input DI5 (as indicated by DI delayed status bit 4)	6															
	DI6	Digital input DI6 (as indicated by DI delayed status bit 5)	7															
	DIO1	Digital input/output DIO1 (as indicated by DIO delayed status bit 0)	10															
	DIO2	Digital input/output DIO2 (as indicated by DIO delayed status bit 1)	11															
196.13	User set IO sel in2	See parameter 196.12 User set IO sel in1 .	Off/ List															
196.20	Time synchronization source	Defines first priority source for inverter's date and time synchronization from an external source.	DDCS Controller/ List															
	Internal	No external time synchronization for inverter's date and time.	0															
	DDCS Controller	AC800M automation PLC through CI858, Module bus.	1															
	Fieldbus A or B	Fieldbus channel A or B.	2															
	Fieldbus A	Fieldbus channel A.	3															
	Fieldbus B	Fieldbus channel B.	4															
	D2D or M/F	D2D-communication master, or master in master/follower link.	5															
	Embedded FB	Embedded fieldbus	6															
	Embedded Ethernet	Ethernet port in BCU.	7															
	Panel link	User's panel e.g. ACS-AP-I or inverter composer-tool.	8															
	Ethernet tool link	inverter composer-tool Ethernet link.	9															

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
196.24	Full days since 1st Jan 1980	Sets day count starting from 1st January 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 inverter 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/ Real
	1 ... 59999 days	Days since beginning of 1980.	1 = 1 days
196.25	Time in minutes within 24 h	Sets the 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/ Real
	0 ... 1439 min	Minutes since midnight.	1 = 1 min
196.26	Time in ms within one minute	Sets the number of milliseconds passed since last minute. See parameter 196.24 Full days since 1st Jan 1980 .	0 ms/ Real
	0 ... 59999 ms	Number of milliseconds since last minute.	1 = 1 ms
196.29	Time source status	Shows the status and priority of active time source. This parameter is read-only.	0b0000/ Bit list
	b0: Time tick received	1 = 1st priority tick received: Tick was received from 1st priority source.	
	b1: Aux Time tick received	1 = 2nd priority tick received: Tick was 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 is received from an external controller.	
	b4: Master/Follower	1 = Tick received: Tick is received through the master/follower link.	
	b5: Reserved	-	
	b6: D2D	1 = Tick received: Tick is received through the inverter-to-inverter link.	
	b7: FbusA	1 = Tick received: Tick is received through fieldbus interface A.	
	b8: FbusB	1 = Tick received: Tick has been received through fieldbus interface B.	
	b9: EFB	1 = Tick received: Tick was received through the embedded fieldbus interface.	
	b10: Ethernet	1 = Tick received: Tick was received through the Ethernet port on the BCU control unit.	
	b11: Panel link	1 = Tick received: Tick is received from the control panel, or Drive composer PC tool connected to the control panel.	
	b12: Ethernet tool link	1 = Tick received: Tick is received from Drive composer PC tool through an FENA-xx module.	
	b13 Parameter setting	1 = Tick received: Tick is set by parameters 196.24... 196.26 .	
	b14 RTC	1 = RTC time in use: Time and date is read from the real-time clock.	

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b15 Drive On-Time	1 = Inverter on-time in use: Time and date are displaying inverter on-time.	
196.61	User data logger status word	Shows the status of user data logger. This parameter is read-only.	0x0000/ <i>Bit list</i>
	b0: Running	User data logger is running. This bit is cleared after post trigger time has passed.	
	b1: Triggered	User data logger has triggered. This bit is cleared when user data logger is re-started.	
	b2: Data available	Data logger contains data that can be read. Note: this bit is not cleared after it has risen because triggered data is saved into ZMU.	
	b3: Configured	User data logger configured. Note: this bit is not cleared after it has risen because configuration data is saved into ZMU.	
	b4 ... b15: Reserved		
196.63	User data logger trigger	Activates bit pointer to trigger user data logger	Off/ <i>List</i>
	Off	User data logger not triggered.	0
	On	User data logger triggered.	1
	<i>Other</i>	See <i>Terms and abbreviations</i> on page 59.	-
196.64	User data logger start	Activates bit pointer to start user data logger.	Off/ <i>List</i>
	Off	User data logger not started.	0
	On	User data logger started.	1
	<i>Other</i>	See <i>Terms and abbreviations</i> on page 59.	-
196.65	Factory data logger time level	Selects time level of factory data logger. When factory data logger is made to sample on a slower time level, data may be captured from a longer time period.	500us/ <i>Real</i>
	500us	Factory data logger runs at 500us time level. Data is captured approximately for the set time period.	0
	2ms	Factory data logger runs at 2ms time level. Data is captured approximately for the set time period.	1
	10ms	Factory data logger runs at 10ms time level. Data is captured approximately for the set time period.	2
202 Fan control		Fan control related parameters.	
202.01	DC door fan mode	Selects DC side door fan control mode. DC and auxiliary cabinet door fans are controlled based on this parameter.	Normal operation/ <i>List</i>
	Normal operation		0
	Forced on		1
	Forced off		2
202.02	AC door fan mode	Selects AC side door fan control mode. AC and aux cabinet door fans are controlled based on this parameter.	Normal operation/ <i>List</i>
	Normal operation		0
	Forced on		1
	Forced off		2

No.	Bit/Name/Value/Range	Description	Def/Type FbEq16/32
202.03	Power module fan mode	Selects AC side door fan control mode. AC cabinet and LCL filter fans are controlled based on this parameter.	Normal operation/ List
	Normal operation		0
	Forced on		1
	Forced off		2
202.20	Power module fan reference	Shows power module fan speed reference. This parameter is read-only.	-/ Real
	0...100%		1 = 1 rpm
202.21	Power module 1 fan	Shows power module 1 fan feedback. This parameter is read-only.	-/ Real
	0...20000 rpm		1 = 1 rpm
202.22	Power module 2 fan	Shows power module 2 fan feedback. This parameter is read-only.	-/ Real
	0...20000 rpm		1 = 1 rpm
202.23	Power module 3 fan	Shows power module 3 fan feedback. This parameter is read-only.	-/ Real
	0...20000 rpm		1 = 1 rpm
202.24	Power module 4 fan	Shows power module 4 fan feedback. This parameter is read-only.	-/ Real
	0...20000 rpm		1 = 1 rpm
202.25	Expected grid rotation	Selects expected grid voltage rotation direction. Note: If this value differs from the measured direction, the LCL fans will rotate in wrong direction and can overheat.	Default/ List
	Default	Actual grid is rotating in the default direction.	0
	Opposite	Actual grid is rotating in the opposite direction.	1
204 PLC Extension Inputs		PLC extension inputs.	
204.01	PLC digital Inputs 1	PLC CPU unit PM564 digital inputs	0x0000/ Bit list
	b0: Input fuse status		
	b1: Spare DI1		
	b2: Surge protection device status		
	b3: Door fan CB status		
	b4: AC busbar TP status		
	b5: DC busbar TP status		
	b6 ... b15 Reserved		
204.02	PLC digital inputs 2	PLC I/O unit DX571 # 1 digital inputs	0x0000/ Bit list
	b0: ISU 1 AC contactor status		

No.	Bit/Name/Value/ Range	Description	Def/Type
	b1: ISU 1 DC contactor status		
	b2: ISU 1 LCL filter overheat signal		
	b3: AC breaker open command		
	b4: ISU 2 AC contactor status		
	b5: ISU 2 DC contactor status		
	b6: ISU 2 LCL filter overheat signal		
	b7: AC breaker open command		
	b8...b15: Reserved		
204.03	PLC digital inputs 3	PLC I/O unit DX571 # 2 digital inputs.	0x0000/ Bit list
	b0: Spare DI2		
	b1: AC breaker feedback signal status		
	b2: AC breaker trip signal status		
	b3: SPARE (MV trafo oil temperature)		
	b4: SPARE (MV trafo oil level)		
	b5: SPARE (MV trafo oil pressure)		
	b6: SPARE (MV trafo gas supervision)		
	b7: 48 V buffer ready status		
	b8...b15: Reserved		
204.04	Cabinet temperature	Defines cabinet temperature.	-/ Real
	0...65535		1 = 1
204.05	Spare AI 0-10 V	Spare analog input 0 to 10 V	-/ Real
	0...65535		1 = 1
204.06	PLC watchdog read	PLC reads this parameter and copies the value to PLC watchdog write parameter. This parameter also has the reboot/error return acknowledgement signal in bit 8. It means that PLC has noticed the reboot or the error acknowledgement signal.	-/ Real
	0...65535		1 = 1
204.117	DC input current 1	Defines DC input 1, current measurement.	-/ Real
	0...65535		1 = 1
204.118	DC input current 2	Defines DC input 2, current measurement.	-/ Real
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
204.119	DC input current 3	Defines DC input 3, current measurement.	-/ Real
	0...65535		1 = 1
204.120	DC input current 4	Defines DC input 4, current measurement.	-/ Real
	0...65535		1 = 1
204.121	DC input current 5	Defines DC input 5, current measurement.	-/ Real
	0...65535		1 = 1
204.122	DC input current 6	Defines DC input 6, current measurement.	-/ Real
	0...65535		1 = 1
204.123	DC input current 7	Defines DC input 7, current measurement.	-/ Real
	0...65535		1 = 1
204.124	DC input current 8	Defines DC input 8, current measurement.	-/ Real
	0...65535		1 = 1
204.125	DC input current 9	Defines DC input 9, current measurement.	-/ Real
	0...65535		1 = 1
204.126	DC input current 10	Defines DC input 10, current measurement.	-/ Real
	0...65535		1 = 1
204.127	DC input current 11	Defines DC input 11, current measurement.	-/ Real
	0...65535		1 = 1
204.128	DC input current 12	Defines DC input 12, current measurement.	-/ Real
	0...65535		1 = 1
204.129	DC input current 13	Defines DC input 13, current measurement.	-/ Real
	0...65535		1 = 1
204.130	DC input current 14	Defines DC input 14, current measurement.	-/ Real
	0...65535		1 = 1
204.131	DC input current 15	Defines DC input 15, current measurement.	-/ Real
	0...65535		1 = 1
204.132	DC input current 16	Defines DC input 16, current measurement.	-/ Real
	0...65535		1 = 1
204.133	DC input current 17	Defines DC input 17, current measurement.	-/ Real
	0...65535		1 = 1
204.134	DC input current 18	Defines DC input 18, current measurement.	-/ Real
	0...65535		1 = 1
204.135	DC input current 19	Defines DC input 19, current measurement.	-/ Real
	0...65535		1 = 1
204.136	DC input current 20	Defines DC input 20, current measurement	-/ Real
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
204.137	DC input current 21	Defines DC input 21, current measurement.	-/ <i>Real</i>
	0...65535		1 = 1
204.138	DC input current 22	Defines DC input 22, current measurement.	-/ <i>Real</i>
	0...65535		1 = 1
204.139	DC input current 23	Defines DC input 23, current measurement.	-/ <i>Real</i>
	0...65535		1 = 1
204.140	DC input current 24	Defines DC input 24, current measurement.	-/ <i>Real</i>
	0...65535		1 = 1
204.141	PLC error class	Defines PLC error class.	-/ <i>Real</i>
	0...65535		1 = 1
204.142	PLC error component	Defines PLC error, fault component.	-/ <i>List</i>
	0...65535		1 = 1
	External communication module		1
	External communication module		6
	Local I/P		8
	CPU		9
	Internal communication module		10
	COM1		11
	COM2		12
	FBP		13
	I/O bus		14
	User		15
204.143	PLC error device	Defines component specific PLC error, faulty device. See AC500 documentation.	-/ <i>Real</i>
	0...65535		1 = 1
204.144	PLC error module	Defines device specific PLC error, faulty module.	-/ <i>List</i>
	0...65535		1 = 1
	Initialization		1
	Runtime		2
	Project/configuration		3
	Protocol		4
	Device itself		31
204.145	PLC error channel	Defines module specific PLC error fault channel. See AC500 documentation.	-/ <i>Real</i>
	0...65535		1 = 1
204.146	PLC error identifier	Defines PLC error identifier. See AC500 documentation.	-/ <i>Real</i>
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
204.147	PLC error state	Defines output status of PLC read error. The error status is a combination of the states "Error has come", "Error has gone" and "Error has been acknowledged". See AC500 documentation.	-/ <i>Real</i>
	0...65535		1 = 1
204.148	PLC CPU load	Defines PLC CPU load.	-/ <i>Real</i>
	0...65535		1 = 1
204.201	PLC SW version, lower bits	Defines PLC software version lower bits.	-/ <i>Real</i>
	0...65535		1 = 1
204.202	PLC SW version, upper bits	Defines PLC software version upper bits.	-/ <i>Real</i>
	0...65535		1 = 1
204.203	PLC runtime system version	Defines PLC runtime system version.	-/ <i>Real</i>
	0...65535		1 = 1
204.204	PLC bootcode version	Defines PLC bootcode version.	-/ <i>Real</i>
	0...65535		1 = 1
204.205	PLC onboard I/O version	Defines PLC onboard I/O version.	-/ <i>Real</i>
	0...65535		1 = 1
204.206	PLC software MD5 hash #1	Defines PLC software MD5 hash bytes 0 and 1.	-/ <i>Real</i>
	0...65535		1 = 1
204.207	PLC software MD5 hash #2	Defines PLC software MD5 hash bytes 2 and 3.	-/ <i>Real</i>
	0...65535		1 = 1
204.208	PLC software MD5 hash #3	Defines PLC software MD5 hash bytes 4 and 5.	-/ <i>Real</i>
	0...65535		1 = 1
204.209	PLC software MD5 hash #4	Defines PLC software MD5 hash bytes 6 and 7.	-/ <i>Real</i>
	0...65535		1 = 1
204.251	PLC error code	Defines PLC error code.	-/ <i>Real</i>
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
205 PLC Extension Outputs		PLC output signals.	
205.01	PLC Relay Outputs 1	PLC CPU unit PM564 relay outputs 1.	0x0000/ <i>Bit list</i>
	b0: SPARE 1		
	b1: SPARE 2		
	b2: SPARE 3		
	b3: SPARE 4		
	b4: SPARE 5		
	b5: SPARE 6		
	b6 ... 15 Reserved		
205.02	PLC Relay Outputs 2	PLC I/O unit DX571 # 1 relay outputs 2.	0x0000/ <i>Bit list</i>
	b0: ISU 1 AC contactor command		
	b1: ISU 1 charging contactor command		
	b2: ISU 1 DC contactor command		
	b3: AC cabinet fan control		
	b4: ISU 2 AC contactor command		
	b5: ISU 2 charging contactor command		
	b6: ISU 2 DC contactor command		
	b7: DC cabinet fan control		
	b8...b15: Reserved		
205.03	PLC Relay Outputs 3	PLC I/O unit DX571 # 2 relay outputs 2.	0x0000/ <i>Bit list</i>
	b0: AC breaker close		
	b1: AC breaker reset		
	b2: AC breaker open		
	b3: SPARE 1		
	b4: MV breaker close		
	b5: MV breaker open		
	b6: SPARE 2		
	b7: SPARE 3		
	b8...b15: Reserved		
205.04	PLC watchdog write	Shows the value that PLC reads and copies from the "PLC watchdog read" parameter. This parameter is read-only.	-/ <i>Real</i>
	0...65535		1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
205.05	PLC diagnostics counter	Defines PLC diagnostics counter.	0/ <i>Real</i>
	0...1024		1 = 1
205.06	PLC watchdog threshold	Defines PLC link watchdog threshold level.	1500 ms/ <i>Real</i>
	1...10000 ms	Threshold level	1 = 1 ms
205.07	PLC CPU reboot	Defines the state 1 to reboot PLC.	-/ <i>Real</i>
	0...65535		1 = 1
205.08	PLC error acknowledgement	Defines the value for acknowledging PLC error. Value 1 indicates that an error in the PLC is acknowledged.	-/ <i>Real</i>
	0...65535		1 = 1
205.09	PLC configuration code	Defines PLC configuration code.	-/ <i>Real</i>
	0...255		1 = 1
207 Thermal limitation		Thermal limitation parameters.	
207.59	Iout limit 1	Shows output current limit calculated from the limitation curve group 1. This parameter is read-only.	-/ <i>Real</i>
	0.00 ... 2.00 p.u.		100 = 1 p.u.
207.60	Iout limit scaled	Shows lower of the calculated output current limits scaled with the relational limit. This parameter is read-only.	-/ <i>Real</i>
	0.00 ... 2.00 p.u.		100 = 1 p.u.
207.64	Relative limit IGBT	Shows IGBT module temperature based relational current limit calculated from the limitation curve. This parameter is read-only.	-/ <i>Real</i>
	0.00 ... 200.00 %		1 = 1 %
207.71	Altitude	Selects altitude for inverter installation. This value is used for altitude based derating.	1000 m/ <i>List</i>
	1000 m		0
	1100 m		1
	1200 m		2
	1300 m		3
	1400 m		4
	1500 m		5
	1600 m		6
	1700 m		7
	1800 m		8
	1900 m		9
	2000 m		10
	2100 m		11
	2200 m		12
	2300 m		13
	2400 m		14

No.	Bit/Name/Value/ Range	Description	Def/Type
	2500 m		15
	2600 m		16
	2700 m		17
	2800 m		18
	2900 m		19
	3000 m		20
	3100 m		21
	3200 m		22
	3300 m		23
	3400 m		24
	3500 m		25
	3600 m		26
	3700 m		27
	3800 m		28
	3900 m		29
	4000 m		30
208 DC input monitor			
208.01	Input voltage	Shows DC input voltage value. This parameter is read-only.	-/ <i>Real</i>
	-		1 = 1 V
208.03	Input power	Shows DC input power value. This parameter is read-only.	-/ <i>Real</i>
	0.0...10000.0 kW	Power in kilowatts.	1 = 1 kW/ 10 = 1 kW
208.04	Input current	Shows measured input current of power module. This parameter is read-only.	0 / <i>Real</i>
	-1000.0...1000.0 A	Power module input current.	10 = 1 A
208.09	Input current monitoring	Enables DC current monitoring function.	Enable/ <i>List</i>
	Disable	DC current monitoring disabled.	0
	Enable	DC current monitoring enabled.	1
208.12	Reverse current limit	Defines reverse current limit. A smaller current value is interpreted as reverse current.	-100.0 A/ <i>Real</i>
	-500.0...100.0 A		10 = 1 A
208.13	Reverse current delay	Defines duration for which DC input current has to be more negative than the limit at which a trip is triggered.	2 s/ <i>Real</i>
	0...2000 s	Reverse time limit	1 = 1 s

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
210 Grounding supervision		Grounding supervision parameters.	
210.01	Grounding mode	Sets used grounding mode.	Off/ List
	Off	Grounding mode is Off.	0
	Forced	Grounding mode is forced. Grounding is closed without measuring the insulation resistance.	1
	Automatic	Grounding mode is set automatically. The actual state machine runs independently based on the settings in parameters 210.03...210.03 and the internal states of the inverter.	2
210.02	Grounding device	Sets the used grounding device/board.	MGND-01/ List
	MGND-01	Using this board functional grounding can be performed from either the positive pole (option code +F282) or negative pole (option code +F283).	1
	MGND-21	Using this board direct fuse grounding can be accomplished (option code +F303).	2
210.03	Grounding state	Shows grounding state. This parameter is read-only	-/ List
	Disabled	Grounding is disabled and system is not grounded.	0
	Forced grounding	Grounding is connecting after forced command.	1
	Grounded (forced)	Grounded by forced command.	2
	Forcing failed	Forced grounding failed.	3
	Faulted	Inverter is faulted and grounding state machine is in faulted state. Inverter is faulted and grounding state machine in faulted state.	4
	Ungrounded night	Ungrounded night mode. Input voltage is low and grounding is open.	5
	Insulation measurement	Insulation measurement ongoing.	6
	Grounding connecting	Grounding is ongoing, Monitoring is not yet enabled.	7
	Grounded operation	Grounded and monitored operation.	8
	Grounded night	Grounded night mode. Input voltage is low and grounding is closed.	9
	Grounding opening	Grounding is opening.	10
	Grounding for night	Grounding is closing for night.	11
	Ungrounded operation	Ungrounded operation.	12
	Open during operation	Grounding is opening during operation.	13
	Grounding during operation	Grounding is closing during operation.	14
	Ungrounding for night	Grounding is opening for night.	15
210.04	Ignore insulation resistance	Enables ignore insulation resistance action. This action allows grounding when the insulation resistance is low, e.g., during high moisture mornings. In all cases, grounding is opened (removed), if there is a high grounding voltage or current.	Disable/ List
	Disable	Ignore insulation resistance disabled.	0
	Enable	Ignore insulation resistance enabled.	1

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
210.05	Ungrounded operation	Enables ungrounded operation. Set this parameter if the type of panel in use can function without grounding. Grounding is closed (activated) when the insulation resistance is sufficiently high.	Disable/ List
	Disable	Ungrounded operation disabled.	0
	Enable	Ungrounded operation enabled.	1
210.06	Unground on fault	Enables ungrounding function in the event of fault.	Disable / List
	Disable	Ungrounding on fault is disabled.	0
	Enable	Ungrounding on fault is enabled.	1
210.07	Night grounding	Enables night grounding function. Night grounding means grounding is active while input voltage is low. Note: Grounding is open (removed) when the input voltage is higher than the limit to allow insulation resistance measurement.	Disable/ List
	Disable	Night grounding is disabled.	0
	Enable	Night grounding is enabled.	1
210.08	Wake-up voltage	Defines wake-up voltage.	500 V/ Real
	0...1000 V	Wake-up volt.age	1 = 1 V
210.09	Night mode voltage	Defines night mode voltage.	400 V/ Real
	0...1000 V	Night mode voltage.	1 = 1 V
210.10	Grounding transient time	Defines grounding transient time for which detection is disabled after the grounding command. This action avoids nuisance tripping due to high transients.	1.00 s/ Real
	0.00...20.00 s	Grounding transient time.	1 = 1 s/ 100 = 1 s
210.11	Minimum grounding interval	Defines minimum interval between consecutive groundings. If grounding is opened due to high ground current, the next grounding cannot be made before this interval.	1 min/ Real
	0...1000 min		1 = 1 min
210.12	Grounding circuit voltage fail action	Selects how the inverter should react in the event of a grounding circuit voltage failure.	Warning/ List
	Warning	Indicates 57606 <i>Grounding circuit over voltage</i> warning code in the event of grounding circuit voltage failure.	0
	Fault	Triggers a 37126 <i>Grounding circuit over voltage</i> fault code in the event of grounding circuit voltage failure.	1
210.13	Grounding current limit	Defines limit for rms value of the grounding current. When value is beyond this limit, a fault/warning is activated.	0.25 A/ Real
	0.00...7.00 A	Grounding current limit.	1 = 1 A/ 100 = 1 A
210.14	Total grounding current	Shows rms value of the grounding current. This parameter is read-only.	-/ Real
	0.000...10.000 A	Total grounding current	1 = 1 A/ 1000 = 1 A

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
210.15	Resistive grounding current -10.000...10.000 A	Shows resistive grounding current. This parameter is read-only. Resistive grounding current	-/ Real 1 = 1 A/ 1000 = 1 A
210.16	Grounding current fault action No Warning Fault	Selects how the inverter should react in the event of residual current failure. No action selected. Indicates 57605 <i>Residual current</i> warning code in the event of residual current failure. Triggers 37125 <i>Residual current</i> fault code in the event of residual current failure.	Warning/ List 0 1 2
210.17	Grounding current time limit 0.000...2.000 s	Defines disconnection time for residual current fault. Grounding current time limit.	0.160 s/ Real 1 = 1 s/ 1000 = 1 s
210.18	Sudden change current fault action No Warning Fault	Selects how the inverter should react if a sudden change fault occurred. No action selected. Indicates 57604 <i>Grounding current sudden change</i> warning code in the event of a sudden change in current fault. Triggers 37124 <i>Grounding current sudden change</i> fault code in the event of a sudden change in current fault.	No/ List 0 1 2
210.19	Step 1 current limit 0.000...5.000 A	Defines current limit for the step 1 sudden change. The standard limit is 30 mA, meaning this parameter value should be less than the standard limit. Step 1 current limit.	0.024 A/ Real 1 = 1 A/ 1000 = 1 A
210.20	Step 2 current limit 0.000...5.000 A	Defines current limit for the step 2 sudden change. The standard limit is 60 mA, meaning this parameter value should be less than the standard limit. Step 2 current limit.	0.048 A/ Real 1 = 1 A/ 1000 = 1 A
210.21	Step 3 current limit 0.000...5.000 A	Defines current limit for the step 3 sudden change. The standard limit is 150 mA, meaning this parameter value should be less than the standard limit. Step 3 current limit.	0.120 A/ Real 1 = 1 A/ 1000 = 1 A
210.22	Step 1 time limit 0.000...2.000 s	Defines disconnection time for step 1 sudden change. Step 1 disconnection time.	0.160 s/ Real 1 = 1 s/ 1000 = 1 s
210.23	Step 2 time limit 0.000...2.000 s	Defines disconnection time for step 2 sudden change. Step 2 disconnection time.	0.080 s/ Real 1 = 1 s/ 1000 = 1 s

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
210.25	Insulation resistance measurement	Enables insulation resistance measurement when grounding is not used.	Disable/ List
	Disable	Insulation resistance measurement is disabled.	0
	Enable	Insulation resistance measurement is enabled.	1
210.26	Insulation resistance device	Selects insulation measurement device.	MIRU-01 List
	MIRU-01	MIRU-01 is used as the measurement device.	1
210.27	Insulation resistance device state	Shows insulation measurement device state. This parameter is read-only.	-/ List
	Disabled	Device is disabled.	0
	Not ready	Device is measuring and result is not yet valid.	1
	Measuring	Device is measuring and result is valid.	2
	Failed	Device is broken. Measurement has taken too much time.	3
210.28	Insulation resistance limit	Defines insulation resistance value. A lower value than the limit results in fault/warning.	3000 Ohm/ Real
	0...10000000 Ohm	Resistance value.	1 = 1 Ohm
210.29	Insulation resistance	Shows insulation resistance value. This parameter is read-only.	-/ Real
	0...1000000000 Ohm	Resistance value.	
210.30	Insulation resistance fault action	Selects how the inverter should react for the insulation resistance fault.	Warning/ List
	No	No action selected	0
	Warning	Indicates 57686 <i>Insulation resistance</i> warning code if the insulation resistance is not within limits.	1
	Fault	Triggers 37127 <i>Insulation resistance</i> fault code if the insulation resistance is not within limits.	2
210.31	Minimum Riso measurement time	Defines minimum waiting time for insulation resistance measurement. Any measurement result before this time is considered as invalid.	5 min/ Real
	0...1000 min		1 = 1 min
210.32	Maximum Riso measurement time	Defines maximum measurement time for insulation resistance. If any valid measurement is not received within this time, the measurement device is assumed broken.	60 min/ Real
	0...200 min		1 = 1 min
210.33	MIRU self-test	Enables MIRU self test.	Disable/ List
	Disable	MIRU self test disabled.	0
	Enable	MIRU self test enabled.	1
210.34	Self-test voltage	Defines input voltage limit when MIRU self test is activated before connecting to the grid.	500 V/ Real
	0...1000 V	Voltage	1 = 1 V

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
210.35	Status word	Shows the status of relay output source. When grounding or insulation resistance measurement is enabled, bits in the parameter are set accordingly. The actual relay output sources can be pointed to these bits.	0b0000/ <i>Bit list</i>
	b0: Grounding contactor command		-
	b1: Insulation measurement disable command		-
	b2...15: Reserved		-
210.36	Sudden change warning indication time	Defines the duration for indicating a suddenly changed warning.	10 s/ <i>Real</i>
	0...10000 s		1 = 1 s
211 Temperatures		Temperature monitoring related parameters. All parameters in this group are read-only unless otherwise specified.	
211.01	Ambient temperature	Shows ambient temperature.	-/ <i>Real</i>
	-50.0 ... 100.0 °C		10 = 1 °C
211.02	Control board temperature	Shows control board temperature.	-/ <i>Real</i>
	-50.0 ... 100.0 °C		10 = 1 °C
211.03	PU1 IGBT T1	Shows module 1 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.04	PU1 IGBT T2	Shows module 1 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.05	PU1 IGBT T3	Shows module 1 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.06	PU1 PSU temperature	Shows module 1 power supply temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.07	PU1 air temperature	Shows module 1 air temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.08	PU1 board temperature	Shows module 1 board temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.09	PU2 IGBT T1	Shows module 2 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.10	PU2 IGBT T2	Shows module 2 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.11	PU2 IGBT T3	Shows module 2 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.12	PU2 PSU temperature	Shows module 2 power supply temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
211.13	PU2 air temperature	Shows module 2 air temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.14	PU2 board temperature	Shows module 2 board temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.15	PU3 IGBT T1	Shows module 3 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.16	PU3 IGBT T2	Shows module 3 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.17	PU3 IGBT T3	Shows module 3 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.18	PU3 PSU temperature	Shows module 3 power supply temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.19	PU3 air temperature	Shows module 3 air temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.20	PU3 board temperature	Shows module 3 board temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.21	PU4 IGBT T1	Shows module 4 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.22	PU4 IGBT T2	Shows module 4 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.23	PU4 IGBT T3	Shows module 4 IGBT temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.24	PU4 PSU temperature	Shows module 4 power supply temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.25	PU4 air temperature	Shows module 4 air temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.26	PU4 board temperature	Shows module 4 board temperature.	-/ <i>Real</i>
	-50.0 ... 150.0 °C		10 = 1 °C
211.27	Estimated case temperature	Shows estimated IGBT case temperature.	-/ <i>Real</i>
	-50.0 ... 200.0 °C		10 = 1 °C
211.28	Estimated IGBT temperature	Shows estimated IGBT junction temperature.	-/ <i>Real</i>
	-50.0 ... 200.0 °C		10 = 1 °C
211.41	Busbar thermal protection status	Shows busbar thermal protection status.	-/ <i>Bit list</i>
	b0: DC busbar TP		
	b1: DC busbar cool down		

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
	b2: AC busbar TP		
	b3: AC busbar cool down		
	b4...b15: Reserved		
213 Wake-up monitor		Parameters for wake-up/sleep monitor and state machine.	
213.02	Wake-up state	Shows wake-up monitor state for debugging. This parameter is read-only.	Initialize/ List
	Initialize	Inverter is initializing or not yet ready for operation.	0
	First start	Inverter waits for DC voltage to settle between limits.	1
	Disconnected wake	After inverter has completed sleep, it checks when input voltage is suitable for grid connection.	2
	Connected wake	Inverter is connected to grid. It monitors the power level to be high enough and the wake timer has expired.	3
	Low power	Inverter is operating, but power is lower than the minimum limit.	4
	Reconnect	When power is too low for a long time, a reconnection is not allowed for the duration of the set time limit.	5
	Reconnect open DC	When power is too low for long time and DC voltage goes too low, the DC contactors are opened.	6
	Connected sleep	Inverter operated normally. Wake-up is completed and inverter is checking sleep conditions.	7
	Fault recover	A fault has occurred and the inverter used the first start limits and tries to connect back.	8
	Going to sleep	Power of the inverter drops below going to sleep limit.	9
	Disconnected sleep	Inverter shuts down and waits for the cool down period, until a wake-up can be tried.	10
	Wakeup count over	Reconnection was attempted number of times. A cool down for many hours will be done before further reconnection.	11
213.04	Max daily connect attempts	Defines limit for daily connection attempts. When the limit exceeds, a timer (parameter 213.15 Timeout for exceeding daily connections) waits for multiple hours before the next attempt.	10/ Real
	0 ... 20	Daily connection attempts limit.	1 = 1
213.05	Min input voltage for wake-up	Defines minimum voltage for the wake-up of the inverter. The limit is set in percentage of the peak value of the grid's phase-to-phase voltage.	125.0 %/ Real
	0.0 ... 200.0 %	Percent of peak value of the grid's phase-to-phase voltage.	10 = 1 %
213.07	Delay for grid connection	Defines time that the voltage is required to be between the minimum voltage (parameter 213.05 Min input voltage for wake-up) and the maximum voltage (1500 V) for connecting to the DC input and grid.	5 min/ Real
	0...100 min	Connection voltage time limit.	1 = 1 min

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
213.08	Min input voltage for first start	Defines minimum voltage for the first wake-up of inverter. The value is a percent of the peak value of the grid's phase-to-phase voltage.	100.0 %/ <i>Real</i>
	0.0...200.0 %	Percent of peak value of the grid's phase-to-phase voltage.	10 = 1 %
213.10	Delay for first start	Defines the duration that the DC input voltage has to be between the limits of minimum voltage (parameter 213.08 Min input voltage for wake-up) and maximum voltage (1500 V) for connecting the inverter to the DC input and grid for the first time.	0 min/ <i>Real</i>
	0 ... 2000 min	Time limit for connecting the inverter.	1 = 1 min
213.11	Time for wake-up completed	Defines the duration when the wake-up is considered to be completed. The inverter starts checking the sleep conditions.	60 min/ <i>Real</i>
	0 ... 2000 min	Time for wake-up completed.	1 = 1 min
213.12	Min power for wake-up	Defines percent of minimum power level for connecting the inverter.	0.5 %/ <i>Real</i>
	0.0 ... 100.0 %	Percent of minimum power level for wake up.	10 = 1 %
213.13	Disconnection delay in wake-up	Defines the duration for which produced power is less than the limit and inverter has to stay connected. Defines the duration for disconnecting the inverter during morning start-up, when power has dropped below the limit defined in parameter 213.12 Min power for wake-up .	20 min/ <i>Real</i>
	0 ... 2000 min	Time for low power.	1 = 1 min
213.14	Reconnection delay	Defines delay time before a reconnection to the grid is attempted again.	10 min/ <i>Real</i>
	0 ... 2000 min	Delay time for reconnection.	1 = 1 min
213.15	Timeout for exceeding daily connections	Defines delay time for new attempts of reconnection after the limit (parameter 213.04 Max daily connect attempts) is exceeded.	12 h/ <i>Real</i>
	0 ... 24 h	Delay time for new attempts of reconnection.	1 = 1 h
213.16	Min power for sleep	Defines minimum power level for disconnecting the inverter.	0.5 %/ <i>Real</i>
	0 ... 100 %	Percent of minimum power level for sleep.	1 = 1 %
213.17	Disconnection delay for sleep-mode	Defines time limit for disconnection. The inverter power is below the limit (213.16 Min power for sleep) for this duration.	20 min/ <i>Real</i>
	0 ... 2000 min	Time limit for disconnection.	1 = 1 min
213.18	Evening cool down delay	Defines time limit for which connecting of the inverter is not tried again after sleep mode is completed.	40 min/ <i>Real</i>
	0 ... 2000 min	Time limit for cool down.	1 = 1 min
213.21	Min DC voltage for DC contactors to stay closed	Defines minimum DC voltage when DC contactors are kept closed. The value is percent of peak value of the grid's phase-to-phase voltage.	102.0 %/ <i>Real</i>
	0.0 ... 200.0 %	Percent of the diode rectified DC voltage.	10 = 1 %

No.	Bit/Name/Value/ Range	Description	Def/Type FbEq16/32
213.51	Night Q production	Activates Night Q production mode.	Disable/ List
	Disable	Night Q production mode disabled	0
	Enable	Night Q production mode enabled	1
	Force on	Night Q production mode forced to On	3
213.52	Night Q low power	Defines reactive power level required for the night Q production to be active.	50 kVAr/ Real
	0...1000 kVAr	Night Q reactive power in kVAr.	1 = 1 kVAr
213.53	Night Q delay	Defines time for which reactive power reference should be below the low power limit for night Q production mode to be deactivated.	10 s/ Real
	0...3600 s	Night Q reactive power delay time in seconds.	1 = 1 s
213.54	Night Q reference	Defines reactive power reference for night Q production. The value overrides the normal Q-ref, when the set value differs from 0 kVAr.	0 kVAr/ Real
	-4000 ... 4000 kVAr	Night Q reactive power reference in kVAr.	1 = 1 kVAr
214 Switch control		Switch control parameters. All parameters in this group are read-only unless otherwise specified.	
214.01	Feedback status	Shows status of switch feedback signals.	0b0000/ Bit list
	b0: AC contactor 1	AC contactor 1	
	b1: AC contactor 2	AC contactor 2	
	b2: AC contactor 3	AC contactor 3	
	b3: AC contactor 4	AC contactor 4	
	b4: DC contactor 1	DC contactor 1	
	b5: DC contactor 2	DC contactor 2	
	b6: DC contactor 3	DC contactor 3	
	b7: DC contactor 4	DC contactor 4	
	b8: AC breaker 1	AC breaker 1	
	b9: AC breaker 2	AC breaker 2	
	b10: AC breaker 3	AC breaker 3	
	b11: AC breaker 4	AC breaker 4	
	b12: DC switch 1	DC switch 1	
	b13: DC switch 2	DC switch 2	
	b14: DC switch 3	DC switch 3	
	b15: DC switch 4	DC switch 4	
214.05	DC contactor 1 switchings	Shows number of counts that contactor is switched on.	0/ Real
	0...4294967295	DC contactor 1 switching counts.	1 = 1
214.06	DC contactor 2 switchings	Shows number of counts that contactor is switched on.	0 / Real
	0...4294967295	DC contactor 2 switching counts.	1 = 1

No.	Bit/Name/Value/ Range	Description	Def/Type
			FbEq16/32
214.09	AC contactor 1 switchings	Shows number of counts that contactor is switched on.	0 / <i>Real</i>
	0...4294967295	AC contactor 1 switching counts.	1 = 1
214.10	AC contactor 2 switchings	Shows number of counts that contactor is switched on.	0 / <i>Real</i>
	0...4294967295	AC contactor 2 switching counts.	1 = 1
214.13	AC breaker 1 switchings	Shows number of counts that breaker is switched on.	0 / <i>Real</i>
	0...4294967295	AC breaker 1 switching counts.	1 = 1

5

Troubleshooting

Contents of this chapter

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

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

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

See,

- [*Fault messages generated by inverter* \(page 165\)](#)
- [*Warning messages generated by the inverter* \(page 178\)](#)

Reset a fault

After cause of a fault is corrected, the active fault can be reset from control panel, Drive composer PC tool, I/O interface, or fieldbus. When fault is removed, the inverter can be restarted.

Some faults may be restarted by an autoreset feature. Autoreset is indicated in event logs.

Event history

■ Event logs

The inverter event history can be accessed from **Events** menu. The menu includes submenus for active faults, active warnings, faults, and other events.

Active faults – shows all currently active faults.

Active warnings – shows all currently active warnings.

Faults – shows faults that have been reset.

Other events – includes, e.g., all fault resets, pure events, activation, and deactivation stamps for warnings.

You can also access event history from parameter group [104 Warnings and faults](#). The group shows codes of active warnings and faults (a maximum of five each) and five previously occurred warnings and faults.

Auxiliary codes

Some events generate an auxiliary code that often helps in identifying problem.

On control panel – auxiliary code is stored as part of details of event.

In Drive composer PC tool – auxiliary code is shown in event listing.

Fault messages generated by inverter

If there is an active fault message, reset inverter using any of these methods:

- Press “Reset” button on control unit,
- Issue a reset through parameter [189.11 Reset active faults](#), or
- Power-cycle inverter.

Monitor inverter for a few minutes to see whether it resumes normal operation.

- If inverter appears to operate normally, monitor operation closely for a few days.
- If a fault cannot be reset or if it occurs frequently, record event date and time, inverter's serial number, and contact your system supplier.

Fault messages

Code	Fault	Cause	What to do
11776	Overcurrent	Output current has exceeded internal fault limit.	
11778	Short circuit	Short-circuit in output.	This fault cannot be reset. Reboot control unit either by switching power off and on, or using parameter 196.08 Control board boot .
11779	Calibration	Current measurement calibration fault.	Measure the offset of output phase current measurement or difference between output phase U2 and W2.
11780	IGBT overload	Excessive IGBT temperature. This fault protects IGBT(s).	Check cable.
11781	BU current difference	BU current difference	
11782	BU earth leakage	BU earth leakage	
11783	BU commutation difference	BU commutation difference	
11785	DC short circuit	DC short-circuit	
15872	Input phase loss	Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse.	Check input power line fuses. Check for input power supply imbalance.
15873	Fr Grid Fault	Grid warning when BAMU measured grid voltage moves outside the user defined Fault Ride Through window.	
15876	DC link overvoltage	Excessive intermediate circuit DC voltage.	Check that supply voltage matches nominal input voltage supply of inverter. Check supply line for static or transient overvoltage.
15877	DC link undervoltage	Intermediate circuit DC voltage is not sufficient.	
15878	BU DC link difference	Difference in DC voltages between parallel-connected inverter modules.	Contact your local ABB representative.

Code	Fault	Cause	What to do
15879	BU voltage difference	Difference in main voltages between parallel-connected inverter modules.	Contact your local ABB representative.
15880	Charging	DC link voltage charging time exceeded. Voltage level or du/dt or charging current is not acceptable.	
15881	Charging count	Too many DC link charging attempts.	Two attempts inside five minutes is allowed to prevent charging circuit overheating.
15882	Charging busbar	Charging busbar fault.	
15885	Overvoltage Fault	DC overvoltage fault	
15886	Undervoltage fault	DC undervoltage fault	
15888	DC unbalance fault	DC unbalance fault.	
19968	IGBT overtemperature	Estimated IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation.
19969	Cooling	Module temperature is excessive.	
19970	IGBT temperature	IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation.
19971	Excess temperature	Power unit module temperature is excessive.	Check ambient conditions. Check air flow and fan operation.
19972	Excess temperature difference	High temperature difference between IGBTs of different phases.	Check cooling of inverter module(s).
19974	Cabinet temperature		
19975	Control board temperature	Control board temperature is too high.	Check proper cooling of cabinet.
19977	Ambient temperature		
19978	PCB space cooling	Temperature difference between ambient and inverter module PCB space temperature difference has exceeded fault limit.	Check cooling fan inside PCB space.
24067	XSTO circuit open	Circuit connected to XSTO:IN1 and/or XSTO:IN2 is opened.	-
24068	PU logic error	Power unit logic memory error. memory of power unit logic is cleared. This fault cannot be reset.	Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .

Code	Fault	Cause	What to do
24069	Rating ID mismatch	Mismatch between PU/CU rating. The hardware of inverter does not match the information stored in memory unit. This may occur e.g., after a firmware update or memory unit replacement.	This fault cannot be reset. Cycle power to inverter.
24070	Main contactor	Main contactor / main breaker is not functioning properly.	Check following: <ul style="list-style-type: none">• digital input DI3 connection• main contactor / main breaker control interlocking circuit.• main contactor operating voltage level (should be 230 V).
24071	PU communication	Communication errors detected between control unit and power unit.	Check connection between control unit and power unit.
24072	Power unit lost	The connection between control unit and power unit is lost.	Check connection between control unit and power unit.
24073	PU communication internal	Internal communication error	Contact your local ABB representative.
24074	Measurement circuit ADC	Measurement circuit fault.	Contact your local ABB representative.
24075	PU board powerfail	Power unit power supply failure.	Contact your local ABB representative.
24076	Measurement circuit DFF	Measurement circuit fault.	Contact your local ABB representative.
24077	PU communication configuration	PU channel configuration error.	This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
24078	Reduced run	Some xINTs are missing.	
24079	PU state feedback	State feedback supervision supervises state feedback signals from output phases and compares signals to actual control signals. All output phases are sampled individually.	-
24080	Charging feedback	Charging feedback missing	
24081	Unknown PU fault	The power unit logic has generated a fault which is not known by software.	Check logic and software compatibility.
24082	Bamu configuration	Incorrect jumper settings on BAMU board.	Check jumper settings on BAMU board. Set all jumpers to sw select mode. Configuration of external measurements is set through parameter group 191BAMU configuration .

Code	Fault	Cause	What to do
24083	Auxiliary circuit breaker	Circuit breaker fault triggered by input selected in parameter circuit breaker fault source in group 131.	
24084	Measurement circuit temperature	Problem with internal temperature measurement of inverter. If device has only one IGBT temperature measurement in one phase, fault is triggered otherwise warning is indicated.	Contact your local ABB representative.
24085	Overtemperature hw	Hardware overtemperature is detected (3L target specific).	
24086	Redundant measurement	Redundant measurement supervision has indicated a difference in duplicated measurements that is beyond limits.	This fault cannot be reset. Contact your local ABB representative. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
24088	Charging contactor	Charging contactor	Check charging contactor feedback DI4.
24089	CU logic error	Configuration lost in control unit FPGA. Problem in control unit hardware.	This fault cannot be reset. This fault automatically reboots control unit after a short delay. Replace control unit.
28160	FPGA version incompatible	Firmware and FPGA versions are not compatible.	Update FPGA. This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28161	FBA A mapping file	Fieldbus adapter A mapping file read error.	Contact your local ABB representative.
28162	FBA B mapping file	Fieldbus adapter B mapping file read error.	Contact your local ABB representative.
28163	Task overload	Task overload fault.	Internal fault. This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot . Contact your local ABB representative.
28164	Stack overflow	Stack overflow fault.	Internal fault. This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot . Contact your local ABB representative.

Code	Fault	Cause	What to do
28165	Internal file load	Internal file load fault.	This fault cannot be reset. Contact your local ABB representative. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28166	Internal record load	Internal record load error.	Contact your local ABB representative.
28167	Application loading	Application file is not compatible or corrupted.	This fault cannot be reset. Check fault logger for a fault code extension. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28168	Memory Unit Detached	Memory unit detached.	This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28169	Internal SSW fault	Internal SSW fault.	This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28170	User Set Fault	User Set Fault	
28171	Kernel overload	Operating system error.	This fault cannot be reset. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot . Contact your local ABB representative.
28172	Parameter system	Parameter loading or saving failed.	Try forcing a save using parameter 196.07 Param save . Retry.
28173	FBA A parameter conflict	Fieldbus adapter A parameter conflict fault. The inverter does not have a functionality requested by PLC or requested functionality is not activated.	Check PLC programming. Check settings in parameter groups: 150 FBA and 151 FBA A settings .
28174	FBA B parameter conflict	Fieldbus adapter B parameter conflict fault. The inverter does not have a functionality requested by PLC or requested functionality is not activated.	Check PLC programming. Check settings of parameter groups: 150 FBA and 154 FBA B settings .

Code	Fault	Cause	What to do
28181	Text data overflow	Text data overflow fault.	Internal fault. Reset fault. If fault persists, contact your local ABB representative.
28182	Text 32-bit table overflow	Text 32-bit table overflow fault	Internal fault. Reset fault. If fault persists, contact your local ABB representative.
28183	Text 64-bit table overflow	Text 64-bit table overflow fault	Internal fault. Reset fault. If fault persists, contact your local ABB representative.
28184	Text file overflow	Text file overflow fault	Internal fault. Reset fault. If fault persists, contact your local ABB representative.
28185	Synchronization fault	Synchronization fault	
28186	Rating ID fault	Rating ID load error.	Contact your local ABB representative.
28187	Backup/Restore Timeout	Backup/Restore timeout error.	Check panel / PC-tool communication if it is still in backup/restore state.
28188	Fast power off	Inverter has received a fast power off command.	Check that it is safe to continue operation. Return fast power off pushbutton to normal position. Restart inverter.
28189	Internal SW error	Internal SW error. This fault cannot be reset.	Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot . Contact your local ABB representative.
28190	Unrecoverable SW Error	Unrecoverable SW Error. An unrecoverable error has occurred.	This fault cannot be reset. Record fault code and auxiliary fault code and report them to factory. Cycle power to inverter to recover. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot . Contact your local ABB representative.

Code	Fault	Cause	What to do
28191	Licensing fault	A required license is missing. software on this inverter requires a license that could not be found. missing license is indicated by value of aux code field.	This fault cannot be reset. Contact your product vendor for further instructions. Reboot control unit either by switching power off and on, or by using parameter 196.08 Control board boot .
28192	Fault reset		
28193	Control unit restart is required	New logic configuration file is downloaded to PU.	Inverter is in a special mode and a power-up is required.
28194	Power unit logic's download has failed	Download of new logic configuration file to PU failed.	Inverter is in a special mode and a power-up is required. Also a new download can be started.
32257	Panel loss	Control panel loss fault. Control panel or PC tool selected as active control location for inverter has stopped communicating.	Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform.
32266	Overfrequency	Output frequency is too high.	
32267	FBA A communication	Fieldbus adapter module A communication fault. Cyclical communication between inverter and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of field bus 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.
32268	FBA B communication	Fieldbus adapter B communication fault. Cyclical communication between inverter and fieldbus adapter module B 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.
32270	TUCSO fault	FSO subsystem fault	
32271	FSO general fault	FSO general fault, see warning details on page xx.	
32272	Ext I/O comm loss	Ext I/O comm loss	
32275	Incompatible option	Option module is not supported	Remove incompatible option module.

Code	Fault	Cause	What to do
36352	Overvoltage fault	Overvoltage fault	<p>Check:</p> <p>Aux code 1 = Overvoltage1 (U1ab) Aux code 2 = Overvoltage1 (U1bc) Aux code 3 = Overvoltage1 (U1ca) Aux code 4 = Overvoltage2 (U1ab) Aux code 5 = Overvoltage2 (U1bc) Aux code 6 = Overvoltage2 (U1ca) Aux code 7 = Overvoltage3 (U1ab) Aux code 8 = Overvoltage3 (U1bc) Aux code 9 = Overvoltage3 (U1ca) Aux code 20 = Overvoltage1 (GridEst) Aux code 21 = Overvoltage2 (GridEst) Aux code 22 = Overvoltage3 (GridEst)</p>
36353	Undervoltage fault	Undervoltage fault	<p>Check:</p> <p>Aux code 1 = Undervoltage1 (U1ab) Aux code 2 = Undervoltage1 (U1bc) Aux code 3 = Undervoltage1 (U1ca) Aux code 4 = Undervoltage2 (U1ab) Aux code 5 = Undervoltage2 (U1bc) Aux code 6 = Undervoltage2 (U1ca) Aux code 11 = Undervoltage1 (GridEst) Aux code 12 = Undervoltage2 (GridEst)</p>
36354	Overfrequency fault	Overfrequency fault	
36355	Underfrequency fault	Underfrequency fault	
36356	Sliding overvoltage fault	Sliding overvoltage fault	
36357	Rate of change of frequency fault	Rate of change of frequency fault	
36358	AI Supervision	Analog In Supervision. Analog input value has violated user set MIN or MAX.	Check analog input values
36359	Net lost	Net lost	
37121	Over temperature	Over temperature fault level is exceeded.	
37122	Cold ambient	Ambient temperature has dropped below fault level and inverter operation is stopped.	
37123	Excess humidity	The relative humidity of cabinet has exceeded fault level regardless of humidity control attempt.	-

Code	Fault	Cause	What to do
37124	Grounding current sudden change	Sudden change in grounding current detected	-
37125	Residual current	Residual current failure	-
37126	Grounding circuit over voltage	Grounding circuit over voltage detected. The fuse on grounding circuit may be broken.	-
37127	Insulation resistance	Insulation resistance fault	-
37128	Reverse current	Reverse current fault.	Check auxiliary code. <ul style="list-style-type: none"> • If only a single auxiliary number, then number refers to a module. • If two numbers, first number refers to a module number and second number to a DC input number.
37129	DC Overcurrent	DC Overcurrent fault.	Check auxiliary code. <ul style="list-style-type: none"> • If only a single auxiliary number, then number refers to a module. • If two numbers, first number refers to a module number and second number to a DC input number.
37130	External fault 1	Customer IO external fault 1	
37131	External fault 2	Customer IO external fault 2	
37132	External fault 3	Customer IO external fault 3	
37137	Module 1 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 1 (M1).	Contact your local ABB representative.
37138	Module 2 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 2 (M2).	Contact your local ABB representative.
37139	Module 3 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 3 (M3).	Contact your local ABB representative.
37140	Module 4 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 4 (M4).	Contact your local ABB representative.
37141	Module 1 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 1 (M1).	Contact your local ABB representative.
37142	Module 2 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 2 (M2).	Contact your local ABB representative.
37143	Module 3 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 3 (M3).	Contact your local ABB representative.

Code	Fault	Cause	What to do
37144	Module 4 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 4 (M4).	Contact your local ABB representative.
37145	Fan status feedback M1	A fan failure is detected from shared fan status feedback signal of module 1 (M1). At least one of the fans connected to shared feedback signal has failed.	-
37146	Fan status feedback M2	A fan failure is detected from shared fan status feedback signal of module 2 (M2). At least one of the fans connected to shared feedback signal has failed.	-
37147	Fan status feedback M3	A fan failure is detected from shared fan status feedback signal of module 3 (M3). At least one of the fans connected to shared feedback signal has failed.	-
37148	Fan status feedback M4	A fan failure is detected from shared fan status feedback signal of module 4 (M4). At least one of the fans connected to shared feedback signal has failed.	-
37149	Temperature sensor fail	Possible temperature sensor failure detected. At least one of the temperature measurements is beyond sanity check limits.	For more information, see temperature sensor failure status parameters.
37151	Humidity sensor failure	Sensor failure detected in one or more humidity measurements.	Check sensor failure statuses for more information.
37152	AC contactor opening	AC contactor failed to open.	Check aux code to identify contactor.
37153	AC contactor closing	AC contactor failed to close.	
37154	Open AC contactor	AC contactor is open unintentionally.	
37155	Closed AC contactor	AC contactor closed unintentionally.	
37156	DC contactor opening	DC contactor failed to open.	
37157	DC contactor closing	DC contactor failed to close.	
37158	Open DC contactor	DC contactor is open unintentionally.	Check aux code to identify contactor.
37159	Closed DC contactor	DC contactor closed unintentionally.	Check aux code to identify contactor.

Code	Fault	Cause	What to do
37160	DC switch open	DC switch is open. Check aux code to identify switch.	-
37161	MV transformer gas discharge fault	Medium voltage transformer gas discharge fault occurred.	-
37162	MV side phase lost fault	Medium voltage side phase is lost.	-
37163	MV transformer overpressure fault	Medium voltage transformer overpressure fault occurred.	-
37164	MV breaker opened fault	Medium voltage breaker is opened.	-
37165	MV transformer vacuum fault	Medium voltage transformer vacuum fault occurred.	-
37166	MV transformer low oil level fault	Medium voltage transformer low oil level fault occurred.	-
37167	MV transformer temperature fault	Medium voltage transformer overtemperature fault occurred.	-
37168	Main circuit SPD	Main circuit SPD failed.	-
37169	DC fuse	DC fuse is blown. See aux code for module information.	-
37170	48 V power supply	48 V power supply failed. See aux code for module information.	-
37171	48 V buffer	48 V buffer failed. See aux code for module information.	-
37172	24 V buffer	24 V buffer failed. See aux code for module information.	-
37173	Aux circuit breaker	Aux circuit breaker failed. See aux code for module information.	-
37174	LCL pressure sensor	LCL pressure sensor failed. See aux code for module information.	-
37175	AC door	AC door is open. See aux code for module information.	Check AC door.
37176	DC door	DC door open. See aux code for module information.	Check DC door.
37177	Smoke detector	Smoke detector has detected smoke inside control cabinet.	-
37178	LCL overheat	LCL filter overheated. See aux code for module information.	Check LCL filter and LCL cooling.
37179	Not supported PLC HW configuration	Unsupported PLC HW variant is installed.	Check PLC HW and SW.
37180	AC switch open	AC switch is open.	Check aux code to identify switch.

Code	Fault	Cause	What to do
37181	AC switch closed	AC switch is closed.	Check aux code to identify switch.
37184	AC breaker tripped	AC breaker tripped internally.	Check breaker. Check aux code to identify breaker.
37185	AC breaker closing	AC breaker failed to close.	Check breaker. Check aux code to identify breaker.
37186	AC breaker opening	AC breaker failed to open.	Check breaker. Check aux code to identify breaker.
37200	Transfer trip	Transfer trip	-
37201	Shutdown	Shutdown commanded	-
37202	DC input current deviation	Current deviation detected.	<p>Check Aux code to know which DC input activated fault.</p> <ul style="list-style-type: none"> • First number refers to module. • Second number refers to DC input. <p>Examine affected DC input for shading.</p> <p>Make sure that panels in affected DC inputs are undamaged.</p> <p>Make sure that DC input monitoring configuration settings are feasible.</p>
37203	Blown DC input fuse	One or more DC input fuse(s) has/have failed.	<p>Check fuse.</p> <p>Aux code shows which DC input activated fault.</p> <ul style="list-style-type: none"> • First number refers to module. • Second number refers to DC input. <p>If aux code number refers to such a DC input that is not connected, then run string configuration assistant with correct settings. If inverter returns the fault state again, contact your maintenance or service person to replace all failed DC input fuses.</p>
37204	DC input current measurement faulty	One or more DC input current measurement has/have failed.	<p>Check DC input connections and sensor.</p> <p>Aux code (format XYZ) gives more details of fault.</p> <p>X – indicates whether event was activated by calibration function (1) or is measurement out of range (0).</p> <p>Y – shows module number</p> <p>Z – shows DC input number. E.g. aux code 112 means calibration function reports faulty current in DC input 2 of module 1.</p>
37205	MV Breaker opening	Medium voltage breaker is commanded to be opened.	Stop inverter.

Code	Fault	Cause	What to do
37206	DC current measurement faulty	One or more DC current measurement has/have failed.	<p>Check DC connections and sensor.</p> <p>Check from Event log -> Active fault. aux code number refers to affected power module.</p> <p>E.g., number 1 refers to module 1.</p> <p>Check wiring and sensor.</p>
37207	SCADA communication lost	SCADA communication is lost. Communication is lost if heartbeat echo is not received in defined time. Heartbeat max interval can be configured via parameter 164.12 Heartbeat max interval .	<p>Verify that heartbeat is echoed back to system. If echo interval is too long, modify heartbeat max interval via parameter 164.12 Heartbeat max interval.</p>
37208	SCADA communication timeout	<p>SCADA communication timeout. Communication is lost when heartbeat was not returned by SCADA within defined time.</p> <p>Aux code 4 indicates that communication has returned but is currently in timeout state.</p> <p>Control commands are frozen during timeout state.</p>	<p>Wait for communication timeout to pass.</p> <p>Timeout length can be configured with parameter 164.11 Communication loss timeout.</p>
37375	Solar SW	Solar software fault.	See aux code and contact your local ABB representative.
58149	MFA internal diagnostics tra_time fault	MFA internal software diagnostics has triggered a fault. Control cycle tra_time has gone below pre-defined limit.	Contact your local ABB representative.
58150	MFA internal diagnostics CPU max fault	MFA internal software diagnostics has triggered a fault. CPU usage has exceed pre-defined limit.	Contact your local ABB representative.
65024	FB A force trip	Fieldbus adapter A force trip fault. A fault trip command has been received through fieldbus adapter A.	Check fault information provided by PLC.
65025	FB B force trip	Fieldbus adapter B force trip fault. A fault trip command has been received through fieldbus adapter B.	Check fault information provided by PLC.
65027	XSTO IN1 open	Circuit connected to XSTO:IN1 is opened.	-
65028	XSTO IN2 open	Circuit connected to XSTO:IN2 is opened	-

Warning messages generated by the inverter

Warnings do not prevent inverter power feed to grid, but output power may be limited.

Code	Warning	Cause	What to do
44544	Current calibration	Current calibration is about to be performed. Current offset and gain measurement calibration will be performed at next start.	-
44545	Overcurrent	Output current has exceeded internal fault limit.	-
44546	Earth leakage	Earth leakage warning. Load unbalance.	Check for no earth fault in cables. Measure insulation resistances If no earth fault detected, contact ABB.
44547	Short circuit	Short-circuit.	
44548	IGBT overload	Excessive IGBT junction to case temperature	This warning protects IGBT(s) and can be activated by a short circuit in inverter output. Check inverter output.
44549	BU current difference	BU current difference	
44550	BU earth leakage	BU earth leakage	
44551	BU commutation difference	BU commutation difference	
44552	Frt Grid Warning	Grid warning. Measured grid voltage moved inside user defined Fault Ride Through area.	
44553	DC link overvoltage	DC link overvoltage warning. Excessive intermediate circuit DC voltage.	Check that overvoltage protection is enabled. See parameter 135.26 Connect overvoltage type . Check mains for static or transient overvoltage. Check brake chopper and resistor (if used). Check deceleration time. Use coast-to-stop function (if applicable). Retrofit frequency converter with brake chopper and brake resistor.
44554	DC link undervoltage	DC link undervoltage warning. Intermediate circuit DC voltage is not sufficient due to missing mains phase blown fuse or rectifier bridge internal fault.	Check supply and fuses.

Code	Warning	Cause	What to do
44555	DC not charged	DC voltage is too low. The voltage of intermediate DC circuit has not reached the operating level.	Contact your local ABB representative.
44556	BU DC link difference	BU DC link difference	
44557	BU voltage difference	BU voltage difference	
44562	IGBT overtemperature	Estimated inverter IGBT temperature is excessive.	Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up.
44563	Cooling	Inverter module temperature is excessive.	
44564	Excess temperature	Temperature measurement from power unit is too high	
44565	Excess temperature difference	High temperature difference between IGBTs of different phases.	
44566	IGBT temperature	Inverter module IGBT temperature is excessive.	
44567	PU communication	Communication errors detected between control unit and power unit.	Check connection between control unit and power unit.
44569	Measurement circuit temperature	Problem with internal temperature measurement of inverter	Contact your local ABB representative.
44570	PU board powerfail	Power unit power supply failure	Contact your local ABB representative.
44571	PU communication internal	Communication errors detected between control unit and power unit.	Check connections between inverter control unit and power unit.
44572	Measurement circuit ADC	Measurement circuit fault	Contact your local ABB representative.
44573	Measurement circuit DFF	Measurement circuit fault	Contact your local ABB representative.
44574	PU state feedback	PU state feedback. State feedback supervision supervises the state feedback signals from output phases and compares the signals to actual control signals. All of the output phases are sampled individually.	
44575	Charging feedback	Charging feedback missing	
44577	Flash erase speed exceeded		Contact your local ABB representative.
44580	Supply voltage unselected	Supply voltage unselected or is not defined.	Contact your local ABB representative.

Code	Warning	Cause	What to do
44581	FBA A parameter conflict	Fieldbus adapter A parameter conflict warning. The inverter does not have a functionality requested by PLC or the requested functionality is not activated.	Check PLC programming. Check settings in parameter groups 150 FBA and 151 FBA A settings .
44582	FBA B Parameter conflict	Fieldbus adapter B parameter conflict warning. The inverter does not have a functionality requested by PLC or the requested functionality is not activated.	Check PLC programming. Check settings of parameter groups 150 FBA and 154 FBA B settings .
44583	AI parametrization	AI parametrization error The current/voltage jumper setting of an analog input does not correspond to parameter settings.	Adjust jumper setting (on inverter control unit). To validate changes in jumper settings, reboot control board reboot either by switching power off or on, or through parameter 196.08 Control board boot .
44592	FBA A communication	Fieldbus adapter module A communication warning. Cyclical communication between inverter 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.
44593	FBA B communication	Fieldbus adapter module B communication warning. Cyclical communication between inverter 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.
44606	Panel loss	Panel loss warning. Control panel or PC tool selected as active control location for inverter has stopped communicating.	Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform.
44631	Autoreset	A fault is about to be autoreset. This is an informative warning.	

Code	Warning	Cause	What to do
44633	Fast power off	Fast power off command received.	Check that it is safe to continue operation. Return fast power off pushbutton to normal position. Restart inverter.
44634	Enable start signal missing	No enable start signal received	Contact your local ABB representative.
44635	Run enable missing	No run enable signal received	Switch on run enable signal (e.g., in fieldbus control word).
44636	External power signal missing	External power feedback signal missing.	
44639	Temperature Warning	High temperature e.g., from Klixon or other sensor.	
44640	Control board temperature	Control board temperature is too high.	Check control cabinet air flow. If sensor is faulty (aux. code = 1) change control board.
44641	Overvoltage warning	Overvoltage warning	Check auxiliary codes: 1 = Overvoltage1 (U1ab) 2 = Overvoltage1 (U1bc) 3 = Overvoltage1 (U1ca) 4 = Overvoltage2 (U1ab) 5 = Overvoltage2 (U1bc) 6 = Overvoltage2 (U1ca) 7 = Overvoltage3 (U1ab) 8 = Overvoltage3 (U1bc) 9 = Overvoltage3 (U1ca) 20 = Overvoltage1 (GridEst) 21 = Overvoltage2 (GridEst) 22 = Overvoltage3 (GridEst)
44642	Undervoltage warning	Undervoltage warning	Check auxiliary codes: 1 = Undervoltage1 (U1ab) 2 = Undervoltage1 (U1bc) 3 = Undervoltage1 (U1ca) 4 = Undervoltage2 (U1ab) 5 = Undervoltage2 (U1bc) 6 = Undervoltage2 (U1ca) 11 = Undervoltage1 (GridVoltage) 12 = Undervoltage2 (GridVoltage)
44643	Overfrequency warning	Overfrequency warning	
44644	Underfrequency warning	Underfrequency warning	

Code	Warning	Cause	What to do
44645	Sliding overvoltage warning	Sliding overvoltage warning	
44646	Rate of change of frequency warning	Rate of change of frequency warning	
44647	AI Supervision	Analog In Supervision Analog Input Value has violated user set MIN or MAX.	Check Analog Input Values
44648	Fast power off	Fast power off warning received.	Check that it is safe to continue operation.
44653	DDCS controller comm loss	DDCS communication between drive and external controller is lost.	Check status of controller. See user documentation of controller. Check cable connections. If necessary, replace cables.
44654	Internal SW error	Internal SW error	
44655	Ambient temperature	Ambient temperature	
44656	Overtemperature hw	Overtemperature hw detection	
44657	Redundant measurement	Redundant measurement supervision has indicated a difference in duplicated measurements that is outside limits.	Contact your local ABB representative.
44659	Fan	Cooling fan stuck or disconnected	Check fan operation and connection. Replace fan if faulty.
44661	SD card	SD card is not operating properly. Saving power unit diagnostic data on SD card may not be possible.	Check that SD card is properly inserted in control unit and that it is in working condition.
44662	PCB space cooling	Temperature difference between ambient and inverter module PCB space temperature difference has exceeded warning limit.	Check cooling fan inside PCB space.
44664	Net lost	Net lost	
44665	Power fail saving	Power fail saving is requested too frequently. Due to limited saving interval some of the requests do not trigger saving and power fail data might be lost. This might be caused by DC voltage oscillation.	Check supply voltage.
44677	Charging count	More than one charging attempts are performed.	Two attempts inside five minutes is allowed to prevent overheating of charging circuit.
44680	Parameter map configuration	Too many parameters in configuration file.	

Code	Warning	Cause	What to do
44681	Mapped parameter value cut	Mapped parameter value is cut.	Check parameter scaling and format.
44682	User lock is open	User lock is open.	Activate lock by inputting an invalid pass code to parameter 196.02 Passcode .
44683	User pass code not confirmed	User pass code has been inputted to "Change user pass code" parameter but is not confirmed with "Confirm user pass code" parameter.	
44684	Control unit battery	Control unit battery voltage is low. Real time clock may not preserve its time.	Replace control unit CR2032 battery.
44685	Power unit's logic update in progress	New logic configuration file is downloaded to PU. Drive is in a special mode and can not be started.	
48642	MCB maintenance (Pure event)	MCB maintenance alert.	See maintenance schedule for MCB.
48648	Power up (Pure event)	Power up.	
48649	SSW internal diagnostics (Pure event)	System SW diagnostics has recorded an exceptional event during normal execution of system SW.	See aux code of event for more information.
48656	Power unit's logic update event (Pure event)	Logic configuration file is downloading to power unit.	See aux code of event for more information.
57600	Cold power section temperature	The minimum operational power section temperature is exceeded. The inverter start may be inhibited.	
57601	Over temperature	Over temperature warning level exceeded. Nominal output current may not be available.	
57603	Excess humidity	The relative humidity of cabinet has exceeded the warning level regardless of humidity control attempt.	
57604	Grounding current sudden change	Sudden change in grounding current is detected.	
57605	Residual current	Residual current warning	
57606	Grounding circuit over voltage	Grounding circuit over voltage is detected	
57607	Insulation resistance	Insulation resistance below limit	

Code	Warning	Cause	What to do
57608	Module 1 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 1 (M1).	Contact your local ABB representative.
57609	Module 2 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 2 (M2).	Contact your local ABB representative.
57610	Module 3 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 3 (M3).	Contact your local ABB representative.
57611	Module 4 main air channel fan fail	A fan failure is detected in at least one of the main air channel fans in module 4 (M4).	Contact your local ABB representative.
57612	Module 1 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 1 (M1).	Contact your local ABB representative.
57613	Module 2 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 2 (M2).	Contact your local ABB representative.
57614	Module 3 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 3 (M3).	Contact your local ABB representative.
57615	Module 4 LCL fan fail	A fan failure is detected in at least one of the LCL fans in module 4 (M4).	Contact your local ABB representative.
57616	Fan status feedback M1	A fan failure is detected from shared fan status feedback signal of module 1 (M1). At least one of the fans connected to shared feedback signal has failed.	-
57617	Fan status feedback M2	A fan failure is detected from shared fan status feedback signal of module 2 (M2). At least one of the fans connected to shared feedback signal has failed.	-
57618	Fan status feedback M3	A fan failure is detected from shared fan status feedback signal of module 3 (M3). At least one of the fans connected to shared feedback signal has failed.	-
57619	Fan status feedback M4	A fan failure is detected from shared fan status feedback signal of module 4 (M4). At least one of the fans connected to shared feedback signal has failed.	-
57620	Temperature sensor fail	Possible temperature sensor failure detected. At least one of temperature measurements has gone outside sanity check limits.	Check status parameter of failed temperature sensor.

Code	Warning	Cause	What to do
57621	Humidity sensor failure	Sensor failure detected in one or more humidity measurements.	Check sensor failure status.
57622	PLC manual test mode active	PLC manual test mode is active. Normal inverter operation is not possible.	-
57623	Hot ambient temperature	The maximum operational ambient temperature is exceeded. Inverter operation may be inhibited.	-
57624	Cold ambient temperature	The minimum operational ambient temperature is exceeded. Inverter operation may be inhibited.	-
57625	Option code not defined	Option code is not yet defined. Inverter start inhibited.	Set option code. See option codes in parameter 206.101. Contact your local ABB representative.
57626	Wrong PLC HW configuration	PLC hardware and set option codes do not match. Aux code 1: configuration code is not set.	Change PLC hardware or option code xH382 in parameter 206.103. Contact your local ABB representative. After change, remove power from PLC.
57627	DC voltage not stable for starting	DC voltage is not stabilized in start sequence. DC voltage has not stabilized to open voltage, and starting inverter failed.	Check DC input voltage from parameter 208.01 Input voltage . Try to disable and enable. If problem persists, contact ABB.
57628	Night Q feature not supported	Night Q mode is not supported in this inverter.	-
57629	PLC link fault	Internal PLC link is not operational, inverter is stopped.	-
57630	DC input reverse connected	Negative voltage detected in DC input. DC input positive and negative voltages are connected in reverse order.	Check connection of DC positive and negative poles.
57631	Nominal voltage out of range	nominal grid voltage set in parameter group 135 Grid monitoring is beyond allowed range.	-
57632	No country code selected	No country or grid code is selected	Select country or grid code with parameter 135.01 Grid code .
57633	AC Breakers	AC breakers are not closed within the expected time.	-
57634	AC breaker manually opened	Inverter opened AC breakers after receiving a user command.	Close breakers by user command before inverter can start.
57635	External warning 1	Customer IO external warning 1	

Code	Warning	Cause	What to do
57636	External warning 2	Customer IO external warning 2	
57637	External warning 3	Customer IO external warning 3	
57639	Wrong PLC inverter type	PLC and BCON softwares are not for same inverter (PVS980 / PVS800)	
57640	Wrong PLC type	PLC hardware differs from parametrization. PLC XC / eCo type is not correct.	Check parameters 206.108 <i>Option C184</i> and 206.109 <i>Option C129</i> . Those parameters set XC PLC model. Contact you local ABB representative.
57641	MV transformer gas discharge warning	Medium voltage transformer gas discharge.	-
57642	MV breaker opened warning	Medium voltage breaker is opened.	-
57643	MV transformer temperature warning	Medium voltage transformer temperature is too high.	-
57644	MV transformer low oil level warning	Medium voltage transformer oil level is too low.	-
57645	MV transformer vacuum warning	Medium voltage transformer vacuum failure.	-
57646	MV side phase lost warning	Medium voltage side phase is lost.	-
57647	MV transformer overpressure warning	Medium voltage transformer overpressure.	-
57648	DC link overvoltage	DC link voltage is too high to start or to keep running.	-
57649	Input overvoltage	Input voltage is too high to start or to keep running.	-
57650	DC switch open	DC switch is open.	Check aux code to identify switch.
57651	Main circuit SPD	Main circuit surge protection device indicates a failure.	-
57652	DC fuse	DC fuse is blown.	See aux code for module.
57653	48 V power supply	48 V power supply failed.	See aux code for module information.
57654	48 V buffer	48 buffer failed.	See aux code for module information.
57655	24 V buffer	24 buffer failed.	See aux code for module information.
57656	Aux circuit breaker	Aux circuit breaker failed.	See aux code for module information.
57657	LCL pressure sensor	LCL pressure sensor fail.	See aux code for module information.

Code	Warning	Cause	What to do
57658	Smoke detector	Smoke detected.	-
57659	LCL overheat	LCL overheat detected. See aux code for module information.	-
57660	AC switch open	AC switch is open.	Check aux code to identify switch.
57661	AC disconnection device not selected	AC disconnection device is not selected.	Insert device to parameter 206.21. Contact you local ABB representative.
57662	AC switch closed	AC switch is closed.	See aux code to identify switch.
57664	AC door	AC door open.	See aux code for module information.
57665	DC door	DC door open.	See aux code for module information.
57666	Check rating id	Rating Id is either not set or it is not valid.	-
57667	Configuration change pending	A change in module configuration is requested but configuration update is not allowed while inverter is running.	-
57668	Disabling all modules requested	All modules are requested to be disabled.	Enable at least one module for operating system.
57669	Disabling non-existing module	A module not existing in configuration is requested to be disabled.	Check module disable forcing parameters.
57670	Manual module disable active	Module(s) of inverter are manually disabled.	-
57671	Heating CB or aux SPD	Heating circuit breaker or auxiliary SPD failed because auxiliary circuit breaker monitoring signal is down but 48 V power supply status is OK. See aux code for module information.	See aux code for module information.
57672	PLC version not supported	PLC software version is not supported.	Update PLC software version. For supported PLC version , see parameter 206.10. Contact you local ABB representative. For current PLC version, see parameters 204.201 PLC SW version, lower bits and 204.202 PLC SW version, upper bits .
57680	Transfer trip	Transfer trip	-
57681	Shutdown	Shutdown	-

Code	Warning	Cause	What to do
57682	DC input configuration	DC input is connected even though it is not configured as connected.	<p>Check M1...M4 connected DC inputs from parameter group 174 DC input current monitor.</p> <p>Aux code shows which DC input activated warning.</p> <ul style="list-style-type: none"> • First number refers to module. • Second number refers to DC input.
57683	DC input current deviation	DC input monitor detected current unbalance in DC inputs	<p>Check auxiliary code to know which DC input activated warning.</p> <ul style="list-style-type: none"> • First number refers to module. • Second number refers to DC input. <p>Examine affected DC input for shading.</p> <p>Make sure panels in affected DC inputs are not damaged.</p> <p>Make sure DC input monitoring configuration settings are feasible.</p>
57684	Blown DC input fuse	Blown DC input fuse detected.	<p>Check auxiliary code to know which DC input activated warning.</p> <ul style="list-style-type: none"> • First number refers to module. • Second number refers to DC input. <p>If aux code number refers to a DC input that is not connected, run string configuration assistant with proper settings.</p> <p>If inverter returns warning state again, contact your local ABB representative to replace failed DC input fuses.</p>
57685	DC input current measurement	<p>DC input current measurement is out of range.</p> <p>Connection is lost or sensor is broken.</p> <p>One or more DC input current measurement has/have failed.</p>	<p>Check DC input connections and sensor.</p> <p>Check aux code (format XYZ):</p> <p>X – shows activated event by calibration function</p> <p>Y – reports module number</p> <p>Z – indicates DC input number</p> <p>Check wiring and sensor.</p>
57686	Insulation resistance device	Insulation resistance device has not produced a valid measurement in time.	
57687	Grounding signal	Grounding current signal is invalid.	Check signal cable.

Code	Warning	Cause	What to do
57688	DC current measurement faulty	DC current measurement is found faulty. One or more DC current measurement has/have failed. Connection is lost or sensor is broken. This check is done when DC contactors are open.	Check DC connections and sensor. Check from Event log -> Active warnings . The aux code shows which module has activated the warning. The number refers to module, e.g., number 1 refers to module 1. Check wiring and sensor.
57689	SCADA communication lost	SCADA communication lost. Communication is lost if heartbeat echo is not received within defined time.	Verify that heartbeat is echoed back to system. If echo interval is too long, modify heartbeat max interval with parameter 164.12 Heartbeat max interval .
57690	SCADA communication timeout	SCADA communication timeout. Communication is lost when heartbeat was not returned by SCADA within define time of specification. Aux code 4 indicates that communication has returned but is currently in timeout state. Control commands are frozen during timeout state.	Wait for communication timeout to pass. Timeout length can be configured with parameter 164.11 Communication loss timeout
57854	Autoreset	Autoreset is active and is about to reset inverter.	Autoreset resets faults after defined time is elapsed.
58112	Grid undervoltage trip (Pure event)	Grid undervoltage trip	
58113	Grid overvoltage trip (Pure event)	Grid overvoltage trip	
58114	Grid underfrequency trip (Pure event)	Grid single phase anti-islanding trip	
58115	Grid overfrequency trip (Pure event)	Grid single phase anti-islanding trip.	
58116	Grid 1 phase anti-island trip (Pure event)	Grid single phase anti-islanding trip.	
58117	Grid anti-islanding trip (Pure event)	Grid anti-islanding trip.	
58118	Grid RoCoF trip (Pure event)	Grid rate of change of frequency trip.	
58119	Grid combinatory trip (Pure event)	Grid combinatory trip.	
58120	Grid sliding average trip (Pure event)	Grid sliding average trip.	

Code	Warning	Cause	What to do
58121	Grid zero cross trip (Pure event)	Grid zero cross monitor trip.	
58122	Extreme AC overvoltage (Pure event)	Inverter protects itself because of extreme AC voltage.	
58128	Grid LVRT trip (Pure event)	Grid low voltage ride through trip.	
58129	Grid HVRT trip (Pure event)	Grid high voltage ride through trip.	
58130	Grid external monitor trip (Pure event)	Grid external monitor trip.	
58144	Transfer trip (Pure event)	Transfer trip	
58145	Shutdown (Pure event)	Shutdown	
58146	DC current measurement faulty (Pure event)	DC current measurement is found faulty. Connection is lost or sensor is broken. This check is done when DC contactors are open.	Check DC connections and sensor. Aux code shows which module activated warning. number refers to module, e.g., Number 1 refers to module 1.
58147	SCADA communication timeout (Pure event)	SCADA communication timeout. Communication is lost when heartbeat was not returned by SCADA in time defined in specification. Aux code 4 indicates that communication has returned but is currently in timeout state.	Control commands are frozen during timeout state. Timeout length can be configured with parameter 164.11 Communication loss timeout .
58148	SCADA communication lost (Pure event)	SCADA communication is lost. Communication is lost if heartbeat echo is not received within defined time (see aux code 3).	

6

Communication interfaces

Contents of this chapter

This chapter describes how the inverter can be controlled by external devices over a communication or fieldbus network through an optional fieldbus adapter module.

System overview

Important: This inverter is not allowed to be connected to a public network. See [Cybersecurity disclaimer](#) on page [13](#) and *Cybersecurity for ABB drives Technical guide* [3AXD10000492137 (English)].

The inverter can be connected to an external control system through an optional fieldbus adapter that is mounted on the inverter control unit.

The inverter interface for a fieldbus connection is fieldbus adapter B (FBA B), while the fieldbus adapter A is reserved for internal inverter communication. The inverter can be configured to receive all of its control information through the fieldbus interface(s), or the control can be distributed between the fieldbus interface(s) and other available sources.

Note: The text and examples in this chapter describe the configuration of one fieldbus adapter (FBA B) by parameters [150.31...150.33](#) and parameter groups [154 FBA B settings](#)...[156 FBA B data out](#).

Fieldbus adapters are available for various communication systems and protocols, e.g.:

- EtherNet/IP™ (FENA-11 or FENA-21 adapter)
- Modbus/RTU (FSCA-01 adapter)
- Modbus/TCP (FENA-11 or FENA-21 adapter)
- PROFINET IO (FENA-11 or FENA-21 adapter).

The cyclic communication between a fieldbus system and the IGBT supply unit consists of 16/32-bit input and output data words.

Connecting inverter to communication or fieldbus network

The inverter is connected to a communication or fieldbus network using a communication adapter module installed on the BCU control unit of the inverter. There are different types of communication adapters and the table below describes some of the most commonly used.

Adapter type	Protocol
FENA-01/11/-21	Modbus/TCP, EtherNet/IP, PROFINET IO
FSCA-01	Modbus/RTU

For more information, see the adapters user's manual.

Setting up the inverter for fieldbus control

1. Install the fieldbus adapter module mechanically and electrically according to the instructions given in the User's manual of the module.
2. Power up the inverter.
3. Enable communication between the inverter and the fieldbus adapter module with parameter [150.31 FBA B Enable](#).
4. Select how the inverter should react to a fieldbus communication break with parameter [150.32 FBA B comm loss func](#).
Note: This function monitors both the communication between the fieldbus master and the adapter module, and the communication between the adapter module and the inverter.
5. Define the time between communication break detection and the selected action with parameter [150.33 FBA B comm loss t out](#).
6. Select application-specific values for the rest of the parameters in group [150 FBA](#).
7. Set the fieldbus adapter module configuration parameters in group [154 FBA B settings](#). As a minimum, set the required node address and the control profile. Set profile to transparent 16 mode.
Note: The parameter indices and names vary depending on the fieldbus adapter in use.
8. Define the process data transferred to and from the inverter using parameter groups [155 FBA B data in](#) and [156 FBA B data out](#) or use direct addressing.
9. Save valid parameter values to permanent memory by setting parameter [196.07 Param save](#) manually to Save.
10. Validate the settings in parameter groups [154 FBA B settings](#), [155 FBA B data in](#) and [156 FBA B data out](#) by setting parameter [154.27 FBA par refresh](#) to Configure.

Accessing inverter parameters

Parameter address mapping for the Modbus interface can be calculated according to the table below.

Register address	Register data
(4)00101...(4)09999	Inverter Parameter Access (16-bit) Register Address = (4)00000 + 100 × Group + Index Example for inverter Parameter 101.08: (4)00000 + 100 × 101 + 8 = 410108
(4)20000...(4)29999	Inverter Parameter Access (32-bit) Register Address = (4)20000 + 200 × Group + 2 × Index Example for inverter Parameter 124.01: (4)20000 + 200 × 124 + 2 × 1 = 444802

7

Tools

Contents of this chapter

This chapter describes the PC tools that can be used with the PVS800-57B inverter. These tools may be used in commissioning, troubleshooting, and service activities. All the tools require a PC running the Windows operating system. The software tools comprise the following two PC software applications:

- Drive loader 2
- Drive composer entry (or Drive composer pro)

Drive loader 2

Drive loader 2 is a standalone tool for updating the firmware of the inverter. Drive loader 2 is available through the ABB sales channels.

Drive composer entry

Drive composer entry is a basic startup and maintenance tool. With this tool, it is possible to adjust and monitor parameters with a single inverter through a point-to-point connection. Drive composer entry can be downloaded for free from the ABB website.

Drive composer pro

Drive composer pro is an enhanced version of the Drive composer entry tool. In addition to all the features in the entry level version, its network tool supports multiple inverters and enables fast monitoring of inverter signals. Drive composer pro is available through the ABB sales channels.

Further information

More information about ABB products for solar applications on Internet:

www.abb.com/solar

www.abb.com/solarinverters

Contact us

www.abb.com/solar

3AXD50000048332 Rev A (EN) 2017-07-13