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User's manual

NX inverters

ARFIFF04
Vacon 8000 Solar

Application manual

Vacon 8000 Solar Application manual

INDEX

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1. INTRODUCTION

This document describes the functionality of Vacon 8000 Solar inverter application.

1.1 Grid Code Support Information

1.1.1 Certified Grid Code Standards for Solar 8000 Cabinet Products

Table 1 Certified Grid Code standards and Power sizes, for application version v. 0.45 and newer (n = 2 … 6)

Power [kW] / Std	10	15	20	25	30	40	50	80	100	125	200	250	n x 200
Low Voltage													
VDE 0126-1-1	X	X	X	X	X	X	X	X	X	X	X		
EN 50438	X	X	X	X	X	X	X	X	X	X	X		
CEI 11-20	X	X	X	X	X	X	X	X	X	X	X		
R.D. 1663/2003	X	X	X	X	X	X	X	X	X	X	X		
AS 4777.3	X	X	X	X	X	X	X	X	X	X	X		
IEC 62116	X	X	X	X	X	X	X	X	X	X	X		
Medium Voltage													
BDEW 2008							X		X	X	X		X
Arrêté du 23 avril 2008	X	X	X	X	X	X	X	X	X	X	X		X
CEI 0-16	X	X	X	X	X	X	X	X	X	X	X		X
P.O. 12.2/12.3							X		X	X	X		X

Table 2 Certified Grid Code standards and Power sizes, for application version v. 0.47 and newer (n = 2 … 6)

Power [kW] / Std	10	15	20	25	30	40	50	80	100	125	200	250	n x 200
Low Voltage													
VDE 0126-1-1	X	X	X	X	X	X	X	X	X	X	X		
VDE AR-N-4105					X		X	X	X				
EN 50438	X	X	X	X	X	X	X	X	X	X	X		
CEI 0-21					X		X	X	X				
CEI 11-20	X	X	X	X	X	X	X	X	X	X	X		
R.D. 1663/2003	X	X	X	X	X	X	X	X	X	X	X		
AS 4777.3	X	X	X	X	X	X	X	X	X	X	X		
IEC 62116	X	X	X	X	X	X	X	X	X	X	X		
Medium Voltage													
BDEW 2008							X		X	X	X		X
Arrêté du 23 avril 2008	X	X	X	X	X	X	X	X	X	X	X		X
CEI 0-16	X	X	X	X	X	X	X	X	X	X	X		X
P.O. 12.2/12.3							X		X	X	X		X

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1.1.2 Supported Grid Code Standards

Vacon Solar Application complies also with, but Vacon 8000 Cabinet Products are not certified for, the following standards regardless of Power Size:

Application ARFIFF04 v. 0.45 and newer:

- CGC/GF 001:2010

Application ARFIFF04 v. 1.00 and newer:

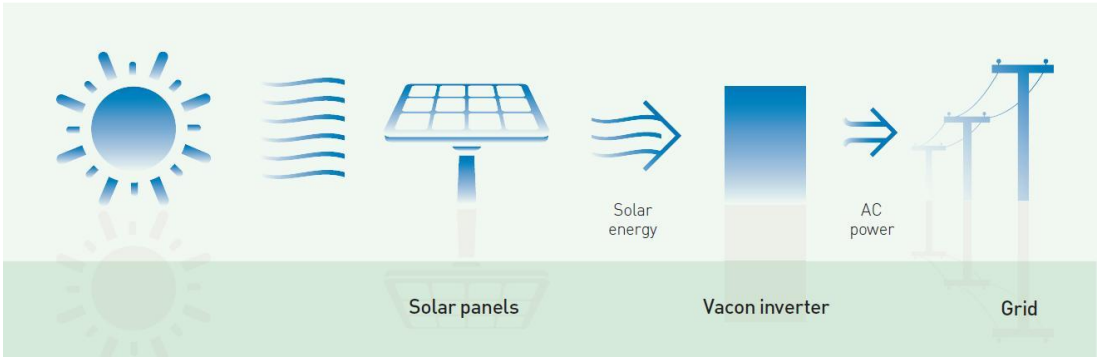
- G59
- GB/T 19964-2012
- NERC PRC-024-1
- IEEE 1547
- FERC 661A

Application ARFIFF04 v. 1.02 and newer:

- NT30

2. GENERAL

Vacon 8000 Solar product is an answer to growing renewable energy market. The Solar inverters need only DC voltage and the grid to start producing energy.



Picture 1. Basic solar system.

2.1 Basic features

The Vacon 8000 Solar application works with Multi master and Stand-alone configurations. It can be used with thin film and polycrystal Solar panels. Multi master configured system is controlled by external Touch panel.

Additional functions:

- Grid Code functionality.
- Possibility to send Power Limit also from Fieldbus
- Multi-Master functionality with daily master change.
- Maximum Power Point Tracking
- Possibility to set any parameter value through Fieldbus interface.

2.2 Stand Alone (≤250 kW)

Vacon 8000 Solar Stand-alone system maximum power is 250 kW. There is only one inverter unit which is producing energy to the grid. This system is working alone and there is no need to use any external control systems or backup systems.

2.3 Multimaster (2 … 6 x 200 kW)

Vacon 8000 Solar Multi master functionality is used in bigger systems. There are two to six 200 kW inverter units which are producing energy to the grid. This system has always the touch panel, which controls the system. Inverters are equally loaded, because each time system is started, MPPT master is changed, which will extend the lifetime of the inverters.

In Solar 8000 Multimaster system there is one inverter which is controlling other inverters' DC side behaviour and that inverter is called master inverter. Master inverter collects information of the DC bus and makes decisions regarding what DC reference is used.

Other inverters are slave inverters and they follow DC reference coming from the master inverter. Each of the inverters is responsible of its own behaviour on the Grid side, i.e. complying with Grid Code Standard.

Each unit is sending status information to operator panel and they can be read in touch panel.

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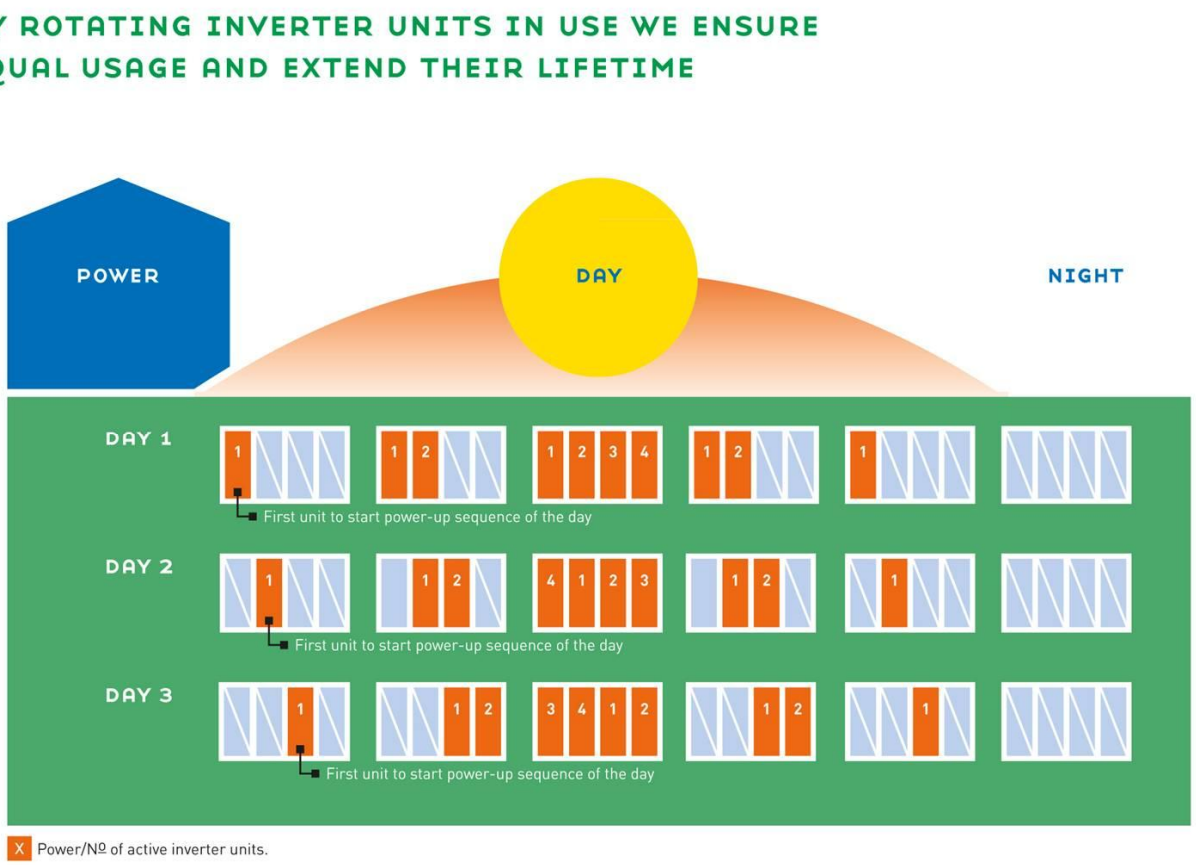
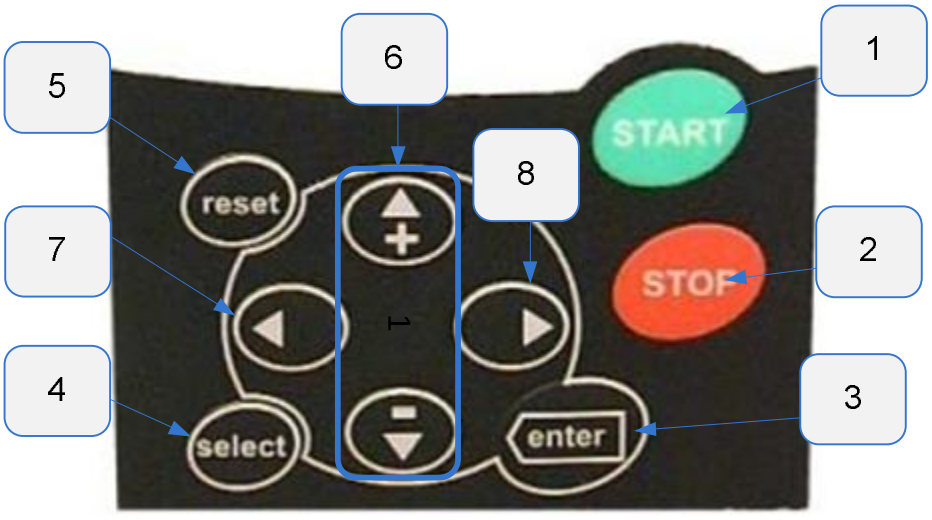


Picture 2. Multi master system master change function.

2.4 How to use

2.4.1 Keypad push buttons



Picture 3. Keypad push buttons

1 = Start button.
Pressing this button Unit goes to ready state in multi master system or if stand-alone configuration is used it goes ready state and if there is enough DC voltage, it will try to run.

Pressing start button for 5 seconds when the Control Source is set to Panel forces the drive to start regardless of DC level.

2 = Stop button.
Pressing this button stops the unit

3 = The Enter button serves for:
1) confirmation of selections
2) fault history reset (2…3 seconds)

4 = This button is used to switch between two latest displays. May be useful when you want to see how the changed new value influences some other value.

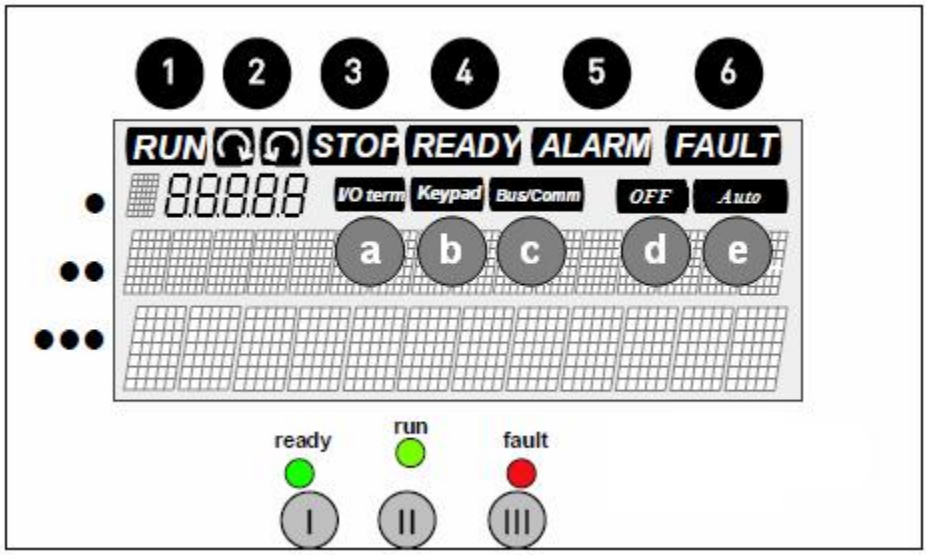
5 = This button is used to reset active faults.

6 = Browser button up and down
Browse the main menu and the pages of different submenus.
Edit values.

7 = Menu button left
Move backward in menu.
Move cursor left (in parameter menu).
Exit edit mode.

8 = Menu button right
Move forward in menu.
Move cursor right (in parameter menu).
Enter edit mode.

2.4.2 Inverter status indications



Picture 4.Keypad Indicators

The inverter status indications tell the user what the status of the Inverter and the Inverter is and whether the Inverter control software has detected irregularities in Inverter functions.

1 RUN = Inventer is running;

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= Indicates the direction of Inverter running.

STOP = Indicates that the Inverter is not running and not ready.

READY = Lights when AC and DC Voltage is on. In case of a trip or stop button is pushed, the symbol will not light up.

ALARM = Indicates that the Inverter is running outside a certain limit and a warning is given.

FAULT = Indicates that unsafe operating conditions were encountered due to which the Inverter was stopped.

2.4.3 Control place indications

The symbols I/O term, Keypad and Bus/Comm (see Figure 7-1) indicate the choice of control place made in the Keypad control menu (M3).

a ***I/O term*** = I/O terminals are the selected control place; i.e. START/STOP commands or reference values etc. are given through the I/O terminals.

b ***Keypad*** = Control keypad is the selected control place; i.e. the Inverter can be started or stopped, or its reference values etc. altered from the keypad.

c ***Bus/Comm*** = The inverter is controlled through a fieldbus.

d ***OFF*** = Run enable not active

e ***Auto*** = Unit is ready to start in the morning.

2.4.4 Status LEDs (green – green – red)

The status LEDs light up in connection with the READY, RUN and FAULT Inverter status indicators.

I (Ready) = Steady ON (no other LEDs): Start command has been given, all start criterions have been fulfilled except that the drive has not detected high enough voltage to start up.

Blinking at 2 Hz: All external start criterions have been fulfilled but no start command has been given.

II (Run) = Steady ON: The Inverter is running.

Blinking: Stop command has been given and the inverter is ramping power down.

(Fault) = Blinks when unsafe operating conditions were encountered due to which the Inverter was stopped (Fault Trip). Simultaneously, the Inverter status indicator FAULT blinks on the display and the fault description can be seen on the panel.

2.4.5 Text lines

The three text lines (•, ••, •••) provide the user with information on his present location in the keypad menu structure as well as with information related to the operation of the Inverter.

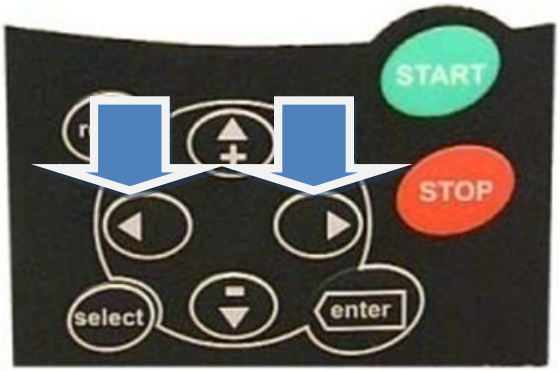
• = Location indication; displays the symbol and number of menu, parameter etc.

•• = Description line; Displays the description of menu, value or fault.

••• = Value line; Displays the numerical and textual values of references, parameters etc. and the number of submenus available in each menu.

2.5 Basic & I/O Parameters

No parameters are visible without press the right and left arrow (Picture 5) buttons on the panel for more than 3 seconds. Parameters at in Basic parameters group (G2.1) and IO Signals (G2.2) are visible for 10 minutes.



Picture 5. How to open Basic parameters.

2.6 Service

To get the user level password parameter P2.10 visible one has to press the up and down arrow buttons on the panel for more than 3 seconds. (Picture 6)

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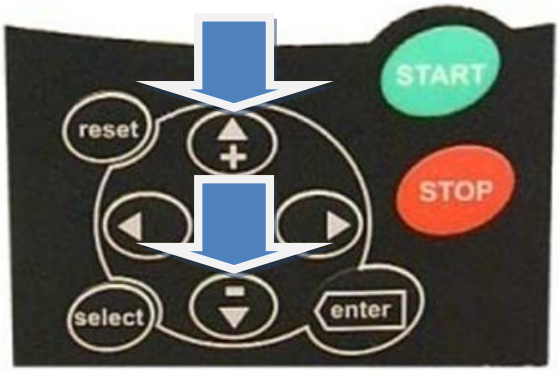

Picture 6. How to open set password.

After this the parameter menu appears and the password parameter is last in menu. There is 60 seconds time to give the right password unlocking all submenus in the parameter menu, system menu and option card menu.

3. APPLICATION

3.1 Quick Application Commissioning Guide

The Solar 8000 application has been design for easy and fast commissioning. The user only needs to set the Basic parameters and check if the there are any I/O parameters to be changed.

The user can enable access to Basic and I/O parameters by pressing the Left & Right Arrow buttons simultaneously for couple for seconds.

The Basic parameters are meant to be set in numerical order. Then the option board parameters are set correctly automatically and system is ready faster.

3.1.1 Commissioning Steps

Table 3. Application Commissioning Steps

Step #	Step	Description
1	If you are updating the application to newer version, write down the following counter values: V1.2 Total Energy kWh V1.12 RunTime Total V1.15 Grid Connections V1.22.23 IntFanRunHours V1.22.24 ExtFanRunHours	These values need to be written down so that the counters can be reset to correct values after application update.
2	After application update, write the corresponding counter values to these parameters: P2.7.2 TotalEnergyPreset P2.7.3 GridConnPreset P2.7.4 TotalRunTimPrese P2.7.5 IntFanRuntPresVa P2.7.6 ExtFanRuntPresVa Change parameter P2.7.1 LoadSaveCountVal to “Save values”	This will set the counters to the values before application update.
3	Set parameters P2.1.1 – P2.1.6 in numerical order.	By setting the parameters in numerical order the necessary option board parameters are set also automatically to their correct/default values. This speeds up the process especially in Multimaster system commissioning.
4	If commissioning is done before large scale power production is possible, set P2.1.7.1 DC Start Level parameter to a level where the inverter will surely start when the sun is up. Otherwise no need to change anything else in Basic Parameters	This parameter indicates the minimum DC voltage needed for the drive to try start up. If this is larger than the current DC level when the drive is stopped (as it is during morning or evening commissioning) the drive will not start.
5	Set the I/O parameters in G2.2 as required.	Some fault or warning may have been triggered due to wiring in customized cabinet solutions.
6	Reset any possible faults.	Reset the possible wiring related faults / warnings.
7	Set P2.5.2.1 SystemBus Test to “Enable” in any one unit	This will start a SystemBus test procedure that will blink the Ready, Run and Fault LEDs in all of the drives in order, starting from the inverter where the parameter was set. If the LEDs do not blink in all of the units, check the optical cables, jumper settings in OPT-D2 option boards and Basic parameters in all of the drives.
8	Set P2.5.1.1 Simulation Mode to	This activates the simulation mode

	"SimModSimDC" in all units and press start in the Beijer panel	where drives use simulated DC voltage (P2.5.1.6) and simulates power production which the Beijer touch panel can see. This test ensures that the system works as a whole and the communication between the inverters and Beijer touch panel is working (in multimaster system) alright without actually having DC or real output power. You may need to lower the limit for starting up the next follower in the Beijer parameters to enable follower start ups.
9	When every drive in the system has ran, press stop in the Beijer panel and set P2.5.1.1 Simulation Mode to "Disable"	This disables the simulation mode and enables the drive to run normally.
10	Give Start command. If drive has not started but Ready LED is lit and power production should be possible, press Start button for 5 seconds.	If the DC is above the P2.1.7.1 DC Start Level the drive will start. Pressing the Start button for 5 seconds forces the drive to start regardless of DC level.
11	Make sure parameter P2.1.7.6 DC Start Level Max is set to appropriate value compared to the specified open circuit voltage of the panel field. NOTE: during hot summer days, the actual open circuit voltage can go as low as 90% of the specified OC voltage, set the parameter accordingly!	P2.1.7.6 DC Start Level Max is the absolute maximum value that the addition of offset after natural stops will not exceed. This is to ensure that the start level never rises so high that the drive will never start up.
12	In Multimaster system when power production is ~75 % from system maximum, use P2.1.8.10 DC Calibration to tweak the output power of all of the drives to match each other.	This is done to ensure that the small DC voltage measurement errors between the drives are not causing adverse effects on the power production and the produced power values are close to the same in the Multimaster panel.

3.1.2 Multimaster PLC out of commission

Note! This feature requires changes to settings behind Service password!

If it happens that the multimaster control PLC is out of order, the drives are able to work using master-follower operation mode where all of the drives are always working at the same time:

Step #	Step	Description
1	Set parameter P2.1.6 Configuration to "SB Master" in the unit #1	This setting indicates for the unit #1 that it needs to send the start command to the other drives via SystemBus
2	Set P3.1 Control Source in the master to Panel	This way the user can use the Panel to give the Start command to the master unit and the drive no longer listens to commands from Fieldbus
3	Set P3.1 Control Source in all of the other drives to SystemBus	This way the follower drives listen for the Start command from SystemBus
4	Reset possible faults and give Start command to the master unit.	The drives start up and start producing power.

	If drives have not started but Ready LED is lit in the Master unit and large scale power production is possible, press Start button for 5 seconds.	

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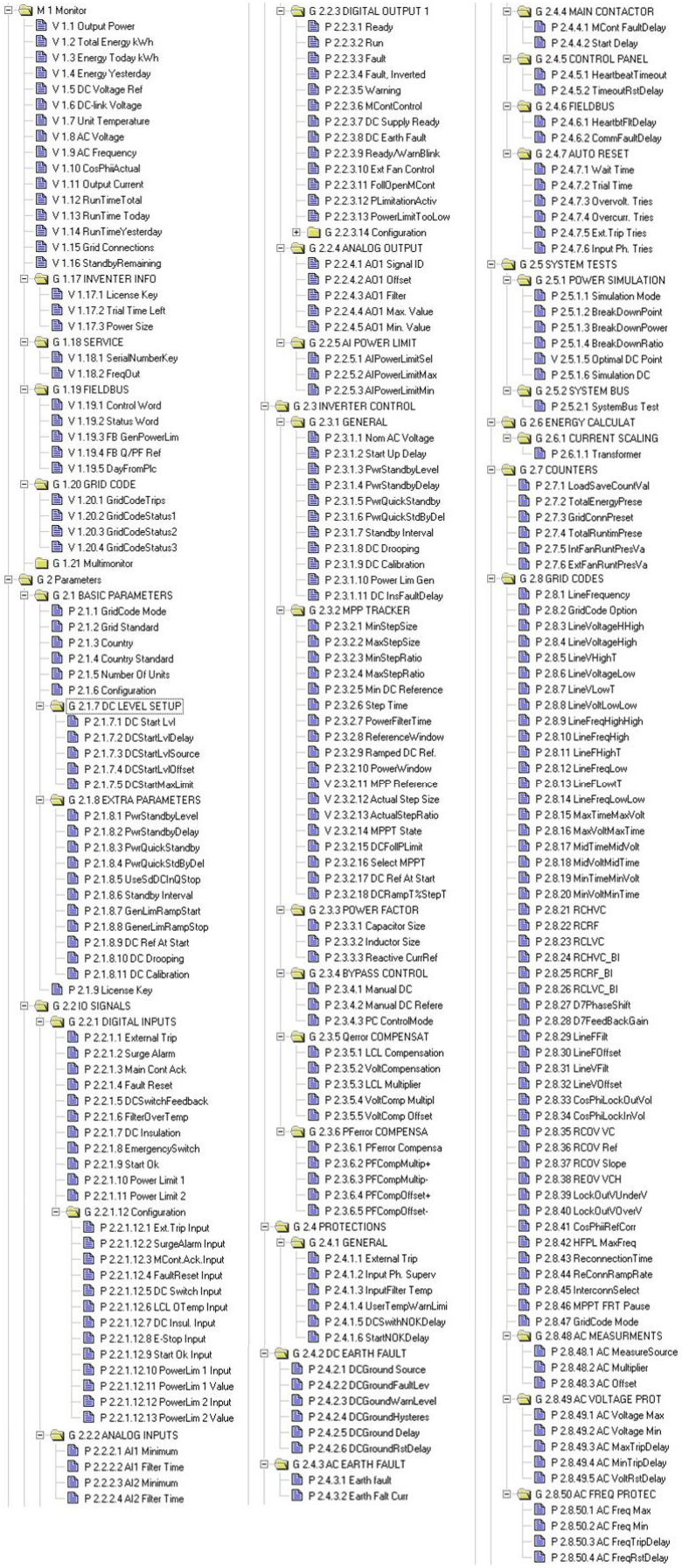
3.2 Menu structure



Picture 7. Menu tree (OLD PICTURE)

3.3 VACON 8000 SOLAR APPLICATION PARAMETER LISTS

3.3.1 M1. Monitor Values

The monitoring values are the actual values of parameters and signals as well as statuses and measurements.

On the next pages you will find the lists of monitoring values within the respective monitor values groups. The monitor values descriptions are given on pages 16 to 19. Monitor values description includes more than is available in this application see monitor value list what is available.

Column explanations:

Code = Location indication on the keypad; Shows the operator the present parameter number

Values = Name of monitor value

Min = Minimum value of monitor value

Max = Maximum value of monitor value

Unit = Unit of monitor value; Given if available

ID = ID number of the parameter

All monitoring value is possible to monitoring from fieldbus by ID number

"Cursive text" Means how monitor value name is shown in the keypad.

3.3.1.1 Basic

Basic monitor values and descriptions

Table 4. Monitoring values

Code	Values	Min	Max	Unit	ID	Description
V1.1	Output Power	0,0	1000,0	kW	1707	Approximate Output power of inverter on the grid side of LC.
V1.2	Total Energy kWh	0	4,29E+09	kWh	1837	Total energy produced.
V1.3	Energy Today kWh	0,0	6553,5	kWh	1708	Energy produced today.
V1.4	Energy Yesterday	0,0	6553,5	kWh	1733	Energy produced yesterday.
V1.5	DC Voltage Ref	50,00	150,00	%	1200	Used DC voltage reference by the regenerative unit in % of Nominal DC Voltage.
V1.6	DC-link Voltage	0	1000	V	1839	Filtered DC Link voltage in Volts.
V1.7	Unit Temperature	-50	200	°C	1109	Temperature of the unit in Centigrade
V1.8	AC Voltage	0	1000	V	1709	AC Voltage measured on the grid side of the main contactor by an external measurement circuit.
V1.9	AC Frequency	-100,00	100,00	Hz	1835	Grid frequency in ##.## Hz. The sign indicates the phase order. Can be monitored only when UNIT is in RUN state.
V1.10	CosPhiiActual	-1,000	1,000		1717	Drive output's Cosine Phi
V1.11	Output Current	0	Varies	A	1834	Output current of the inverter coming out of the cabinet. (Transformers inside cabinet are taken into consideration.)
V1.12	RunTimeTotal	0	99999999	h	1836	Total time the inverter has been running.
V1.13	RunTime Today	0	255	h	1731	The time the inverter has been running today.
V1.14	RunTimeYesterday	0	255	h	1732	The time the inverter was running yesterday.

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V1.15	Grid Connections	0	4,29E+09		1706	Total number of times the inverter has closed the main contactor and connected to the grid.
V1.16	StandbyRemaining	0	65535	s	1201	Remaining time in standby mode, if standby mode is activated.

Table 5 G1.16 Inverter Info

Code	Values	Min	Max	Unit	ID	Description
V1.16.1	License Key	0	1		1909	0 = Trial Time 1 = Valid
V1.16.2	Trial Time Left	0	50	h	1910	If no valid license key is entered, the counter will count down from 50h to 0h while in run mode. When 0 is reached the inverter will not start again.
V1.16.3	Power Size	-1		kW	1588	Shows what power size device is defined to be

Table 6 G1.17 Service

Code	Values	Min	Max	Unit	ID	Description
V1.17.1	Serial Number Key	0	65535		1997	
V1.17.2	FreqOut	-10000	10000	Hz	1123	The frequency in the drive's terminals. - If this is negative when the drive is running the phases of the main lines are connected wrong - If this is positive when the drive is running and D7 measurement is negative, phases to D7 are connected wrong

Table 7 G1.18 Fieldbus

Code	Values	Min	Max	Unit	ID	Description
V1.18.1	Control Word	0	65535		1478	Control Word from the PLC
V1.18.2	Status Word	0	65535		1479	Status Word from Vacon Inverter
V1.18.3	FB Power Limit	0,0	6553,5	%	1481	Power limit sent by the PLC
V1.18.4	FB Q/PF Ref	Q: -100,0 PF: -1,000	Q: 100,0 PF: 1,000	Q: % PF: -	1480	Reactive Current or Power Factor reference sent by the PLC
V1.18.5	Day from PLC	0	31		1719	Day index sent from the PLC

Table 8 G1.19 Grid Code

Code	Values	Min	Max	ID	Description
V1.19.1	GridCodeTrips	0	65535		Indicates which tripping conditions are met. See details in 3.3.1.2.
V1.19.2	GridCodeStatus1	0	65535		Grid Code status word #1. See details in 3.3.1.2.
V1.19.3	GridCodeStatus2	0	65535		Grid Code status word #2. See details in 3.3.1.2.
V1.19.4	GridCodeStatus3	0	65535		Grid Code status word #3. See details in 3.3.1.2.

3.3.1.2 Monitor Values descriptions

V1.1 Output Power kW ID1707 *"Output Power"*

Output power of inverter, with LCL filter losses compensated.

V1.2	Total Energy kWh	kWh	ID1837	*"Total Energy kWh"*
	Total produced energy to the grid			
V1.3	Energy Today kWh	kWh	ID1708	*"Energy Today kWh"*
	Amount of energy produced today.			
V1.4	Energy Yesterday	kWh	ID1733	*"Energy Yesterday"*
	Amount of energy produced yesterday.			
V1.5	DC Voltage Reference	%	ID1200	*"DC Voltage Ref"*
	Used DC voltage reference. 100 % = 1,35 x Nominal AC Voltage.			
V1.6	DC-link Voltage	V	ID1839	*"DC-link Voltage"*
	Filtered DC Link voltage in Volts.			
V1.7	Unit Temperature	°C	ID1109	*"Unit Temperature"*
	Temperature of the unit in Celsius			
V1.8	Grid Voltage	V	ID1709	*"AC Voltage"*
	AC Voltage measured on the grid side of the main contactor by an external measurement circuit.			
V1.9	Grid Frequency	Hz	ID1835	*"AC Frequency"*
	Grid frequency in ##.## Hz. The sign indicates the phase order. Can be monitored only when UNIT is in RUN state.			
V1.10	Output Current	A	ID1834	*"Output Current"*
	Output current of the inverter coming out of the cabinet. (Transformers inside cabinet are taken into consideration.)			
V1.11	Run Time Total	h	ID1836	*"RunTimeTotal"*
	Total time the inverter has been running.			
V1.12	Run Time Today	h	ID1731	*"RunTime Today"*
	The time the inverter has been running today.			
V1.13	Run Time Yesterday	h	ID1732	*"RunTimeYesterday"*
	The time the inverter was running yesterday.			
V1.14	Grid Connections	Pcs	ID1706	*"Grid Connections"*
	Total number of times the inverter has closed the main contactor and connected to the grid.			
V1.15	Standby Remaining	s	ID1201	*"StandbyRemaining"*
	Remaining time in standby mode, if standby mode is activated.			
V1.16.1	License Key		ID1909	*"License Key"*
	0 = Trial Time 1 = Valid			
V1.16.2	Trial Time Left	h	ID1910	*"Trial Time Left"*
	If no valid license key is entered, the counter will count down from 50h to 0h while in run mode. When 0 is reached the inverter will not start again.			

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V1.16.3 Power Size kW ID1588 *"Power Size Monitor"*

Shows what power size is defined in the inverter
0 = No Power Size Read from Power Unit
–1 = Unknown Power Size

V1.17.1 Serial Number Key

Serial Number Key of the drive.

V1.18.1 Control Word

Control Word received from the Fieldbus

V1.18.2 Status Word

Status Word sent to the upper system/PLC via Fieldbus

V1.18.3 FB Power Limit

Power limit received from the Fieldbus. If this is zero, value from P2.3.1.9 is used

V1.18.4 FB Q/PF Reference

Reactive Current or Power Factor Reference received from Fieldbus. Control Word states which reverence is used.

V1.19.1 Grid Code Trips

Indicates which tripping conditions are met. This status information is valid for any Grid Code standard.

Table 9 Grid Code Tripping information bits

Bit	Description
0	Voltage High High Trip
1	Voltage High Trip
2	Voltage Low Trip
3	Voltage Low Low Trip
4	Frequency High High Trip
5	Frequency High Trip
6	Frequency Low Trip
7	Frequency Low Low Trip
8	Time Based Voltage Dip Trip
9	Time Based Voltage Dip Trip (bi phase)
10	Common Trip
11	Reserved
12	
13	
14	
15	

V1.19.2 Grid Code Status #1

This status indicates if certain Grid Code related situations are in effect, like low voltage, but these bits do not indicate that the drive is disconnecting from the grid. For example in LVRT situation this status indicates Low Voltage situation when the voltage drops below the limits, but it will not disconnect unless the dip is long enough. Some bits are Grid Code Specific.

Table 10 Grid Code Status #1

Bit	Description	
0	Voltage High High	
1	Voltage High	
2	Voltage Low	
3	Voltage Low Low	
4	Frequency High High	
5	Frequency High	
6	Frequency Low	
7	Frequency Low Low	
8	Timer Started	
9	Timer Started (bi phase)	
10	Line NOT ok (not used in GB/T 19964-2012)	
11	Fault Ride Through Enabled	
12	Fault Ride Through Enabled (bi phase)	
Bit	IEEE 1547 NERC PRC-024-1 FERC 661A G59 CEI 0-21 VDE AR-N-4105 NT30	Other
13	Reconnection time elapsed	Modulator Selection Ok
14	High Frequency Power Limitation Active	Low/Medium Voltage Selection Ok
15	Reconnection Power Limitation Active	Country Selection Ok

V1.19.3 Grid Code Status #2

This status is only applicable for IEEE 1547, NERC PRC-024-1, FERC 661A, G59, CEI 0-21 & VDE AR-N-4105 Grid Codes.

Table 11 Grid Code Status #2

Bit	Description
0	Voltage High High Trip
1	Voltage High Trip
2	Voltage Low Trip
3	Voltage Low Low Trip
4	Frequency High High Trip
5	Frequency High Trip
6	Frequency Low Trip
7	Frequency Low Low Trip
8	Time Based Voltage Dip Trip
9	Time Based Voltage Dip Trip(bi phase)
10	Grid Voltage & Frequency Ok
11	Line Frequency Ok
12	Frequency above Power Limitation Threshold
13	Drive is Running
14	Line Voltage Ok
15	Common Trip

V1.19.4 Grid Code Status #3

This status is only applicable for IEEE 1547, NERC PRC-024-1, FERC 661A, G59, CEI 0-21 & VDE AR-N-4105 Grid Codes and has some Grid Code related bits also.

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Table 12 Grid Code Status #3

Bit	Description IEEE 1547 NERC PRC-024-1 FERC 661A G59 CEI 0-21 VDE AR-N-4105 NT30
0	Cos Phii Control Active
Bit	CEI 0-21
1	Under Voltage Reactive Current Injection (50% Reference)
2	Under Voltage Reactive Current Injection (100% Reference)
3	Over Voltage Reactive Current Injection (50% Reference)
4	Over Voltage Reactive Current Injection (100% Reference)
5	Reserved
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

3.3.2 G2. Parameters

On the next pages you will find the lists of parameters within the respective parameter groups. The parameter descriptions are given on pages 22 to 68. Parameter description includes more than is available in this application see parameter list what is available.

Column explanations:

Code = Location indication on the keypad; Shows the operator the present parameter number

Parameter = Name of parameter

Min = Minimum value of parameter

Max = Maximum value of parameter

Unit = Unit of parameter value; Given if available

Default = Value preset by factory

ID = ID number of the parameter

"Cursive text" Means how parameter name is shown in the keypad.

All parameters is possible to control from fieldbus by ID number

Table 13. User Level password parameter

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.10	UserLevel Passwd	0	99999		0	1830	Some parameters are hidden with password and maybe need with service cases

P2.10 User Level Password ID1830 *"UserLevel Passwd"*

Some parameters are hidden with password and maybe need with service cases

3.3.2.1 P2.1 Basic parameters

Table 14. Basic parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.1.1	Grid Code Mode	0	1	1	1575	Specifies is the Grid Code function enabled or disabled.
P2.1.2	Grid Standard	1	2	1	1914	Low voltage Standard / Medium voltage Standard
P2.1.3	Country	0	13	1	1867	This parameter overwrites some default parameter values with country specific values. E.g. based on grid codes. The loading of these values happens only when the parameter is changed. Afterwards some of the overwritten values can be changed manually if needed.
P2.1.4	Country Standard	0	See Description	0	1934	If the Grid Standard specified in P2.1.2 and country specified in P2.1.3 have multiple standards available, the user can select one of them using this parameter. The Maximum

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						number depends on the selections of P2.1.2 and P2.1.3
P2.1.5	Number Of Units	0	12	1	1604	Number of units in array mode system. Needed e.g. for system bus communication Note: This parameter is only visible in drives that support multimaster functionality
P2.1.6	Configuration	-1	Varies	0	1531	Sets the inverter in a stand-alone or panel/array mode. In array mode the inverter has to be given a unique inverter number. Communication parameters for touchpad panel communication, systembus and CAN communication are set based on this value.

P2.1.1 Grid Code Mode ID1575 *"GridCode Mode"*

User can Enabled or Disabled the Grid Code function using this parameter. If the Grid Code function is disabled, other grid Code related parameters matter no more.

P2.1.2 Grid Standard ID1914 *"Grid Standard"*

Low voltage standard / medium voltage standard. Choose grid standard what is in use.

P2.1.3 Country ID1867 *"Country"*

This parameter overwrites some default parameter values with country specific values in Grid Code parameter group. The loading of these values happens only when the parameter is changed. Afterwards some of the overwritten values can be changed manually if needed.

P2.1.4 Country Standard ID1934 *"Country Standard"*

If the country selected in P2.1.1 has multiple implemented Grid Code standards, this index parameter is used to select which standard is in use.

Table 15. Grid standards

Country	General	Germany		France	Italy		Spain	Czech	UK	
Country Standard	0	0	1	0	0	1	0	0	0	1
Low Voltage Standard	VDE 0126-1-1	VDE 0126-1-1	VDE AR-N-4105	EN 50438	CEI 0-21	CEI 11-20	R.D. 1663/2000	EN 50438	EN 50438	G59
Medium Voltage Standard	BDEW 2008	BDEW 2008		Decret Arrete 23.4.2008	CEI 0-16		P.O. 12.2/12.3	(BDEW 2008)	(BDEW 2008)	

Table 16. Grid standards

Country	Belgium	Australia	IEC 62116	USA			China		Romania	Finland
Country Standard	0	0	0	0	1	2	0	1	0	0
Low Voltage Standard	EN 50438	AS 4777.3	IEC 62116	(VDE 0126-1-1)	IEEE 1547		CGC/GF 001:2010			(VDE 0126-1-1)
Medium Voltage Standard	(BDEW 2008)	(BDEW 2008)	(BDEW 2008)	(BDEW 2008)	FERC 661A	NERC PRC-024-1	CGC/GF 001:2010	GB/T 19964-2012	NT30	(BDEW 2008)

P2.1.5 Number of Units ID1604 *"Number Of Units"*

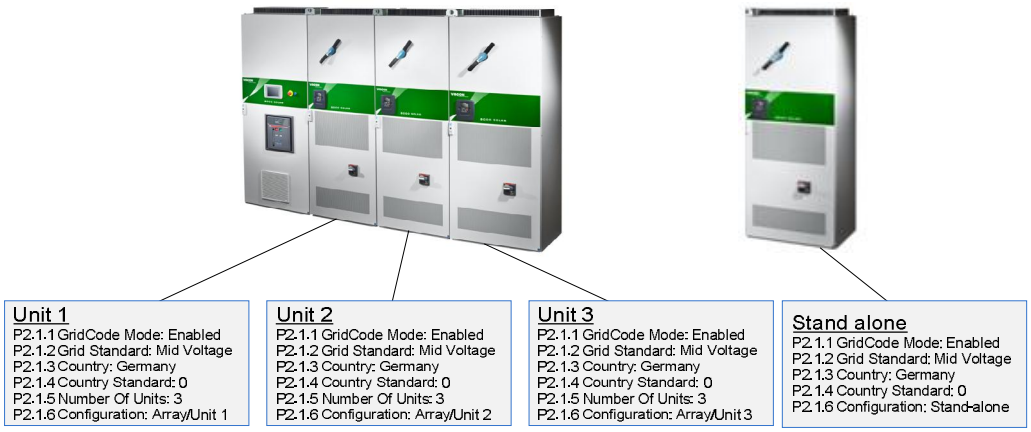
Number of units in the multi master system, defines how many inverter units are connected to system. This information is needed for system bus communication

Note: This parameter is not visible in drives that do not support multimaster functionality

P2.1.6 Configuration ID1531 *"Configuration"*

Sets the inverter in a stand-alone or multi master mode (Array/Unit x). In multimaster mode the inverter has to be given a unique inverter number. This number is used in communication and system identification. Array options are available only with power sizes that support multimaster functionality.

Picture 4 shows example in the Multi master systems parameters.



Picture 8. Example of Basic Parameter configuration in the multi master and stand-alone systems

G2.1.7 DC Level Setup

Table 17. DC Level Setup

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.7.1	DC Start Lvl	0	2000	V	570	1962	If DC voltage is above this limit when the drive is stopped, DC is considered to be high enough to start-up. If the the DC is below this level when the drive is stopped, the DC is considered to be too low to produce power and drive will not try to start-up.
P2.1.7.2	DCStartLvlDelay	1,00	320,00	s	10,00	1964	Delay for when the DC rises above P2.1.7.1 before DC level is considered high enough for starting.
P2.1.7.3	DCStartLvlSource	0	1		1	1966	0 = "Panel", if this is enabled the drive will always use the user-set value in P2.1.7.1 as the Start Level 1 = "ShutdownDC", if this is enabled the drive will use the open circuit DC voltage from the previous natural stop + offset from P2.1.7.5 as the new Start Level.
P2.1.7.4	DCStartLvlOffset	0	300	V	15	1967	Offset value to be used when P2.1.7.4 is set to "ShutdownDC".

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P2.1.7.5	DCStartMaxLimit	0	2000	V	590	1968	Absolute maximum value for the Strt/Stp Level when P2.1.7.4 is set to "ShutdownDC"

P2.1.7.1 DC Start Level ID1962 *"DC Start Lvl"*

When DC rises above this limit when the drive is stopped, DC is considered to be high enough to start-up. If the the DC falls below this level when the drive is stopped, the DC is considered to be too low to produce power and drive will not try to start-up.

P2.1.7.2 DC Start Level Delay ID1964 *"DCStartLvlDelay"*

Delay for when the DC rises above P2.1.7.1 before DC level is considered high enough for starting.

P2.1.7.3 DC Start Level Source ID1966 *"DCStartLvlSource"*

0 = "Panel", if this is enabled the drive will always use the user-set value in P2.1.7.1 as the Start/Stp Level

1 = "ShutdownDC", if this is enabled the drive will use the open circuit DC voltage from the previous natural stop + offset from P2.1.7.5 as the new Start Level. The new level is shown in P2.1.7.1

P2.1.7.4 DC Start Level Offset ID1967 *"DCStartLvlOffset"*

Offset value to be used when P2.1.7.4 is set to "ShutdownDC". This value is always added to the open circuit voltage of the DC bus after a stop due to low power production.

P2.1.7.5 DC Start Max Level ID1968 *"DCStartMaxLimit"*

Absolute maximum limit for the Start Level when P2.1.7.4 is set to "ShutdownDC". This is to make sure adding the offset value after an unsuccessful start-up won't raise the Start Level too high which would make the start-up impossible or to use unreasonable high DC level as start limit.

G2.1.8 Extra Parameters

These are duplicated parameters from other parts of the menu tree which would normally require password to use.

Table 18. Extra Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.8.1	PwrStandbyLevel	-0,1	1000,0	%	1,5 %	1540	If drive's output is equal or below this limit, the drive is not producing enough power and it will stop after a delay set in P2.1.8.2. Setting this –0,1 % will disable the automatic shutdown.
P2.1.8.2	PwrStandbyDelay	0	32000	s	60	1541	Delay for P2.1.8.1.
P2.1.8.3	PwrQuickStandby	-0,1	10,0	%	-0,1	1549	If drive's output is equal or below this limit, the drive is not producing enough power and it will stop immediately after a delay set in P2.1.8.4. Setting this –0,1 % will disable the automatic shutdown.
P2.1.8.4	PwrQuickStdbyDel	0,00	10,00	s	3,00	1560	Delay for P2.1.8.3
P2.1.8.5	Standby Interval	1	3600	s	300	1754	Standby time before trying to startup again after stop due to low power production.
P2.1.8.6	GenLimRampStart	0,0	110,0	%/s	0,0	1786	Generator Power Limit start-up ramp rate. Setting to 0,0 will disable ramping.

P2.1.8.7	GenerLimRampStop	0,0	110,0	%/s	10,0	1785	Generator Power Limit stop ramp rate. Setting to 0,0 will disable ramping.
P2.1.8.8	DC Reference at Start	50	150	%	100	1595	Percentage of start moment's open circuit DC Voltage, which is going to be used as DC Reference at start up.
P2.1.8.9	DC Drooping	0,00	100,00	%	0,00	620	DC Drooping for balancing current output.
P2.1.8.10	DC Calibration	-5,00	5,00	%	0,00	1777	DC calibration for balancing the outputs of parallel drives

P2.1.8.1 Power Standby Level ID1540 *"PwrStandbyLevel"*

If drive's output is equal or below this limit, the drive is not producing enough power and it will stop after a delay set in P2.1.8.2.

Setting this –0,1 % will disable the automatic shutdown.

P2.1.8.2 Power Standby Delay ID1541 *"PwrStandbyDelay"*

Delay for P2.1.8.1.

P2.1.8.3 Power Quick Standby % ID154 *"PwrQuickStandby"*

Inverter will stop within the time specified in P2.1.8.4 if power is below this value and go to standby mode. Value should be tuned so that inverter stops e.g. if DC breaker is opened.

Setting this to -0,1 % disables the feature.

P2.1.8.4 Power Quick Standby Delay % ID1560 *"PwrQuickStdbyDel"*

Delay for P2.1.8.3.

P2.1.8.5 Standby Interval ID1754 *"Standby Interval"*

Standby time before trying to startup again after a stop due to low power production.

P2.1.8.6 Generator Power Limit Start-up Ramp ID1786 *"GenLimRampStart"*

Generator Power Limit start-up ramp rate.

Setting to 0,0 will disable ramping.

P2.1.8.7 Generator Power Limit Stop Ramp ID1785 *"GenerLimRampStop"*

Generator Power Limit stop ramp rate.

Setting to 0,0 will disable ramping.

P2.1.8.8 DC Reference at Start ID1595 *"DC Ref At Start"*

Percentage of start moment's open circuit DC Voltage, which is going to be used as DC Reference at start up.

P2.1.8.9 DC Drooping % ID620 *"DC Drooping"*

When Inverters are used in array mode, drooping can be used for current balancing. The DC voltage reference drooping is set as % of active current reference. E.g. if drooping is 3.00% and active current is 50% then DC voltage reference is reduced 1,5%. With drooping paralleled units can be balanced by adjusting the DCVoltReference to slightly different values.

P2.1.8.10 DC Calibration % ID1777 *"DC Calibration"*

In Multimaster systems inverters are connected to same DC-busbar. There can be some small errors in the measurements of DC voltage between the

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inverters and as they are trying to maintain a slightly different DC Voltage because of this error, it will result in the output power not being equally shared between the inverters in the system. With this parameter the DC Voltage can be calibrated to show same values on all inverters.

3.3.2.2 G2.2 I/O Signals

G2.2.1 Digital Inputs

Note! Check also G2.2.1.10 Configuration parameters for inverted inputs!
Note! If Digital Input signal source is set to DigIn:0.9 or DigIn:0.10, the application uses “ANIN as DIGIN2” or “ANIN as DIGIN1” respectively as signal source.
Note! To disable certain function, set the signal source to DigIN:0.1 (always FALSE) or DigIN:0.2 (always TRUE).

Table 19. Digital Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.2.1.1	External Trip	DigIN:0.1	DigIN:E.10	DigIN:A.1	1214	Select the digital input to activate External Trip.
P2.2.1.2	Surge Alarm	DigIN:0.1	DigIN:E.10	Stand-alone: DigIN:A.2 Multimaster: DigIN:0.1	1806	Select the digital input to Activate Surge Alarm.
P2.2.1.3	Main Cont Ack	DigIN:0.1	DigIN:E.10	DigIN:A.4	1453	This parameter defines if the inverter monitors the status of the main contactor of the unit. If the monitoring function is used, the unit monitors the status and will not start if the state of the contactor does not correspond to the required status, i.e. is open when it should be closed. If status of the main contactor is not monitored in the system the option DigIN:0.x must be chosen.
P2.2.1.4	Fault Reset	DigIN:0.1	DigIN:E.10	DigIN:0.1	1208	Select digital input used for fault reset.
P2.2.1.5	DCSwitchFeedback	DigIN:0.1	DigIN:E.10	Stand-alone: DigIN:0.2 Multimaster: DigIN:A.5	1212	This parameter defines which digital input is used for DC Switch Feedback signal. If this is used the inverter will not go to ready state unless the DCSwitchFeedback signal is TRUE.
P2.2.1.6	FilterOverTemp	DigIN:0.1	DigIN:E.10	DigIN:A.3	1179	Digital input for trigging a LCL filter over temperature fault.
P2.2.1.7	DC Insulation	DigIN:0.1	DigIN:E.10	Stand-alone: DigIN:A.5 Multimaster: DigIN:0.1	1180	Digital input for trigging DC Insulation.
P2.2.1.8	Emergency Switch	DigIN:0.1	DigIN:E.10	Stand-alone P < 40 kW: DigIN:0.1 Stand-alone P >= 40 kW: DigIN:A.6 Multimaster: DigIN:0.1	1181	Digital input for trigging Emergency Switch.

P2.2.1.9	Start Ok	DigIN:0.1	DigIN:E.10	DigIN:0.2	1974	Digital input for giving external Start Ok signal.
P2.2.1.10	Power Limit 1	DigIN:0.1	DigIN:E.10	DigIN:0.1	1182	Digital Input to activate DI Power Limit 1 (P2.2.1.12.11)
P2.2.1.11	Power Limit 2	DigIN:0.1	DigIN:E.10	DigIN:0.1	1183	Digital Input to activate DI Power Limit 2 (P2.2.1.12.13)
P2.2.1.12	Custom DIN 1	DigIN:0.1	DigIN:E.10	DigIN:0.1	1184	Digital input which can be used to control any other variable which has an ID. (Give ID to be controlled in P2.2.1.13.15)

P2.2.1.1 External Trip Input ID1214 *"External Trip"*

Select the digital input to activate External Trip fault.

P2.2.1.2 Surge Alarm Input ID1806 *"Surge Alarm"*

Select the digital input to trigging Activate Surge Alarm.

P2.2.1.3 Main Contactor Feedback ID1453 *"Main Cont Ack"*

This Digital Input is used for feedback signal of the main contactor, if the feedback and drive's main contactor control signal are different for too long the drive gives F64 MCC Fault. If this parameter is set to DigIN:0.x the F64 is disabled.

P2.2.1.4 Fault Reset Input ID1208 *"Fault Reset"*

Select digital input used for fault reset

P2.2.1.5 DC Switch Feedback ID1212 *"DCSwitchFeedback"*

This parameter defines which digital input is used for external DC Switch Feedback signal. If DC Switch Feedback is used the inverter will not go to ready state unless the signal is high.

P2.2.1.6 Filter over Temperature ID1179 *"FilterOverTemp"*

Digital input for trigging a LCL filter over temperature fault.

P2.2.1.7 DC Insulation fault input ID1180 *"DC Insulation"*

Digital input for trigging DC Insulation fault.

P2.2.1.8 Emergency Switch Input ID1181 *"Emergency Switch"*

Digital input for trigging Emergency Switch fault.

P2.2.1.9 Start Ok ID1974 *"Start Ok"*

External signal for Start permission.

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P2.2.1.10 DI Power Limit 1 Activation ID1182 *"Power Limit 1"*

Digital input for activating Power Limit 1. Limitation can be adjusted using P2.2.1.12.11.

P2.2.1.11 DI Power Limit 2 Activation ID1183 *"Power Limit 2"*

Digital input for activating Power Limit 2. Limitation can be adjusted using P2.2.1.12.13.

P2.2.1.12 Digital Input signal for controlling custom variable ID1184 *"Custom DIN 1"*

Digital input which can be used to control any other variable which has an ID. Give ID to be controlled in P2.2.1.13.15.

G2.2.1.10 Configuration

These signals are used to specify are the G2.2.1 Digital Inputs using Normal or Inverted Logic and with some input certain specialized parameters also.

Note! The Normal/Inverted Logic parameters have no effect on Digital Input which is set to DigIN:0.x

Table 20. Digital Input configuration parameters

Code	Parameter	Min	Max	Unit	Default	ID
P2.2.1.10.1	Ext. Trip Input	-	-	-	Inverted Logic	757
P2.2.1.10.2	SurgeAlarm Input	-	-	-	Stand-alone: Inverted Logic Multimaster: Normal Logic	758
P2.2.1.10.3	MCont.Ack.Input	-	-	-	Normal Logic	759
P2.2.1.10.4	FaultReset Input	-	-	-	Normal Logic	760
P2.2.1.10.5	DC Switch Input	-	-	-	Normal Logic	761
P2.2.1.10.6	LCL OTemp Input	-	-	-	Inverted Logic	762
P2.2.1.10.7	DC Insul. Input	-	-	-	Stand-alone: Inverted Logic Multimaster: Normal Logic	763
P2.2.1.10.8	E-Stop Input	-	-	-	Stand-alone P < 40 kW: Normal Logic Stand-alone P >= 40 kW: Inverted Logic Multimaster: Normal Logic	764
P2.2.1.10.9	Start Ok Input	-	-	-	Normal Logic	765
P2.2.1.10.10	PowerLim 1 Input	-	-	-	Normal Logic	766
P2.2.1.10.11	PowerLim 1 Value	0,0	110,0	%	110,0	767
P2.2.1.10.12	PowerLim 2 Input	-	-	-	Normal Logic	768
P2.2.1.10.13	PowerLim 2 Value	0,0	110,0	%	110,0	769
P2.2.1.10.14	CustomDIN1 Input	-	-	-	Normal Logic	770

P2.2.1.10.15	CustomDIN1 ID	0	1999	-	0	771

G2.2.2 Analog Inputs

The Analog Inputs, like Digital Inputs, have been implemented using Terminal To Function (TTF) programming method, which means, user needs to specify which Analog Input is linked to certain function. To disable certain function, set the input to anything between AnIN:0.1 and AnIN:0.10.

G2.2.2.1 Power Limitation

Table 21. Power Limitation Analog Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.2.2.1.1	Power Lim Input	AnIN:0.1	AnIN:E.10	AnIN:0.1		This parameter specifies which Analog Input is used for Power Limitation.
P2.2.2.1.2	Power Lim Max	Power Lim Min	110,0 %	110,0 %	1788	This parameter specifies what is the Power Limitation value at maximum input level.
P2.2.2.1.3	Power Lim Min	0,0 %	Power Lim Max	0,0 %	1789	This parameter specifies what is the Power Limitation value at minimum input level.
P2.2.2.1.4	PLimInput Filter	0,00 s	10,00 s	0,2 s		Filter Time for Power Limitation measurement.
P2.2.2.1.5	AnPLimOnFault	0,0 %	110,0 %	110,0 %		Specifies what Power Limit value from Analog Input is given to the system when Analog Input Fault for this signal has been detected.

Parameters and descriptions

P2.2.2.1.1 Power Limitation Input IDxxxx *"Power Lim Input"*

This parameter can be used to select which input is used for Power Limitation functionality.

P2.2.2.1.2 Maximum Power Limitation Value %
ID1788 *"Power Lim Max"*

Specifies the Power Limit setting at maximum input.

P2.2.2.1.3 Minimum Power Limitation Value %
ID1789 *"Power Lim Min"*

Specifies the Power Limit setting at minimum input.

P2.2.2.1.4 Power Limit Input's Filter Time s
IDxxxx *"PLimInput Filter"*

Filter time in seconds for Power Limitation Input. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.2.2.1.5 Power Limit value from Analog Input in Analog Input Fault situation
% IDxxxx *"AnPLimOnFault"*

Specifies what Power Limit value from Analog Input is given to the system when Analog Input Fault for this signal has been detected. The system uses always the smallest Power Limit value given by any means.

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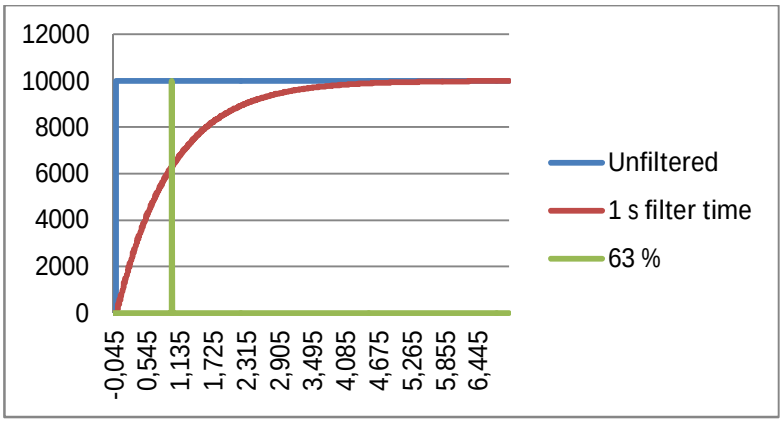

Picture 9. Analog input filter

G2.2.2.2 AC Voltage Measurement

Analog Input based voltage measurement is used in older Solar 8000 Cabinet products. Newer products use AC Voltage and Frequency Measurement Option Board, OPT-D7, for grid monitoring and the following parameters have nothing to do with that.

Table 22. AC Voltage Analog Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.2.2.2.1	ACVolt MeasInput	AnIN:0.1	AnIN:E.10	AnIN:0.1		This parameter specifies which Analog Input is used for AC Voltage Measurement.
P2.2.2.2.2	ACVoltInput Filt	0,00 s	10,00 s	0,2 s		Filter Time for AC Voltage measurement.
P2.2.2.2.3	AnACVoltOnFault	0,00 %	100,00 %	0,00 %		Specifies the Analog Input's value sent to the AC Voltage measurement logic in Analog Input Fault situation

Parameters and descriptions

P2.2.2.2.1 AC Voltage Measurement's Input IDxxxx *"ACVolt MeasInput"*

This parameter can be used to select which input is used for AC Voltage Measurement.

P2.2.2.2.2 AC Voltage Measurement's Filter Time s IDxxxx *"ACVoltInput Filt"*

Filter time in seconds for AC Voltage Measurement. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.2.2.2.3 Analog Input value in Analog Input fault situation % IDxxxx *"AnACVoltOnFault"*

This parameter specifies what Analog Input value is sent to the AC Voltage calculation logic in Analog Input Fault situation.

Note: 100,00 % does not necessarily mean Nominal Voltage!

G2.2.2.3 & G2.2.2.4 Analog Input as Digital Input #1 & #2

With these parameter groups 2 analog inputs can be programmed to be used as Digital Inputs. Parameter group G2.2.2.3 has parameters for Digital Input #1 and G2.2.2.4 for #2.

If any signal in G2.2.1 is set as DigIN:0.10 it is then controlled by Analog Input specified in G2.2.2.3 (Digital Input #1), DigIN:0.9 corresponds to G2.2.2.4 (Digital Input #2).

The parameter groups and functionalities are identical, so only G2.2.2.3 is described here.

Table 23. Parameters for using an Analog Input as Digital Input #1

Code	Parameter	Min	Max	Default	ID	Description
P2.2.2.3.1	AnalogDIN1 Input	AnIN:0.1	AnIN:E.10	AnIN:0.1		This parameter specifies which Analog Input is used as Digital Input #1.
P2.2.2.3.2	AnalogDIN1 Filt	0,00 s	10,00 s	0,2 s		Filter Time for Digital Input #1.
P2.2.2.3.3	AnalogDIN1 Hyst	0,00 %	20,00 %	5,00 %		Hysteresis for the input.
P2.2.2.3.4	AnDIGIN1FaultVal	False	True	False		Specifies what this Digital Input is set to in Analog Input Fault situation

Parameters and descriptions

P2.2.2.3.1 Analog Input selection to be used as Digital Input 1
IDxxxx *"AnalogDIN1 Input"*

This parameter can be used to select which Analog Input is used Digital Input #1.

P2.2.2.3.2 Filter Time s IDxxxx *"AnalogDIN1 Filt"*

Filter time in seconds for the Analog Input. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.2.2.3.3 Hysteresis % IDxxxx *"AnalogDIN1 Hyst"*

Hysteresis value for the Analog Input. The range can be selected from 0.01 to 20.00 %.

P2.2.2.3.4 Digital Input's state in Analog Input Fault situation
IDxxxx *"AnDIGIN1FaultVal"*

Specifies what this Digital Input is set to in Analog Input Fault situation

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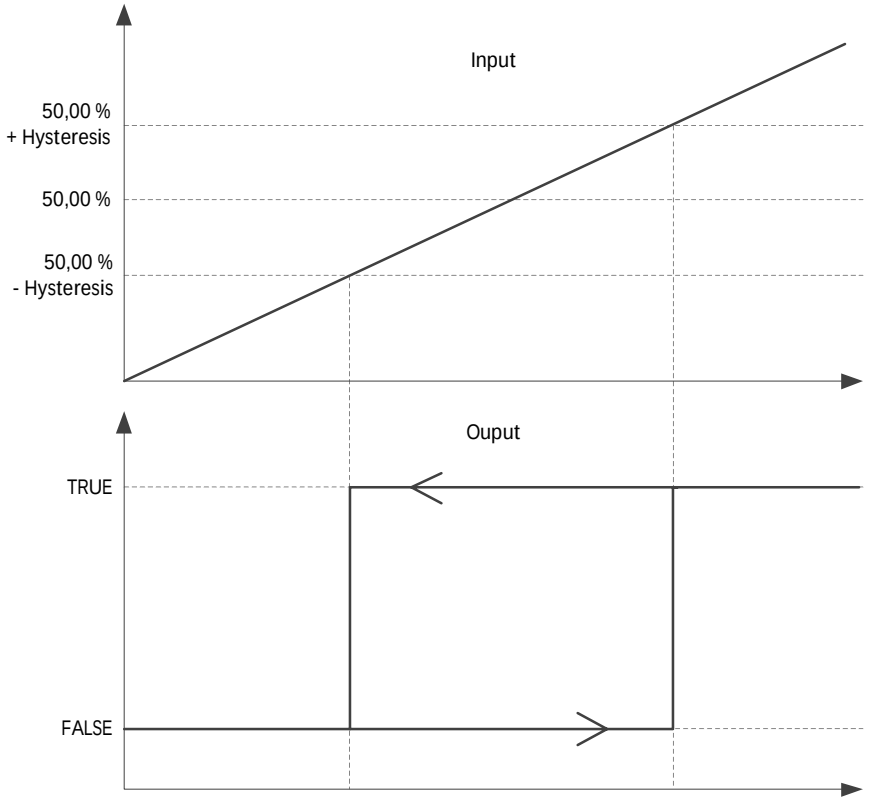

Picture 10. Operation principle of the Analog Input usage as Digital Input.

G2.2.2.5 DC Ground Measurement

Table 24. DC Ground Analog Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.2.2.5.1	DCGroundMonInput	AnIN:0.1	AnIN:E.10	AnIN:0.1		This parameter specifies which Analog Input is used for DC Ground Monitoring.
P2.2.2.5.2	DCGrdInputFilter	0,00 s	10,00 s	0,2 s		Filter Time for DC Ground Monitoring.
P2.2.2.5.3	AnDCGrndFaultVal	0,00 %	100,00 %	100,00 %		Specifies the DC Ground measurements value in Analog Input Fault situation.

Parameters and descriptions

P2.2.2.5.1 DC Ground Monitoring Input IDxxxx *"DCGroundMonInput"*

This parameter can be used to select which input is used for DC Ground Monitoring.

P2.2.2.5.2 DC Ground Monitoring Filter Time s
IDxxxx *"DCGrdInputFilter"*

Filter time in seconds for DC Ground Monitoring. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.2.2.5.3 DC Ground input in Analog Input Fault Situation % IDxxxx *"AnDCGrndFaultVal"*

Specifies the DC Ground measurements value in Analog Input Fault situation.

G2.2.3 Digital Outputs

Table 25.Digital Output parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.2.3.1	Ready	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	432	Open: Drive is not ready Closed: Drive is ready
P2.2.3.2	Run	DigOUT:0.1	DigOUT:E.10	Stand-alone: DigOUT:D.1 Multimaster: DigOUT:0.1	433	Open: Drive is not running Closed: Drive is running
P2.2.3.3	Fault	DigOUT:0.1	DigOUT:E.10	Stand-alone: DigOUT:D.3 Multimaster: DigOUT:0.1	434	Open: Drive is not faulted Closed: Drive is faulted
P2.2.3.4	Fault, Inverted	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	435	Open: Drive is faulted Closed: Drive is not faulted
P2.2.3.5	Warning	DigOUT:0.1	DigOUT:E.10	Stand-alone: DigOUT:D.2 Multimaster: DigOUT:0.1	436	Open: Drive has no warnings active Closed: Drive has active warnings
P2.2.3.6	MContControl	DigOUT:0.1	DigOUT:E.10	DigOUT:B.2	445	Open: Drive commands the main contactor open Closed: Drive commands the main contactor closed Note: This parameter cannot be changed!
P2.2.3.7	DC Supply Ready	DigOUT:0.1	DigOUT:E.10	DigOUT:B.1	440	Open: DC Supply not ready Closed: DC Supply ready
P2.2.3.8	DC Earth Fault	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	441	Open: DC Grounding Ok Closed: DC Grounding Faulted
P2.2.3.9	Ready/WarnBlink	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	442	Open: Drive is not ready Blinking: Drive is ready but has active warning Closed: Drive is ready
P2.2.3.10	Ext Fan Control	DigOUT:0.1	DigOUT:E.10	DigOUT:A.1	443	Open: Drive commands the external fan to stop Closed: Drive commands the external fan to run
P2.2.3.11	FollOpenMCont	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	444	Closed: Drive is a multimaster follower and Grid disconnection is forced
P2.2.3.12	PLimitationActive	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	446	Closed: Selected Power Limit Reference (P2.2.3.13.1) is lower than the trigger level (P2.2.3.13.2)
P2.2.3.13	PowerLimitTooLow	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	449	External Power Limit Reference has been set and the Actual Power Limit value has ramped too low and the inverter has stopped.
P2.2.3.14	Drive Charged	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	450	Closed: Drive is Charged Open: Drive is not Charged

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P2.2.3.15	Drive Ok	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	451	With Solar Application, for the drive to go to the actual “Ready State” it also requires Start Command. This signal will be active even if the Start Command hasn’t been activated, but all the other criterions application can see are fulfilled.
P2.2.3.16	DrvOk/WarnBlink	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	452	Same as “Drive Ok” but if also a warning is activated in the drive, this output will blink at frequency of 2 Hz.

Parameters and descriptions

P2.2.3.1 Ready Signal DO Selection ID432 *“Ready”*

P2.2.3.2 Run Signal DO Selection ID433 *"Run"*

P2.2.3.3 Fault Signal DO Selection ID434 *"Fault"*

P2.2.3.4 “No Fault” Signal DO Selection ID435 *"Fault, Inverted"*

P2.2.3.5 Warning Signal DO Selection ID436 *"Warning"*

P2.2.3.6 Main Contactor Control Signal DO Selection ID445 *"MContControl"*

P2.2.3.7 “DC Supply Ready” Signal DO Selection ID440 *"DC Supply Ready"*

P2.2.3.8 DC Earth Fault Signal DO Selection ID441 *"DC Earth Fault"*

P2.2.3.9 Ready/Warning Blink Signal DO Selection ID442 *"Ready/WarnBlink"*

P2.2.3.10 External Fan Control Signal DO Selection ID443 *"Ext Fan Control"*

P2.2.3.11 Follower’s Main Contactor Open Command Signal DO Selection ID444 *"FollOpenMCont"*

This signal is not used in Solar 8000 cabinet products, but it may be required in certain situations when Solar 8000 module products are used in customer’s own cabinet product. This signal gives “Open Main Contactor” command from multimaster followers, when they have to be disconnected from the grid, due to Grid Code requirement or fault, but the master drive is not wanted to be disconnected.

P2.2.3.12 Power Limitation Active Signal DO Selection ID446 *"PLimitationActiv"*

This signal indicates if selected Power Limit Reference (P2.2.3.13.1) is lower than trigger level (P2.2.3.13.2).

P2.2.3.13 Power Limit Reference Too Low DO Selection ID446 *" PowerLimitTooLow "*

External Power Limit Reference (Panel, Fieldbus, Digital or Analog Input) has been set and the Actual Power Limit value has ramped too low and the inverter has stopped.

P2.2.3.14 Drive Charged Signal DO Selection ID450 *"Drive Charged"*

P2.2.3.15 Drive Ok Signal DO Selection ID451 *"Drive Ok"*

P2.2.3.16 Drive Ok/Warning Blink Signal DO Selection ID452 *" DrvOk/WarnBlink "*

G2.2.3.13 Configuration

Table 26. Digital Output configuration parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.3.13.1	PLimActTrigLevel	0,0	300,0	%	110,0	447	Trigger level for Power Limitation Active Digital Output (P2.2.3.12)
P2.2.3.13.2	PLimActTrigSel	0	2		0	448	Monitored Power Limit Reference: 0 = External Power Limit Reference 1 = Grid Code Power Limit Value 2 = Both

Parameters and descriptions

P2.2.3.13.1 Power Limit Active Signal's Trigger Level ID447 *"PLimActTrigLevel "*

Sets the trigger level when the "Power Limit Active" Digital Output signal closes.

P2.2.3.13.2 Power Limit Level Selection ID448 *"PLimActTrigSel"*

Selects which Power Limit Reference value is used as trigger.

0 = External Power Limit Reference

1 = Grid Code Power Limit Value (signal active also during ramps)

2 = Both

G2.2.4 Analog Outputs

Table 27.Analog Output parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.4.1	AO1 Signal ID	0	2000		0	1233	Set the ID no. of a signal to be connected to AO1. To connect e.g. DC-link voltage to Analog output 1, enter 1839 as parameter value.
P2.2.4.2	AO1 Offset	0	1		0	1234	This parameter defines minimum voltage or current at Analog Output 1. 0 = 0V/0mA, 1 = 4mA
P2.2.4.3	AO1 Filter	0,02	10,00	s	10	1235	Filter time for the signal selected for AO1 in Seconds.
P2.2.4.4	AO1 Max. Value	-30000	30000		1500	1236	Maximum value of a signal selected for AO1. This will correspond to +10V/20mA.
P2.2.4.5	AO1 Min. Value	-30000	30000		0	1237	Minimum value of a signal connected to AO1. This will

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							correspond to 0V/0mA or -10V depending on the type of AO1. 0 = 0V/0mA, 1 = 4mA

Parameters and descriptions

P2.2.4.1 Analog Output 1 Signal ID ID1233 *"AO1 Signal ID"*

Set the ID no. of a signal to be connected to AO1. To connect e.g. DC-link voltage to Analog terminal 1839 as parameter value.

P2.2.4.2 Analog Output 1 Offset ID1234 *"AO1 Offset"*

This parameter defines minimum voltage or current at Analog Output 1.

0 = 0V/0mA,
1 = 4mA

P2.2.4.3 Analog Output 1 Filter s ID1235 *"AO1 Filter"*

Filter time for the signal selected for AO1 in Seconds.

P2.2.4.4 Analog Output 1 Max. Value ID1236 *"AO1 Max. Value"*

Maximum value of a signal selected for AO1. This will correspond to +10V/20mA.

P2.2.4.5 Analog Output 1 Min. Value ID1237 *"AO1 Min. Value"*

Minimum value of a signal connected to AO1. This will correspond to 0V/0mA or -10V depending on the type of AO1.

0 = 0V/0mA,
1 = 4mA

3.3.2.3 G2.3 Inverter Control

Note! This is only visible when correct Service password is set

G2.3.1 General

Table 28 Inverter Control, General parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.1.1	Nom AC Voltage	200	400	V	Varies	1202	Rated Line Voltage
P2.3.1.2	Start Up Delay	0,00	327,67	s	0	1500	Starting delay when run command is given. When programming different delay to paralleled units, the units will start in sequence.
P2.3.1.3	PwrStandbyLevel	-0,1	100,0	%	1,5	1540	The Inverter will stop if power is below this level for a time longer than “PwrStandbyDelay”
P2.3.1.4	PwrStandbyDelay	0,0	32000	s	30	1541	Delay before stopping when power is below “PwrStandbyLevel”
P2.3.1.5	PwrQuickStandby	-0.1	50.0	%	-0,1	1549	Inverter will stop within 3 seconds if power is below this value and go to standby mode. Value should be tuned so that inverter stops e.g. if DC

							breaker is opened.
P2.3.1.6	Standby Interval	1	3600	s	300	1754	How long to wait before trying to start again after the inverter has gone into standby mode. Reasons for standby mode might be a failed test of the photovoltaic field or inverter going into standby because of low power.
P2.3.1.7	DC Drooping	0,00	100,00	%	3	620	There could be some measuring error in the DC voltage if more than one unit. This measuring error could lead to electric power difference between the units in same system. This Dc-link offset problem can be fix by using this parameter.
P2.3.1.8	DC Calibration	-5.00	5.00	%	0,00	1777	Units DC Voltage measuring error correct offset value.
P2.3.1.9	Power Lim Gen	1,0	300,0	%	110,0	1290	Power limit for the generator side operation.
P2.3.1.10	DC Insulation Fault Delay	0,00	320,00	s	60,00	1970	Delay for DC Insulation Fault

Parameters and descriptions

P2.3.1.1 Nominal AC Voltage V ID1202 *"Nom AC Voltage"*

This parameter sets the incoming line voltage for the regenerative Inverter module. Typically this parameter is set to 230/280 in solar application.

P2.3.1.2 Start Up Delay s ID1500 *"Start Up Delay"*

Starting delay after run command. When programming different delay to paralleled units, the units will start in sequence.

P2.3.1.3 Power Standby Level % ID1540 *"PwrStandbyLevel"*

The Inverter will stop if power is below this level for a time longer than “PwrStandbyDelay”

P2.3.1.4 Power Standby Delay s ID1541 *"PwrStandbyDelay"*

Delay before stopping, when power is below “PwrStandbyLevel”

P2.3.1.5 Power Quick Standby % ID154 *"PwrQuickStandby"*

Inverter will stop within the time specified in P2.3.1.6 if power is below this value and go to standby mode. Value should be tuned so that inverter stops e.g. if DC breaker is opened.

Setting this to -0,1 % disables the feature.

P2.3.1.6 Power Quick Standby Delay % ID1560 *"PwrQuickStdbyDel"*

Delay for P2.3.1.5.

P2.3.1.7 Standby Interval s ID1754 *"Standby Interval"*

Time, how long to wait before trying to start again after the inverter has gone into standby mode. Reasons for standby mode might be a failed test of the photovoltaic field or inverter going into standby because of low power.

P2.3.1.8 DC Drooping % ID620 *"DC Drooping"*

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When Inverters are used in array mode, drooping can be used for current balancing. The DC voltage reference drooping is set as % of active current reference. E.g. if drooping is 3.00% and active current is 50% then DC voltage reference is reduced 1,5%. With drooping paralleled units can be balanced by adjusting the DCVoltReference to slightly different values.

P2.3.1.9 DC Calibration % ID1777 *"DC Calibration"*

In Multimaster systems inverters are connected to same DC-busbar. There can be some small errors in the measurements of DC voltage between the inverters and as they are trying to maintain a slightly different DC Voltage because of this error, it will result in the output power not being equally shared between the inverters in the system. With this parameter the DC Voltage can be calibrated to show same values on all inverters.

P2.3.1.10 Power Generator Limit % ID1290 *"Power Lim Gen"*

Power limit for the generator side operation.

P2.3.1.11 DC Insulation Fault Delay s ID1970 *"DCInsFaultDelay"*

Delay for DC Insulation Fault, default 60,00 seconds.

G2.3.2 MPP Tracker

Table 29. MPP Tracker parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.2.1	MinStepSize	0,05	20,00	%	0,60	1810	Minimum step size for the maximum power point tracker. MinStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) is below MinStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.
P2.3.2.2	MaxStepSize	0,05	20,00	%	1,00	1811	Maximum step size for the maximum power point tracker. MaxStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) (step ratio) is above MaxStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.
P2.3.2.3	MinStepRatio	0,05	20,00	dPdU	10,00	1814	Minimum step size for the maximum power point tracker. MinStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) is below MinStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.
P2.3.2.4	MaxStepRatio	0,05	20,00	dPdU	15,00	1813	Maximum step size for the maximum power point tracker. MaxStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) (step ratio) is above MaxStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.3.2.5	Min DC Reference	80,00	300,00	%	109,00	1818	Minimum DC Reference to which the MPP tracker will limit itself and not go below. 109,00% is close to the theoretical minimum value if nominal AC voltage is 230-280V.
P2.3.2.6	Step Time	10	10000	ms	1900	1812	This parameter defines how often the MPP tracker will take a step in any direction. Default varies depending on the inverter size class.
P2.3.2.7	PowerFilterTime	0,00	320,00	s	0,30	1827	The MPP tracker compares the power value before and after a step to see if it has increased or decreased. Hence, if it's going in the right or wrong direction respectively. This parameter adds a low pass filter to the compared signal.
P2.3.2.8	ReferenceWindow	0,8	20,00	%	3,00	1838	In some cases the MPP tracker might not get the requested DC reference. E.g. if the inverter is running at the current limit. In this case it will show up as a deviation between the DC reference and actual. This parameter states the maximum allowed deviation. If bigger, the MPP tracker freezes and forces its value towards the actual value. Should the deviation decrease to the allowed range, then it starts tracking again.
P2.3.2.9	Ramped DC Ref.	0	1		1	1826	This parameter will activate ramping of the DC reference step changes. The reference will be ramped to its new value in half the step time (StepTime/2). This calms the DC link and power output down a little bit if step changes are big. If the inverter is in array configuration it's advised to always enable Ramped DC Ref. The slave inverters will get the reference with a little delay, but if the refs are ramped, the deviation in reference between master and slaves is very small. (If no ramping is used, then the deviation can be MaxStepSize for 10-20ms.)
P2.3.2.10	PowerWindow	0,00	10,00	%	0,10	1828	When the MPP tracker takes a step in any direction. Then the power change has to be bigger than the Power Window for making a decision if the Power has increased or decreased. Otherwise it will take another step in the same direction until the limit is exceeded.
V2.3.2.11	MPP Reference	0,00	320,00	%		1816	The DC reference from the MPP tracker. Shows without ramping if ramping is used.
V2.3.2.12	Actual Step Size	-320,00	320,00	%		1815	This value shows the actual momentary step size of the MPP tracker.
V2.3.2.13	ActualStepRatio	-320,00	320,00	dPdU		1825	This value shows the actual step ratio. Power change divided by actual step size. The value is used for evaluating the size of the next step.

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V2.3.2.14	MPPT State	0	32			1817	State of the MPP tracker. For debugging purpose only.
P2.3.2.15	Actual DC Following Power Limit	0	100	%	70	1755	Fine tuning parameter, used in situations when starting ramp-up is very fast. DC Reference will follow Actual DC level when produced power is over this limit and Actual DC level is not following DC Reference.
P2.3.2.16	Select MPPT	0	1		1	1999	0 = Basic MPPT 1 = Advanced MPPT
P2.3.2.17	DC Reference at Start	50	150	%	80	1595	Percentage of start moments open circuit DC Voltage, which is going to be used as DC Reference at start up.
P2.3.2.18	DCRampT%StepT	0	100	%	33	1829	DC Reference Ramp rate compared to the Step Time P2.3.2.6.

Parameters and descriptions

P2.3.2.1 Minimum Step Size % ID1810 *"MinStepSize"*

Minimum step size for the maximum power point tracker. MinStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) is below MinStepRatio. Scaled linearly between MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.3.2.2 Maximum Step Size % ID1811 *"MaxStepSize"*

Maximum step size for the maximum power point tracker. MaxStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1))(step ratio) is above MaxStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.3.2.3 Minimum Step Ratio dBdU ID1814 *"MinStepRatio"*

Minimum step size for the maximum power point tracker. MinStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) is below MinStepRatio. Scaled linearly between MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.3.2.4 Maximum Step Ratio dBdU ID1813 *"MaxStepRatio"*

Maximum step size for the maximum power point tracker. MaxStepSize is used when (P(k)-P(k-1))/(U(k)-U(k-1)) (step ratio) is above MaxStepRatio. Scaled linearly betwen MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.3.2.5 Min DC Reference % ID1818 *"Min DC Reference"*

Minimum DC Reference to which the MPP tracker will limit itself and not go below. 109,00% is close to the theoretical minimum value if nominal AC voltage is 230-280V.

P2.3.2.6 Step Time ms ID1812 *"Step Time"*

This parameter defines how often the MPP tracker will take a step in any direction.

P2.3.2.7 Power Filter Time s ID1827 *"PowerFilterTime"*

The MPP tracker compares the power value before and after a step to see if it has increased or decreased. Hence, if it's going in the right or wrong direction respectively. This parameter adds a low pass filter to the compared signal.

P2.3.2.8 Reference Window % ID1838 *"ReferenceWindow"*

In some cases the MPP tracker might not get the requested DC reference, e.g. if the inverter is running at the current limit. In this case it will show up as a deviation between the DC reference and actual voltage. This parameter states the maximum allowed deviation. If bigger, the MPP tracker freezes and forces its reference towards the actual value. Should the deviation decrease to the allowed range, then it starts tracking again.

P2.3.2.9 Ramped DC Reference ID1826 *"Ramped DC Ref."*

This parameter will activate ramping of the DC reference step changes. The ramp time is specified by P2.3.2.18 as percentage of Step Time (P2.3.2.6). This calms the DC link and power output down a little bit if step changes are big. If the inverter is in array configuration it's advised to always enable Ramped DC Ref. The slave inverters will get the reference with a little delay, but if the refs are ramped, the deviation in reference between master and slaves is very small. (If no ramping is used, then the deviation can be MaxStepSize for 10-20ms.)

P2.3.2.10 Power Window % ID1828 *"PowerWindow"*

When the MPP tracker takes a step in any direction, the power change has to be bigger than the Power Window for making a decision if the Power has increased or decreased. Otherwise it will take another step in the same direction until the limit is exceeded.

V2.3.2.11 MPP Reference % ID1816 *"MPP Reference"*

The DC reference of the MPP tracker.

V2.3.2.12 Actual Step Size % ID1815 *"Actual Step Size"*

This value shows the actual momentary step size of the MPP tracker.

V2.3.2.13 Actual Step Ratio dBdU ID1825 *"ActualStepRatio"*

This value shows the actual step ratio. Power change divided by actual step size. The value is used for evaluating the size of the next step.

V2.3.2.14 MPPT State ID1817 *"MPPT State"*

State of the MPP tracker. For debugging purpose only.

P2.3.2.15 Actual DC Following Power Limit % ID1755 *" DCFollPLimit "*

Fine tuning parameter, used in situations when starting ramp-up is very fast. DC Reference will follow Actual DC level when produced power is over this limit and Actual DC level is not following DC Reference.

P2.3.2.16 Select MPPT ID1999 *"Select MPPT"*

Select which MPPT function is in use, Basic or Advanced.

P2.3.2.17 DC Reference at Start ID1595 *"DC Ref At Start"*

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Percentage of current DC Voltage, that is going to be used as DC Reference at start up.

P2.3.2.18 DC Reference Ramp Time as % of Step Time ID1829 *"DCRampT%StepT"*

DC Reference Ramp rate compared to the Step Time P2.3.2.6. When the DC Reference is changed that naturally changes the voltage of the capacitors and depending if the voltage is lowered or raised the output of the capacitors cause momentarily either raise or fall of output power. The DC Reference Ramp is used to make that disturbance smaller.

NOTE: Basic MPPT makes only 2 power measurements, before DC Reference change and after the Step Time has elapsed, so the output power needs to be stabilized at the end of the Step Time period. Advanced MPPT makes also a power measurement at half point of Step Time period, so power output has to be stabilized before Step Time / 2 time period has elapsed, otherwise the MPPT will not work properly.

G2.3.3 Power Factor

Table 30.Power factor parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.3.1	Capacitor Size	0,0	100,0	%	5,0	1460	Regen filter capacitor size in ###.# %
P2.3.3.2	Inductor Size	0,0	100,0	%	10,0	1461	Regen total filter inductance in ###.# %
P2.3.3.3	Reactive CurrRef	-100,0	100,0	%	0,0	1459	Regenerative reactive current reference 100,0 = nominal current. Positive = Inductive Negative = Capacitive.

Parameters and description

P2.3.3.1 Capacitor Size % ID1460 *"Capacitor Size"*

Regen filter capacitor size in ###.# %. This is needed for compensation at LCL filters values.

P2.3.3.2 Inductor Size % ID1461 *"Inductor Size"*

Regen total filter inductance in ###.# % This is needed for compensation at LCL filters values.

P2.3.3.3 Reactive Current Reference % ID1459 *"Reactive CurrRef"*

This parameter sets the reference for the reactive current in % of the nominal current. This can be used for power factor correction of Inverter system or reactive power compensation. Positive value gives inductive compensation whereas negative value gives capacitive compensation.

Regenerative reactive current reference 100,0 = nominal current.

Positive = Inductive
Negative = Capacitive

G2.3.4 Bypass Control

Table 31.Bypass Control parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.4.1	Manual DC	0	1		0	1808	0 = Disable 1 = Enable
P2.3.4.2	Manual DC Reference	0,00	320.00	%	150,00	1809	Reference for manual DC control
P2.3.4.3	PC Control Mode	0	3		1	1807	0 = Disable 1 = Start 2 = Reference 3 = Start/Ref

Parameters and descriptions

P2.3.4.1 Manual DC ID1808 *"Manual DC"*

This parameter disables the Maximum Power Point Tracker and the drive uses a manual DC Reference given in P2.3.4.2

0 = Disable
1 = Enable

P2.3.4.2 Manual DC Reference % ID1809 *"Manual DC Reference"*

If MPP Tracker is disabled then you must set DC Voltage reference in percentage to the drive.

$$\frac{V_{DC\ Ref}}{V_{AC} \times 1{,}35} = DC_{Ref\%}$$

P2.3.4.3 PC Control Mode ID1807 *"PC Control Mode"*

With PC control mode can choose is the possible run Units with the NCDrive program.

0 = Disable
1 = Can Start/Stop unit with NCDrive
2 = Can set Reference to unit with NCDrive
3 = Can Start/Stop and set Reference

G2.3.5 Q Error Compensation

Note! This is only visible when correct Service password is set

Note! Reactive Current Compensation is optimized at the moment for only 30, 50, 80 and 100 kW units! The compensations can be enabled regardless of the power size but for the other power sizes the parameters need to be found in controlled artificial grid.

Table 32. Reactive Current Error Compensation Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.5.1	LCL Compensation	0	1		0	1583	Disables or Enables Reactive Current injection LCL error compensation
P2.3.5.2	Voltage Compensation	0	1		0	1584	Disables or Enables Reactive Current injection Voltage error compensation

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P2.3.5.3	LCL Multiplier	0,000	1,000			1594	LCL Compensation Multiplier Default value depends on power size
P2.3.5.4	Voltage Compensation Multiplier	-10000	10000			1586	Voltage Compensation Multiplier Default value depends on power size
P2.3.5.5	Voltage Compensation Offset	-32768	32767			1587	Voltage Compensation Offset Default value depends on power size

Parameters and description

P2.3.5.1 LCL Compensation ID1583

Enables the compensation algorithm which negates the error in Reactive Current Injection at nominal voltage.

P2.3.5.2 Voltage Compensation ID1584

Enables the compensation algorithm which negates the error in Reactive Current Injection at nominal voltage. Optimal functionality requires LCL Compensation also.

P2.3.5.3 LCL Multiplier ID1594

This is the multiplier that LCL Compensation uses. The default value depends on the power size. Use this parameter to fine tune the behaviour.

P2.3.5.4 Voltage Compensation Multiplier ID1586

This is the multiplier that Voltage Compensation uses. The default value depends on the power size. Use this parameter to fine tune the behaviour.

P2.3.5.5 Voltage Compensation Offset ID1587

This is the offset that Voltage Compensation uses. The default value depends on the power size. Use this parameter to fine tune the behaviour.

G2.3.6 Power Factor Error Compensation

NOTE! Power Factor Compensation is optimized at the moment only for 30, 50, 80 and 100 kW units! The compensations can be enabled regardless of the power size but for the other power sizes the parameters need to be found in controlled artificial grid.

Table 33.Power Factor Compensation Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.6.1	Power Factor Compensation	0	1		0	1589	Disables or Enables Power Factor Compensation
P2.3.6.2	Positive side Power Factor Compensation Multiplier	-10000	10000			1590	Positive Power Factor Compensation Multiplier Default value depends on power size
P2.3.6.3	Negative side Power Factor Compensation Multiplier	-10000	10000			1591	Negative Power Factor Compensation Multiplier Default value depends on power size
P2.3.6.4	Positive side Power Factor Compensation Offset	-10000	10000			1592	Positive Power Factor Compensation Offset Default value depends on power size
P2.3.6.5	Negative side	-10000	10000			1593	Negative Power Factor

	Power Factor Compensation Offset						Compensation Offset Default value depends on power size

Parameters and description

P2.3.5.1 Power Factor Compensation ID1589

Enables the compensation algorithm which negates the error in Power Factor Reference.

P2.3.5.2 Positive side Power Factor Compensation Multiplier ID1590

This is the multiplier that Power Factor Compensation uses on the positive side. The default value depends on the power size. Use this parameter to fine tune the behaviour.

P2.3.5.3 Negative side Power Factor Compensation Multiplier ID1591

This is the multiplier that Power Factor Compensation uses on the negative side. The default value depends on the power size. Use this parameter to fine tune the behaviour.

P2.3.5.4 Positive side Power Factor Compensation Offset ID1592

This is the offset that Power Factor Compensation uses on the positive side. The default value depends on the power size. Use this parameter to fine tune the behaviour.

P2.3.5.5 Negative side Power Factor Compensation Offset ID1593

This is the offset that Power Factor Compensation uses on the positive side. The default value depends on the power size. Use this parameter to fine tune the behaviour.

3.3.2.4 G2.4 Protections

Note! This is only visible when correct Service password is set

G2.4.1 General

Table 34.Protections, General parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.1.1	External Trip	0	2		2	701	This parameter defines a response to external trip. If the inverter monitors the state of external trip input and a fault occurs the inverter can be set to respond to the fault. 0 = No response 1 = Warning 2 = Fault
P2.4.1.2	Input Ph. Superv	0	2		2	1518	The input phase supervision

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							ensures that the input phases of the Inverter have an approximately equal current. 0 = No response 1 = Warning 2 = Fault
P2.4.1.3	InputFilter Temp	0	2		2	1505	This parameter defines a response to Input filter over temperature fault. The fault is monitored through digital input . 0 = No response 1 = Warning 2 = Fault
P2.4.1.4	UserTempWarnLimit	40	100	°C	78	1853	Limit for giving the temperature rising warning.
P2.4.1.5	DCSwitchNOKDelay	0,00	100,00	s	0,20	1971	Delay for dropping DC Switch digital input signal to FALSE.
P2.4.1.6	StartNOKDelay	0,00	100,00	s	0,20	1973	Delay for dropping Start Ok digital input signal to FALSE.

Parameters and descriptions

P2.4.1.1 External Trip ID701 *"External Trip"*

This parameter defines a response to external trip. If the inverter monitors the state of external trip input and a fault occurs the inverter can be set to respond to the fault.

0 = No response
1 = Warning
2 = Fault

P2.4.1.2 Input Phase Supervisor ID1518 *"Input Ph. Superv"*

The input phase supervision ensures that the input phases of the Inverter have an approximately equal current.

0 = No response
1 = Warning
2 = Fault

P2.4.1.3 Input Filter Temp ID1505 *"InputFilter Temp"*

This parameter defines a response to Input filter over temperature fault. The fault is monitored through digital input.

0 = No response
1 = Warning
2 = Fault

P2.4.1.4 UserTempWarnLimit ID1853

Limit for giving the temperature rising warning

P2.4.1.5 DCSwitchNOKDelay ID1603

Delay for dropping DC Switch digital input signal to FALSE.

P2.4.1.6 StartNOKDelay ID1602

Delay for dropping Start Ok digital input signal to FALSE.

G2.4.2 DC Earth Fault

Table 35.DC Earth Fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.2.1	DCGround Source	0	2		2	1801	Analog input source to take the DC Earth Fault measurement from. 0 = Not Used 1 = Analog Input 2 = Digital Input
P2.4.2.2	DCGroundFaultLev	0,00	100,00	%	13,00	1715	Fault level of analog input.
P2.4.2.3	DCGoundWarnLevel	0,00	100,00	%	8,00	1716	Warning level of analog input.
P2.4.2.4	DCGroundHysteres	0,00	2,00	%	0,00	1714	Hysteresis for warning and fault levels.
P2.4.2.5	DCGround Delay	0,00	100,00	s	3,00	1782	Delay for warning and fault.
P2.4.2.6	DCGroundRstDelay	1	3600	s	180	1750	Reset delay of fault, if fault conditions no longer active.

Parameters and descriptions

P2.4.2.1 DC Ground Source ID1801 *"DCGround Source"*

Used to select the input method for DC Ground Fault.

P2.4.2.2 DC Ground Fault Level % ID1715 *"DCGroundFaultLev"*

Fault level of analog input.

P2.4.2.3 DC Ground Warning Level % ID1716 *"DCGoundWarnLevel"*

Warning level of analog input.

P2.4.2.4 DC Ground Hysteresis % ID1714 *"DCGroundHysteres"*

Hysteresis for warning and fault levels.

P2.4.2.5 DC Ground Delay s ID1782 *"DCGround Delay"*

Delay for warning and fault.

P2.4.2.6 DC Ground Reset Delay s ID1750 *"DCGroundRstDelay"*

Reset delay of fault, if fault conditions no longer active.

G2.4.3 AC Earth Fault

Table 36.AC Earth Fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.3.1	Earth fault	0	1		1	1332	Action in case of Earth Fault. 0 = No response 1 = Fault
P2.4.3.2	Earth Fault Curr	0,0	100,0	%	50,0	1333	Max level of Earth current in % of unit current.

Parameters and descriptions

P2.4.3.1 Earth fault ID1332 *"Earth fault"*

Action in case of Earth Fault.

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0 = No response
1= Fault

P2.4.3.2 Earth Fault Current % ID1333 *"Earth Fault Curr"*

Max level of Earth current in % of unit current.

G2.4.4 Main Contactor

Table 37.Main Contactor parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.4.1	MCont FaultDelay	0,00	10,00	s	0,50	1521	Delay for Main contactor fault. Delay between main contactor control relay close/open command and main contactor acknowledge signal. If acknowledge signal is not received within this time, then fault 64 is trigged.
P2.4.4.2	Start Delay	0,00	10,00	s	0,40	1519	Main contactor ON delay. Delay from Main contactor acknowledge to modulation start.

Parameters and descriptions

P2.4.4.1 Main Contactor Fault Delay s ID1521 *"MCont FaultDelay"*

Delay for Main contactor fault. Delay between main contactor control relay close/open command and main contactor acknowledge signal. If acknowledge signal is not received within this time, then fault 64 is trigged.

P2.4.4.2 Start Delay s ID1519 *"Start Delay"*

Main contactor ON delay. Delay from Main contactor acknowledge to modulation start.

G2.4.5 Control panel

Table 38. Control panel parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.5.1	HeartbeatTimeout	0,00	320,00	s	10,00	1840	The inverter should receive a heartbeat signal from the external control panel once every second. If the signals are not received and inverter is controlled by external panel, then the inverter will trip after the set delay with this parameter.
P2.4.5.2	TimeoutRstDelay	0	32000	s	30	1841	The heartbeat timeout fault will be reset automatically after this time if the heartbeat signal re-appears.

Parameters and descriptions

P2.4.5.1 Heartbeat Timeout s ID1840 *"HeartbeatTimeout"*

The inverter should receive a heartbeat signal from the external control panel once every second. If the signals are not received and inverter is controlled by external panel, then the inverter will trip after the set delay with this parameter.

P2.4.5.2 Timeout Reset Delay s ID1841 *"TimeoutRstDelay"*

The heartbeat timeout fault will be reset automatically after this time if the heartbeat signal re-appears.

G2.4.6 System bus

Table 39.System bus fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.6.1	HeartbtFltDelay	0,00	10,00	s	3,00	1600	If a slave does not receive a heartbeat signal from the master, it will lock to its current DC reference and trip after this delay.
P2.4.6.2	CommFaultDelay	0,00	10,00	s	3,00	1601	Trip delay from communication problems with systembus option board.

Parameters and descriptions

P2.4.6.1 Heartbeat Filter Delay s ID1600 *"HeartbtFltDelay"*

If a slave does not receive a heartbeat signal from the master, it will lock to its current DC reference and trip after this delay.

P2.4.6.2 Communication Fault Delay s ID1601 *"CommFaultDelay"*

Trip delay from communication problems with systembus option board.

G2.4.7 Auto reset

Table 40.Automatic reset parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.7.1	Wait Time	0,10	10,00	s		717	This parameter defines the time to wait after a fault trigger has disappeared. When the time has elapsed, the Inverter tries to automatically restart modulation.
P2.4.7.2	Trial Time	0,00	60,00	s		718	If the fault trigger appears more often than defined by parameters P2.4.7.3 to P2.4.7.7 inside the trial time
P2.4.7.3	Overvolt. Tries	0	10		10	721	This parameter determines how many automatic restarts can be

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							made during the trial time set by parameter P2.4.7.2. after an overvoltage trip. 0 = No automatic restart after overvoltage fault trip. >0 = Number of automatic restarts after overvoltage fault trip. The fault is reset and the inverter is started automatically after the DC-link voltage has returned to the normal level.
P2.4.7.4	Overcurr. Tries	0	3		3	722	NOTE! IGBT temp fault also included. This parameter determines how many automatics restarts can be made during the trial time set by P2.4.7.2. 0 = No automatic restart after overcurrent fault trip >0 = Number of automatic restarts after overcurrent trip and IGBT temperature faults.
P2.4.7.5	Ext.Trip Tries	0	10		0	725	This parameter determines how many automatics restarts can be made during the trial time set by P2.4.7.2. 0 = No automatic restart after External fault trip >0 = Number of automatic restarts after External trip.
P2.4.7.6	Input Ph. Tries	0	10		10	726	This parameter determines how many automatics restarts can be made during the time set by P2.4.7.2.

Parameters and descriptions

P2.4.7.1 Automatic reset Wait Time s ID717 *"Wait Time"*

This parameter defines the time to wait after a fault trigger has disappeared. When the time has elapsed, the Inverter tries to automatically restart modulation.

P2.4.7.2 Automatic reset Trial Time s ID718 *"Trial Time"*

If the fault trigger appears more often than defined by parameters P2.4.7.3 to P2.4.7.7 inside the trial time

P2.4.7.3 Over voltage Autoreset tries ID721 *"Overvolt. Tries"*

This parameter determines how many automatic restarts can be made during the trial time set by parameter P2.4.7.2. "Trial Time" After an over voltage trip.

0 = No automatic restart after overvoltage fault trip.
>0 = Number of automatic restarts after overvoltage fault trip. The fault is reset and the inverter is started automatically after the DC-link voltage has returned to the normal level.

P2.4.7.4 Over current Autoreset tries ID722 *"Overcurr. Tries"*

NOTE! IGBT temp fault also included. This parameter determines how many automatics restarts can be made during the trial time set by P2.4.7.2. "Trial Time"

0 = No automatic restart after over current fault trip
>0 = Number of automatic restarts after over current trip and IGBT temperature faults.

P2.4.7.5 External Trip Autoreset tries ID725 *"Ext.Trip Tries"*

This parameter determines how many automatics restarts can be made during the trial time set by P2.4.7.2. "Trial Time"

0 = No automatic restart after External fault trip
>0 = Number of automatic restarts after External trip.

P2.4.7.6 Input Phase Autoreset Tries ID726 *"Input Ph. Tries"*

This parameter determines how many automatics restarts can be made during the time set by P2.4.7.2. "Trial Time"

3.3.2.5 G2.5 System test

Note! This is only visible when correct Service password is given

G2.4.8 Analog Inputs

Table 41. Analog Input Supervision Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.8.1	AnInputFaultMode	0	2	-	1		Analog Input Fault Mode: 0 = No Action 1 = Warning 2 = Fault
P2.4.8.2	AnInFaultDelay	0,00	10,00	s	1,00		The Analog Input fault will be triggered after this delay when faulty operation has been detected.

Parameters and descriptions

P2.4.8.1 Response for Analog Input Malfunction
IDxxxx *"AnInputFaultMode"*

How the inverter responses to Analog Input malfunction:

0 = No Action
1 = Warning
2 = Fault

P2.4.5.2 Reaction Time for Analog Input Malfunction
s IDxxxx *"AnInFaultDelay"*

If P2.4.8.1 is set to “Warning” or “Fault”, this parameter sets the response time.

G2.5.1 Power simulation

There is possibly to put the application in a power unit simulation mode. This mode is meant for testing the inverter without actually starting the power unit, hence generating any real power. This feature is useful during the commissioning phase and gives the possibility to test application logic, I/Os and fieldbus communication.

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Table 42.System test Power simulation parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.1.1	Simulation Mode	0	2		0	1720	0 = Disable 1 = Enable 2 =SimModSimDC
P2.5.1.2	BreakDownPoint	0,00	320,00	V		1721	
P2.5.1.3	BreakDownPower	0,0	3200,0	%		1722	
P2.5.1.4	BreakDownRatio	0,00	320,00	%		1723	
V2.5.1.5	Optimal DC Point	0,00	320,00	V		1724	
P2.5.1.6	Simulation DC	400	900	V	550	1577	Simulation without DC works with this Value

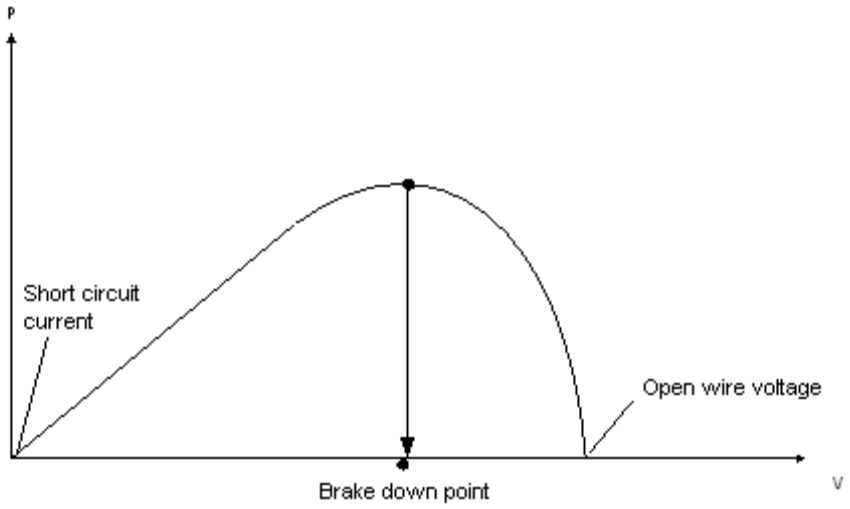
Parameters and descriptions

P2.5.1.1 Simulation Mode ID1720 *"Simulation Mode"*

0 = Simulation Mode Disabled *"Disable"*
1 = Simulation Mode with Real DC Voltage *"Enable"*
2 = Simulation Mode with Simulated DC Voltage (P2.5.1.6)*"SimModSimDC"*

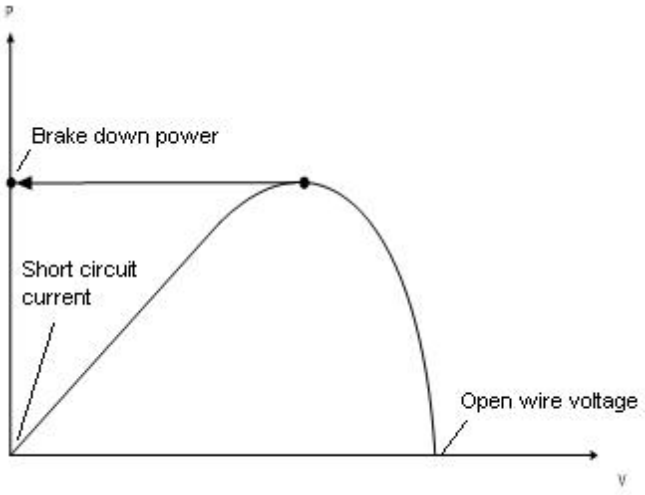
P2.5.1.2 Break Down Point V ID1721 *"BreakDownPoint"*

This parameter defines brake down point voltage.



Picture 11. Brake down point

P2.5.1.3 Break Down Power % ID1722 *"BreakDownPower"*



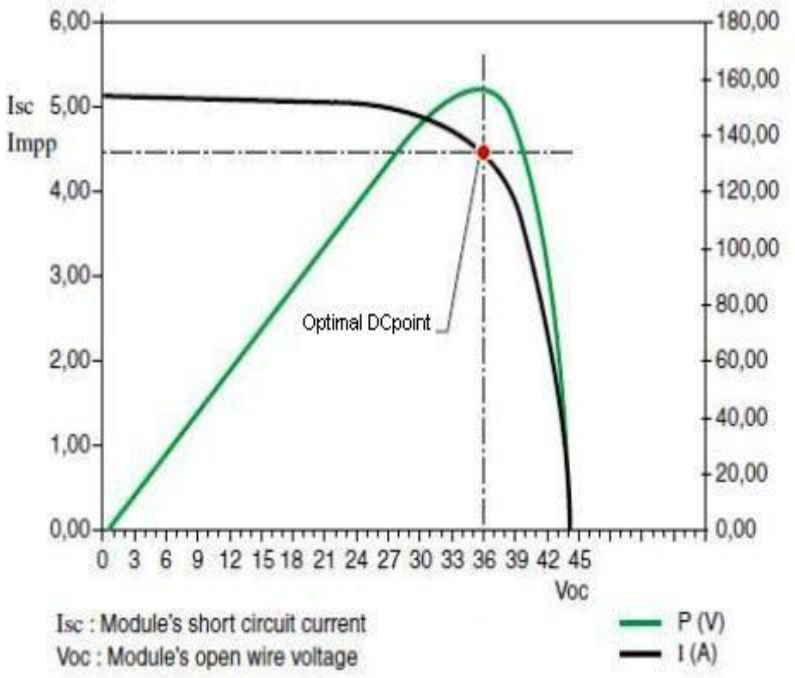
Picture 12. Brake down power

P2.5.1.4 Break Down Ratio % ID1723 *"BreakDownRatio"*

This parameter defines brake down ratio.

V2.5.1.5 Optimal DC Point V ID1724 *"Optimal DC Point"*

Optimal DC Point is the DC Reference point which giving the best power



Picture 13. Optimal DC point

P2.5.1.6 Simulation DC V ID1577 *"Simulation DC"*

There is possibly to give simulation DC-link value to the system without connection to power unit by using this feature.

G2.5.2 System bus

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Table 43.System test, System bus parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.2.1	SystemBus Test	0	1		0	1780	Parameter for testing if system bus configuration is ok. 0 = Disable 1 = Enable

Parameters and descriptions

P2.5.2.1 SystemBus Test ID1780 *"SystemBus Test"*

Parameter for testing if system bus configuration is ok.

0 = Disable
1 = Enable

3.3.2.6 G2.6 Energy counter

Note! This is only visible when correct Service password is set

G2.6.1 Current Scaling

Table 44.Energy counter, Current Scaling parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.6.1.1	Transformer	0	4		0	1855	Parameter for scaling the output current to show the current coming out of the cabinet.(Only for monitoring purpose.) This also changenominal voltage value at grid code functionality. 0= External 1= Internal 230V/400V 2= Internal 230V/415V 3= Internal 230V/440V 4= Internal 230V/460V

Parameters and descriptions

P2.6.1.1 Transformer ID1855 *"Transformer"*

Parameter for scaling the output current to show the current coming out of the cabinet. (Only for monitoring purpose.) If e.g. a 230/400V transformer is used inside the cabinet we need to scale the current, whereas if only an external 280V to mid voltage net is used we do nothing. This also change nominal voltage value at grid code functionality.

0= External
1= Internal 230V/400V
2= Internal 230V/415V
3= Internal 230V/440V
4= Internal 230V/460V

3.3.2.7 G2.7 Counters

Counters are internal values, these needs to be saved to the parameter file when software is updated. After software update you can return these values back to counter values.

Note! This is only visible when correct Service password is set

Table 45.Countes parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.1	LoadSaveCountVal	0	2		0	1861	Counters Values Load or Save Functionality 0 = Idle Do nothing 1 = Load Values; Load inverter counters values to parameters P2.7.2-5 2 = Save Values; Save parameters P2.7.2-5 values to the inverter counters values..
P2.7.2	TotalEnergyPrese	0,0	429496729,5	kWh	0	1858	Value to save to Total Energy counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.7.3	GridConnPreset	0	4294967295		0	1730	Value to load into GridConnection counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.7.4	TotalRuntimPrese	0	65535	h	0	1859	Value to load into Runtime total counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.7.5	IntFanRuntPresVa	0	65535	h	0	1894	Value to load into Internal Fan Runtime counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.7.6	ExtFanRuntPresVa	0	65535	h	0	1896	Value to load into External Fan Runtime total counter when "LoadSaveCountVal" parameter is set to 2/Save.

Parameters and descriptions

P2.7.1 Load or Save Counters Value ID1861 *"LoadSaveCountVal"*

Counters Values Load or Save Functionaly:

0 = Idle "Do nothing"

1 = Load Values; Counter current values to parameters P2.7.2-5

2 = Save Values; Save values in parameters P2.7.2-5 as the inverter's counters values.

P2.7.2 Total Energy Preset value kWh ID1858 *"TotalEnergyPrese"*

Value to save to Total Energy (V1.2) counter when "LoadSaveCountVal" parameter save is activated.

P2.7.3 Grid Connection Preset value pcs ID1730 *"GridConnPreset"*

Value to save to Grid Connection (V1.14) counter when "LoadSaveCountVal" parameter save is activated

P2.7.4 Total Runtime Preset value h ID1859 *"TotalRuntimPrese"*

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Value to save to Runtime total (V1.11) counter when "LoadSaveCountVal" parameter save is activated

P2.7.5 Internal Fan Runtime Preset Value h ID1894 *"IntFanRuntPresVa"*

Value to save to Internal Fan Runtime (Internal) counter when" LoadSaveCountVal " parameter save is activated

P2.7.6 External Fan Runtime Preset Value h ID1896 *"ExtFanRuntPresVa"*

Value to save to External Fan Runtime (Internal) total counter when "LoadSaveCountVal " parameter save is activated

3.3.2.8 G2.8 Grid Codes

Note! This is only visible when correct Service password is set

Table 46.Grid Codes parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P 2.8.1	LineFrequency	0,00	100,00	Hz	50,00	1913	Line Nominal Frequency If FreqScale=100 then 5000 equals 50.00 Hz
P 2.8.2	Gridcode option	0	65535		0	1915	See bitwise descriptions in Table 47.
P 2.8.3	LineVoltageHHigh	100,00	135,00	%	0,00	1916	Medium Voltage High High Limit [%] of Line Nominal Voltage
P 2.8.4	LineVoltageHigh	100,00	135,00	%	0,00	1917	Medium Voltage High Limit [%] of Line Nominal Voltage
P 2.8.5	LineVHighT	0	10000	ms	0	1948	If zero time is internally set correctly
P 2.8.6	LineVoltageLow	0	100,00	%	0,00	1918	Medium Voltage Low Limit [%] of Line Nominal Voltage
P 2.8.7	LineVLowT	0	10000	ms	0	1949	When time based voltage drop trip function is used this function is bypassed.
P 2.8.8	LineVoltageLowLow	0,00	100,00	%	0	1919	Medium Voltage Low Low Limit [%]of Line Nominal Voltage
P 2.8.9	LineFreqHighHigh	0,00	105,00	%	0,00	1920	Medium Voltage Frequency High Limit [%]of Line Nominal Frequency
P 2.8.10	LineFreqHigh	0,00	105,00	%	0,00	1921	Medium Voltage Frequency High Limit [%]of Line Nominal Frequency [InverterNomFrequency]
P 2.8.11	LineFHightT	0,000	1200,000	s	0,000	1944	If zero time is internally set correctly
P 2.8.12	LineFreqLow	0,00	100,00	%	0	1922	Medium Voltage Frequency Low Limit [%]of Line Nominal Frequency
P 2.8.13	LineFLowtT	0,000	1200,000	ms	0,000	1946	If zero time is internally set correctly
P 2.8.14	LineFreqLowLow	0,00	100,00	%	0,00	1923	Medium Voltage Frequency Low Low Limit [%]of Line Nominal Frequency
P 2.8.15	MaxTimeMaxVolt	0	32000	ms	1400	1924	Medium voltage time based trip function maximum time at maximum voltage
P 2.8.16	MaxVoltMaxTime	0,00	100,00	%	80,00	1925	Medium voltage time based trip function maximum voltage at maximum time
P 2.8.17	MidTimeMidVolt	0	32000	ms	1000	1927	Medium voltage time based trip function. Time to tripping when voltage is at "MedTVMidle". Format [ms].
P 2.8.18	MidVoltMidTime	0,00	100,00	%	40,00	1926	Medium voltage time based trip function middle voltage at

							middle time
P 2.8.19	MinTimeMinVolt	0	32000	ms	149	1928	Medium voltage time based trip function minimum time at minimum voltage.
P 2.8.20	MinVoltMinTime	0,00	100,00	%	0,00	1929	Medium voltage time based trip function. Voltage Level for P2.8.19.
P 2.8.21	RCHVC	0,00	320,00	%	0,00	1930	Defines voltage level where reactive current injection is started, set to zero and internally 90 % is used
P 2.8.22	RCRF	0,00	3200,0	%	0,00	1931	Reactive current reference at low voltage corner, set to zero and internally predetermine value for selected standard is used.
P 2.8.23	RCLVC	0,00	320,00	%	0,00	1932	Defines voltage level where 100 % current is injection to the grid, set to zero and internally 50 % is used.
P 2.8.24	RCHVC_BI	0,00	320,00	%	0,00	1933	Defines voltage level where reactive current injection is started on bi phase fault situation, set to zero and internally predetermine value for selected standard is used.
P 2.8.25	RCRF_BI	0,00	320,00	%	0,00	1960	Reactive current reference at low voltage corner on bi phase fault situation. Set to zero and internally predetermine value for selected standard is used..
P 2.8.26	RCLVC_BI	0,00	320,00	%	0,00	1935	Defines voltage level where 100 % current is injection to the grid on bi phase fault situation, set to zero and internally predetermine value for selected standard is used.
P 2.8.27	D7PhaseShift	-180,0	180,0	Deg	0,0	1936	When D7 measurement is behind a transformer and there is a phase shit in voltage angle value can be entered here. Format 0,0 dec.
P 2.8.28	D7FeedBackGain	0,00	200,00	%	0,00	1937	Gain for D7 feedback controller. If value is set to zero grid code will use 70,00 %.
P 2.8.29	LineFFilt	0,00	100,00	s	0,00	1939	Filtering time for frequency for reconnection function for German Medium voltage 2 second time was used on certification process.
P 2.8.30	LineFOffset	-320,00	320,00	Hz	0,00	1940	Offset for frequency for reconnection for German medium voltage.
P 2.8.31	LineVFilt	0,00	100,00	s	0,00	1941	Filtering time for voltage for reconnection function for German Medium voltage 2 second time was used on certification process.
P 2.8.32	LineVOffset	-4000	4000	V	0	1942	Offset for voltage for reconnection for German medium voltage.
P 2.8.33	CosPhiLockOutVolt	0,00	100,00	%	0,00	1951	Limit for disabling the automatic cosine phi control
P 2.8.34	CosPhiLockInVolt	0,00	110,00	%	0,00	1952	Limit for activating the automatic cosine phi control
P 2.8.35	RCOV VC	0,00	130,00	%	0,00	1953	Reactive Current Over Voltage Voltage Corner
P 2.8.36	RCOV Ref	0,0	120,0	%	0,00	1954	Reactive Current Over Voltage Voltage Reference
P 2.8.37	RCOV Slope	0,00	50,00	%/%	0,00	1955	Reactive Current Over Voltage Slope

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P 2.8.38	RCOV VCH	0,00	130,00	%	0,00	1956	Reactive Current Over Voltage Voltage Corner High
P 2.8.39	LockOutUnderV	0,00	100,00	%	0,00	1957	Voltage limit for disabling the reactive current injection in undervoltage situation
P 2.8.40	LockOutOverV	0,00	150,00	%	0,00	1958	Voltage limit for disabling the reactive current injection in overvoltage situation
P 2.8.41	CosPhiiRefCorr	0,000	1,000	%	0,000	1959	Correction for Cosine Phi Reference
P 2.8.42	HFPL MaxFreq	0,00	100,00	%	0,00	1961	High Frequency Power Limit Maximum Freq: Frequency where the power is 0% in high frequency situation
P 2.8.43	ReconnectionTme	0	6 000 000	ms	0	1975	Used in GB/T 19964-2012 to specify reconnection time to be used after the Grid voltage & frequency have returned to the nominal range.
P 2.8.44	ReConnRampRate	0,00	320,00	%/s	0,00	1976	Used in GB/T 19964-2012 to specify power up ramp rate to be used during a reconnection after the Grid voltage & frequency have returned to the nominal range.
P 2.8.45	InterconnSelect	0	4		0	1978	Only used with NERC PRC-024-1 Grid Code standard to specify which interconnection is in use.
P 2.8.46	MPPT FRT Pause	0	1		1	1972	Pause the MPPT functionality in Fault Ride Through Situation
P 2.8.47	GridCode Mode	0	1		1	1575	GridCode functionally Disable/ Enable

Parameters and descriptions

General

P 2.8.1 LineFrequency Hz ID1913 *"LineFrequency"*

Line Nominal Frequency If FreqScale=100 then 5000 equals 50.00 Hz

P 2.8.2 Gridcode option ID1915 *"Gridcode option"*

This parameter contains a collection of Grid Code related option bits. These bits control different aspects of the Grid Code functionality and most of these bits are Grid Code Standard specific. You can see the bitwise descriptions in Table 47.

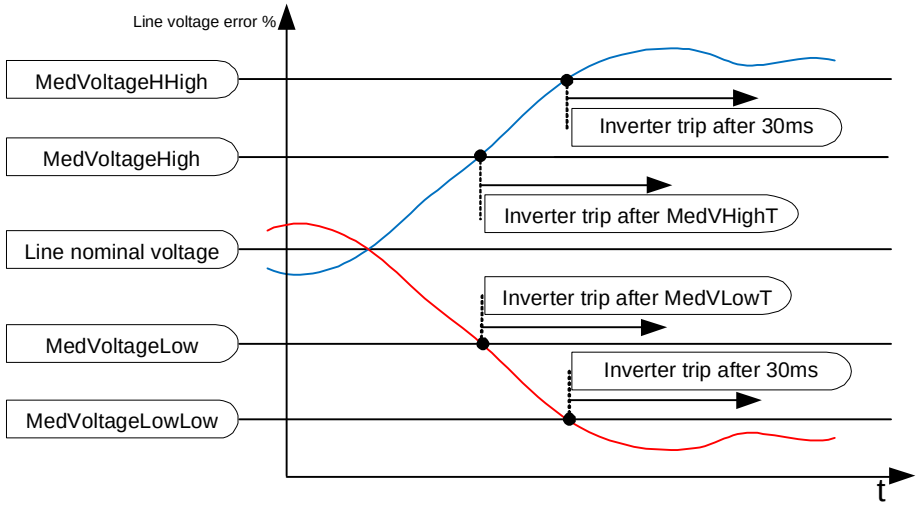
Table 47. Grid Code option bits

Bit	Description			
	IEEE 1547	NERC PRC-024-1	FERC 661A	NT30
0	Reserved	Reserved	Reserved	Reserved
1	Enable Time Based Trip function	Disable Time Based Trip function	Disable Time Based Trip function	Disable Time Based Trip function
2	Reserved	Reserved	Reserved	Disable unsymmetrical current injection
3	Enable Reactive Current Injection	Enable Reactive Current Injection	Enable Reactive Current Injection	Disable Reactive Current Injection
4	Enable CosPhi Control	Enable CosPhi Control	Enable CosPhi Control	Enable CosPhi Control
5	Reserved	Reserved	Reserved	Reserved
6	Reserved	Reserved	Reserved	Reserved
7	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization
8	Reserved	Enable Power Limitation in High Frequency Situation	Enable Power Limitation in High Frequency Situation	Disable RMS Positive Sequence Voltage measurement usage
9	Reserved	Reserved	Reserved	Reserved
10	Enable Anti-islanding	Enable Anti-islanding	Enable Anti-islanding	Disable application level Reactive Current control

11	Reserved	Reserved	Reserved	Enable Anti-islanding
12	Reserved	Reserved	Reserved	Disable RMS Positive Sequence Voltage measurement usage in bi-phase faults
13	Reserved	Reserved	Reserved	Reserved
14	Reserved	Reserved	Reserved	Reserved
15	Reserved	Reserved	Reserved	Reserved

Bit	Description			
	G59	CEI 0-21	VDE AR-N-4105	Other
0	Reserved	Reserved	Reserved	Reserved
1	Use time based trip functions	Use time based trip functions	Use time based trip functions	Disable Time Based Trip function (only Medium Voltage)
2	Reserved	Reserved	Reserved	Disable unsymmetrical current injection
3	Reserved	Reserved	Reserved	Disable Reactive Current Injection (only Medium Voltage)
4	Enable CosPhi Control	Enable CosPhi Control	Enable CosPhi Control	Reserved
5	Reserved	Reserved	Reserved	Reserved
6	Reserved	Reserved	Reserved	Reserved
7	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization	Disable D7 assisted grid synchronization
8	Enable Power Limitation in High Frequency Situation	Reserved	Reserved	Disable Power limiting at high frequencies (only Medium Voltage and non-USA standards)
9	Enable Reconnection Power Ramp-up Function	Reserved	Reserved	Reserved
10	Enable Anti-islanding	Disable Application level Reactive Current Injection	Enable Anti-islanding	Reserved
11	Reserved	Disable Anti-islanding	Reserved	Disable Power Ramping after reconnection (only Medium Voltage)
12	Reserved	Reserved	Reserved	Enable Anti-islanding (only GB/T 19964-2012)
13	Reserved	Reserved	Reserved	Reserved
14	Fast Trip Mode 1	Fast Trip Mode 1	Fast Trip Mode 1	Fast Trip Mode 1
15	Fast Trip Mode 2	Fast Trip Mode 2	Fast Trip Mode 2	Fast Trip Mode 2

Voltage trip function parameters



Picture 14. Medium voltage Trip functions

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P 2.8.3 Line Voltage High High % ID1916 *"LineVoltageHHigh"*

Line Voltage High High Limit [%] of Line Nominal Voltage

P 2.8.4 Line Voltage High % ID1917 *"LineVoltageHigh"*

Line Voltage High Limit [%] of Line Nominal Voltage

P 2.8.5 Line Voltage High Time ms ID1948 *"LineVHighT"*

If zero time is internally set correctly

P 2.8.6 Line Voltage Low s ID1918 *"LineVoltageLow"*

Medium Voltage Low Limit [%] of Line Nominal Voltage

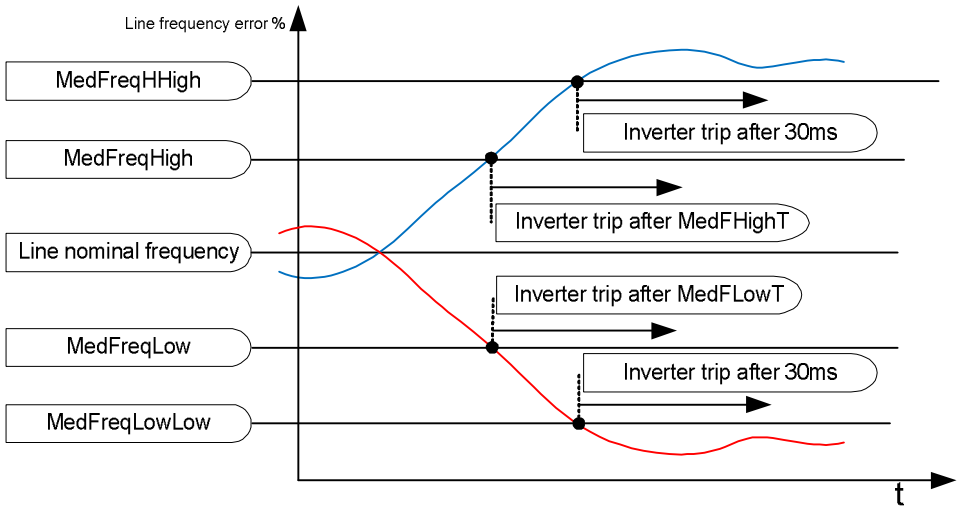
P 2.8.7 Line Voltage Low Time ms ID1949 *"LineVLowT"*

When time based voltage drop trip function is used this function is bypassed.

P 2.8.8 Line Voltage Low Low % ID1919 *"LineVoltageLowLow"*

Line Voltage Low Low Limit [%] of Line Nominal Voltage

Frequency Trip function parameters



Picture 15. Medium frequency Trip functions

P 2.8.9 Line Frequency High High % ID1920 *"LineFreqHighHigh"*

Line Voltage Frequency High Limit [%] of Line Nominal Frequency

P 2.8.10 Line Frequency High % ID1921 *"LineFreqHigh"*

Line Voltage Frequency High Limit [%] of Line Nominal Frequency [InverterNomFrequency]

P 2.8.11 Line Frequency High tT s ID1944 *"LineFHightT"*

If zero time is internally set correctly

P 2.8.12 Line Frequency Low % ID1922 *"LineFreqLow"*

Line Voltage Frequency Low Limit [%] of Line Nominal Frequency

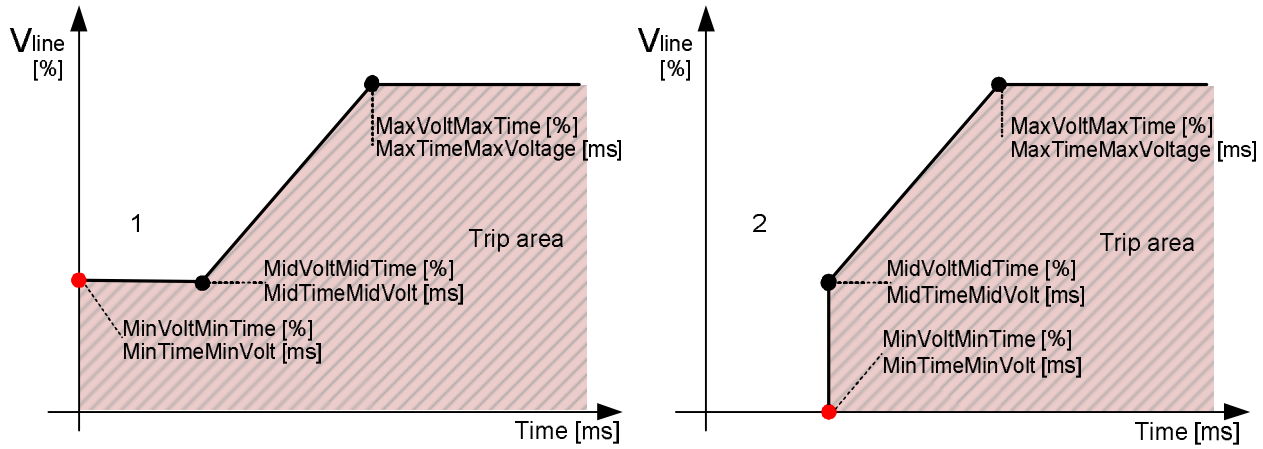
P 2.8.13 Line Frequency Low tTime ms ID1946 *"LineFLowtT"*

If zero time is internally set correctly

P 2.8.14 Line Frequency Low Low % ID192 *"LineFreqLowLow"*

Medium Voltage Frequency Low Low Limit [%] of Line Nominal Frequency

Time based trip function parameters



Picture 16. Editing trip area, 1) immediate trip when voltage drops below certain value, 2) time delay at zero voltage

P 2.8.15 Max Time Max Voltage ms ID1924 *"MaxTimeMaxVolt"*

Medium voltage time based trip function maximum time at maximum voltage

P 2.8.16 Max Voltage Max Time % ID1925 *"MaxVoltMaxTime"*

Medium voltage time based trip function maximum voltage at maximum time

P 2.8.17 Middle Time Middle Voltage ms ID1927 *"MidTimeMidVolt"*

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Medium voltage time based trip function. Time to tripping when voltage is at “MedTVMidle”. Format [ms].

P 2.8.18 Middle Voltage Middle Time % ID1926 *"MidVoltMidTime"*

Medium voltage time based trip function middle voltage at middle time

P 2.8.19 Minimum Time Minimum Voltage ms ID1928 *"MinTimeMinVolt"*

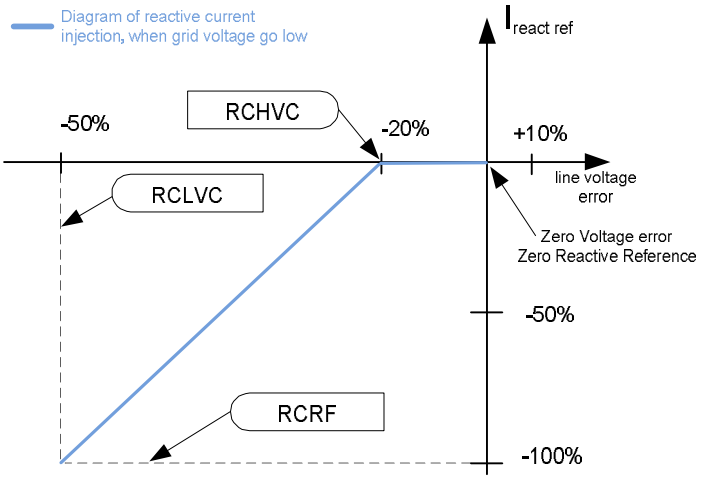
Medium voltage time based trip function minimum time at minimum voltage.

P 2.8.20 Minimum Voltage Minimum Time % ID1929 *"MinVoltMinTime"*

Medium voltage time based trip function. Voltage Level for P2.8.19.

Reactive current injection

Reactive current injection is activated when medium voltage operation has been selected. Injected reactive current is changing linearly between high and low voltage corners. Maximum injected current is set internally to 100 % (of Line Rated Current)



Picture 17. Reactive Current reference line as function of line voltage error.

P 2.8.21 Reactive Current High Voltage Corner % ID1930 *"RCHVC"*

Defines voltage level where reactive current injection is started, set to zero and standard specified default value is used.

P 2.8.22 Reactive Current Reference % ID1931 *"RCRF"*

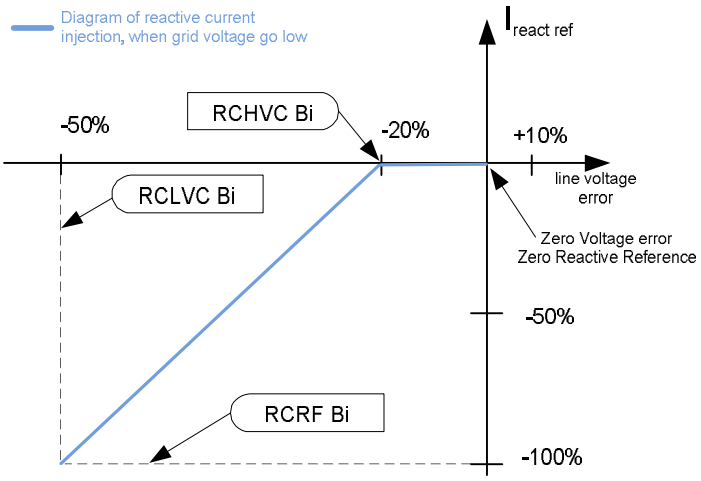
Reactive current reference at low voltage corner, set to zero and standard specified default value is used.

P 2.8.23 Reactive Current Low Voltage Corner % ID1932 *"RCLVC"*

Defines voltage level where 100 % current is injection to the grid, set to zero and standard specified default value is used.

P 2.8.24 Reactive Current High Voltage Corner Bi phase % ID1933 *"RCHVC_BI"*

Defines voltage level where reactive current injection is started on bi phase fault situation, set to zero and standard specified default value is used.



Picture 18. Reactive Current reference line as function of line voltage error in bi phase dip.

P 2.8.25 Reactive Current Reference Bi phase % ID1960 *"RCRF_BI"*

Reactive current reference at low voltage corner on bi phase fault situation. set to zero and standard specified default value is used.

P 2.8.26 Reactive Current Low Voltage Corner Bi phase % ID1935 *"RCLVC_BI"*

Defines voltage level where 100 % current is injection to the grid on bi phase fault situation, set to zero and standard specified default value is used.

Grid measurement feedback

P 2.8.27 D7 Phase Shift Deg ID1936 *"D7PhaseShift"*

When D7 measurement is behind a transformer and there is a phase shit in voltage angle value can be entered here. Format 0,0 dec.

P 2.8.28 D7 Feedback Gain % ID1937 *"D7FeedBackGain"*

Gain for D7 feedback controller. If value is set to zero grid code will use 70,00 %.

P 2.8.29 Line Frequency Filter time s ID1939 *"LineFFilt"*

Filtering time for frequency for reconnection function for German Medium voltage 2 second time was used on certification process.

P 2.8.30 Line Frequency Offset Hz ID1940 *"LineFOffset"*

Offset for frequency for reconnection for German medium voltage.

P 2.8.31 Line Voltage Filter Time s ID1941 *"LineVFilt"*

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Filtering time for voltage for reconnection function for German Medium voltage 2 second time was used on certification process.

P 2.8.32 Line Voltage Offset V ID1942 *"LineVOffset"*

Offset for voltage for reconnection for German medium voltage.

Other

P 2.8.33 Cosine Phi Lock Out Voltage % ID1951

When voltage passes this point, the automatic Cosine Phii control is disabled.

P 2.8.34 Cosine Phi Lock In Voltage % ID1952

When voltage passes this point, the automatic Cosine Phii control is enabled.

P 2.8.35 Reactive Current Over Voltage Voltage Corner % ID1953

When this voltage level is exceeded Reactive Current Injection starts.

P 2.8.36 Reactive Current Over Voltage Reference % ID1954

Reactive Current Over Voltage Reference

P 2.8.37 Reactive Current Over Voltage Slope %/% ID1955

Reactive Current Over Voltage Slope

P 2.8.38 Reactive Current Over Voltage Voltage Corner High % ID1956

Reactive Current Over Voltage Voltage Corner High

P 2.8.39 Lock Out Under Voltage % ID1957

Voltage limit for disabling the Reactive Current Injection in Under Voltage situation.

P 2.8.40 Lock Out Over Voltage % ID1958

Voltage Limit for disabling the reactive current injection in Over Voltage situation.

P 2.8.41 Cosine Phi Reference Correction ID1959

Used as an correction in the Cos Phi reference

P 2.8.42 High Frequency Power Limit Max Frequency % ID1961

Sets the frequency where the power will be limited to 0% in High Frequency situation.

P 2.8.43 Reconnection Time ID1975

Used in GB/T 19964-2012 to specify reconnection time to be used after the Grid voltage & frequency have returned to the nominal range.

P 2.8.44 Reconnection Ramp Rate ID1976

Used in GB/T 19964-2012 to specify power up ramp rate to be used during a reconnection after the Grid voltage & frequency have returned to the nominal range.

P 2.8.45 Interconnection Select ID1977

This parameter is only used with NERC PRC-024-1 Grid Code standard to specify which interconnection is used:

Standard

Eastern

Western

Quebec

ERCOT

These interconnections have different settings for High & Low Frequency detection.

P 2.8.46 MPPT FRT Pause ID1972

Pause MPPT functionality in Fault Ride Through Situation.

P 2.8.47 GridCode Mode ID1575

Enable or Disable the grid code functionality

G2.8.44 AC Measurements

Note! This is only visible when correct Service password is set and Grid code functionality is turned OFF

Table 48. AC measurements parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.8.44.1	AC MeasureSource	0	3		3	1739	From which analog input or OPT-D7 board to take the AC Voltage measurements signal. AC voltage is measured to know the voltage level although main contactor is not closed. 0= Not Used 1=AI1 2=AI2 3=OPT-D7 Board
P2.8.44.2	AC Multiplier	0,1	1000		88,8	1738	Gain/Multiplier for the scaling of the analog signal to voltage. (0-10000/0-10V voltage input to 0-1000/0-1000V AC value.) Vacon CV400 : Default value = 88.8 Avomeri AVMR0100: Default value = 81,5 OPT-D7: 1000,0 actually means a gain equal to 1 in the OPT-D7 case.
P2.8.44.3	AC Offset	1	10000	V	44	1737	Offset for the scaling of the analog signal to AC voltage. AC voltage level at zero analog input signal. Vacon CV400: Default value = 44 Avomeri AVMR0100: Default value = 37 OPT-D7 board:

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							Default value = 0

Parameters and descriptions

P2.8.44.1 AC Voltage Measure Source ID1739 *"AC MeasureSource"*

From which analog input or OPT-D7 board to take the AC Voltage measurements signal. AC voltage is measured to know the voltage level although main contactor is not closed.

0=Not Used
1=AI1
2=AI2
3=OPT-D7 Board

P2.8.44.2 AC Voltage Multiplier ID1738 *"AC Multiplier"*

Gain/Multiplier for the scaling of the analog signal to voltage. (0-10000/0-10V voltage input to 0-1000/0-1000V AC value.)

P2.8.44.3 AC Voltage Offset V ID1737 *"AC Offset"*

Offset for the scaling of the analog signal to AC voltage. AC voltage level at zero analog input signal.

Vacon CV400: Default value = 44
AI1: Default value = 37
OPT-D7 board: Default value = 0

G2.8.45 AC Voltage Protection

Note! This is only visible when correct Service password is set and Grid code functionality is turned OFF

Table 49.AC Voltage protection parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.8.45.1	AC Voltage Max	0	500	V	Varies	1710	Max AC Voltage Limit.
P2.8.45.2	AC Voltage Min	0	500	V	252	1711	Min AC Voltage Limit.
P2.8.45.3	AC MaxTripDelay	0	300	s	0	1796	Trip delay if voltage above max limit.
P2.8.45.4	AC MinTripDelay	0	300	s	0	1797	Trip delay if voltage below min limit.
P2.8.45.5	AC VoltRstDelay	1	3600	s	185	1703	Reset delay of fault if fault conditions no longer active.

Parameters and descriptions

P2.8.45.1 AC Voltage Maximum V ID1710 "AC Voltage Max"

Max AC Voltage Limit.

P2.8.45.2 AC Voltage Minimum V ID1711 *"AC Voltage Min"*

Min AC Voltage Limit.

P2.8.45.3 AC Maximum Trip Delay s ID1796 *"AC MaxTripDelay"*

Trip delay if voltage above max limit.

P2.8.45.4 AC Minimum Trip Delay s ID1797 *"AC MinTripDelay"*

Trip delay if voltage below min limit.

P2.8.45.5 AC Voltage Reset Delay s ID1703 *"AC VoltRstDelay"*

Reset delay of fault if fault conditions no longer active.

G2.8.46 AC Frequency Protection

Note! This is only visible when correct Service password is set and Grid code functionality is turned OFF

Table 50.AC Frequency protection parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.8.46.1	AC Freq Max	45	65	Hz	50,9	1752	Max AC Frequency Limit.
P2.8.46.2	AC Freq Min	45	65	Hz	49,1	1753	Min AC Frequency Limit.
P2.8.46.3	AC FreqTripDelay	0	300	s	0,1	1805	Trip delay if frequency is above or below limits.
P2.8.46.4	AC FreqRstDelay	1	3600	s	185	1751	Reset delay of fault, if fault conditions no longer active.

Parameters and descriptions

P2.8.46.1 AC Frequency Maximum Hz ID1752 *"AC Freq Max"*

Max AC Frequency Limit.

P2.8.46.2 AC Frequency Minimum Hz ID1753 *"AC Freq Min"*

Min AC Frequency Limit.

P2.8.46.3 AC Frequency Trip Delay s ID1805 *"AC FreqTripDelay"*

Trip delay if frequency is above or below limits.

P2.8.46.4 AC Frequency Reset Delay s ID1751 *"AC FreqRstDelay"*

Reset delay of fault, if fault conditions no longer active.

3.3.3 M3 Control

Note! This is only visible when correct Service password is set

Table 51.Control parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P 3.1	Control Source	0	1		Varies	1403	0=Keypad Cntrl 1=External PLC

Parameters and descriptions

P 3.1 Control Source ID1403 *"Control Source"*

0=Keypad Cntrl
1=External PLC

3.3.4 System menu (Control keypad: Menu M6)

For parameters and functions related to the general use of the inverter, such as application and language selection, customised parameter sets or information about the hardware and software, see Chapter 7.3.6 in the Vacon NX User's Manual.

Note! This is only visible when correct Service password is set

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3.3.5 Expander boards (Control keypad: Menu M7)

The M7 menu shows the expander and option boards attached to the control board and board-related information. For more information, see Chapter 7.3.7 in the Vacon NX User's Manual and Vacon I/O option board manual.

Note! These parameters are set automatically when P2.1.5 Configuration is set

3.3.6 Fieldbus interface

3.3.6.1 IDs for 32bit Monitoring Values

Some monitoring values are 32bit in length and as such their fieldbus monitoring may not work properly. Here is a list of High and Low Words of these 32bit monitoring values so that external system can read them as 2 16bit words.

Table 52. High & Low Words of 32bit Monitoring Values

Values	Unit	ID	Description
Total Energy Produced	kWh	High: 1803 Low: 1804	Total Energy of inverter fed into the grid.
Total Run Time	h	High: 1862 Low: 1863	Total time the inverter has been running.
Grid Connections		High: 1864 Low: 1865	Total number of times the inverter has closed the main contactor and connected to the grid.

3.3.6.2 Control Word

Table 53. Fieldbus interface Control data

Name	Type	Unit	Address	Description
Control Word	WORD		2001	Check the next table

Control Word

Table 54. Fieldbus Control word bits

Bit	Name	Value = 0	Value = 1	Description
0	Start Command			Permission for the inverter to start, if all other criteria are ok.
1	Reserved			
2	Fault Reset	-	Fault Reset	
3	Reserved			
4	Reserved			
5	Reserved			
6	Reserved			
7	Reserved			
8	Reserved			

9	Lifebit 1			"Life Counter"
10	Lifebit 2			
11	Lifebit 3			
12	Lifebit 4			
13	Reactive Current / PF Reference selection	Process Data In which target ID is 1480 is used as Reactive Current Reference	Process Data In which target ID is 1480 is used as Power Factor Reference	Selection bit to indicate is the data from Fieldbus meant to be Reactive Current Reference or Power Factor Reference
14	Force Start	-	Forces the start of the inverter regardless of DC Voltage Level	Can be used in Commissioning and Maintenance when the inverter is wanted to start regardless the DC Voltage Level
15	Reserved			

3.3.6.3 Status Words

Table 55. Fieldbus interface status data

Name	Type	Unit	Address	Description
Status Word	WORD		2102	Check the next table.

Status Word

Table 56. Fieldbus status word bits

Bit	Name	Value = 0	Value = 1	Description
0	Ready Status	Not Ready	Ready	Not only if Inverter control is ready, but if all "Ready Criterions" are also fulfilled
1	Activation Status	Stopped	Activated	See Chapter 5.1 When active, the inverter can be in either in Standby or Inverter Running mode.
2	Reserved			
3	Fault Status	No Fault	Fault	Fault(s) active
4	Alarm Status	No Alarm	Alarm	Warning(s) active
5	Standby Status		Standby	See Chapter 5.1
6	Reserved			
7	Inverter Running Status	-	Inverter Running	See Chapter 5.1
8	Reserved			
9	Heartbeat bit			The inverter toggles this bit on and off. 500ms on, 500ms off.
10	Reserved			
11	Reserved			
12	Reserved			
13	Reserved			
14	Reserved			
15	Reserved			

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3.3.6.4 Warning Status words

Statusword 1, ID1819

Table 57. Warnings status word 1

Bit	Name	Value = 0	Value = 1	Description
0	Main Switch Open Fault	No Fault	Fault	See Fault list 64
1	Main Switch Open Warning	No Alarm	Alarm	See Fault list 64
2	AC Voltage Max Fault	No Fault	Fault	See Fault list 72
3	AC Voltage Min Fault	No Fault	Fault	See Fault list 73
4	AC Freg Max Fault	No Fault	Fault	See Fault list 74
5	AC Freg Min Fault	No Fault	Fault	See Fault list 75
6	DC Ground Warning	No Alarm	Alarm	See Fault list 76
7	DC Ground Fault	No Fault	Fault	See Fault list 77
8	Surge Alarm	No Alarm	Alarm	See Fault list 83
9	FB Heardbeat timeout	No Fault	Fault	See Fault list 85
10	Input Switch Alarm	No Alarm	Alarm	See Fault list 86
11	Emergency Switch	No Fault	Fault	See Fault list 95
12	UnBalance	No Fault	Fault	See Fault list 18
13	Thermistor Fault	No Fault	Fault	See Fault list 29
14	Reserved			
15	Reserved			

Statusword 2, ID1820

Table 58. Warnings status word 2

Bit	Name	Value = 0	Value = 1	Description
0	Overvoltage	No Fault	Fault	See Fault list 2
1	Earth Fault	No Fault	Fault	See Fault list 3
2	Inverter Fault	No Fault	Fault	See Fault list 4
3	Charge Switch Fault	No Fault	Fault	See Fault list 5
4	Saturation	No Fault	Fault	See Fault list 7
5	Unknown Fault	No Fault	Fault	See Fault list 8
6	Undervoltage	No Fault	Fault	See Fault list 9
7	Input Phase Fault	No Fault	Fault	See Fault list 10
8	Input Phase Warning	No Alarm	Alarm	See Fault list 10
9	Supply Phase Loss	No Fault	Fault	See Fault list 11
10	Supply Phase Warning	No Alarm	Alarm	See Fault list 11
11	Over Temperature	No Fault	Fault	See Fault list 14
12	Over Temperature Warning	No Alarm	Alarm	See Fault list 14
13	Undertemp	No Fault	Fault	See Fault list 13
14	Temperature Power limit warning	No Alarm	Alarm	See Fault list 97
15	OverCurrent	No Fault	Fault	See Fault list 1

Statusword 3, ID1821

Table 59. Warnings status word 3

Bit	Name	Value = 0	Value = 1	Description
0	Processor Watchdog	No Fault	Fault	See Fault list 25
1	Power Unit Fault	No Fault	Fault	See Fault list 26
2	IGBT HW Temp	No Fault	Fault	See Fault list 31
3	Cooling Fan	No Fault	Fault	See Fault list 32
4	Application Fault	No Fault	Fault	See Fault list 35
5	Control Unit Fault	No Fault	Fault	See Fault list 36
6	Device Changed	No Fault	Fault	See Fault list 37
7	Device Added	No Fault	Fault	See Fault list 38
8	Device Moved	No Fault	Fault	See Fault list 39
9	Device Unknown	No Fault	Fault	See Fault list 40
10	Device Changed	No Fault	Fault	See Fault list 44
11	Device Added	No Fault	Fault	See Fault list 45
12	EEprom Checksum fault	No Fault	Fault	See Fault list 22
13	Counter Fault	No Fault	Fault	See Fault list 24
14	Reserved			
15	Reserved			

Statusword 4, ID1822

Table 60. Warnings status word 4

Bit	Name	Value = 0	Value = 1	Description
0	IGBT Temperature	No Fault	Fault	See Fault list 41
1	EEPROM Fault	No Fault	Fault	See Fault list 48
2	Zero Divice Fault	No Fault	Fault	See Fault list 49
3	External Fault Active	No Fault	Fault	See Fault list 51
4	External Warning Active	No Alarm	Alarm	See Fault list 51
5	Reserved			
6	Fieldbus Communication	No Fault	Fault	See Fault list 53
7	Slot Communication	No Fault	Fault	See Fault list 54
8	System bus Master Heartbeat Trip active	No Fault	Fault	See Fault list 59
9	System bus Communication Fault Trip Active	No Fault	Fault	See Fault list 55
10	LCL OverTemp Fault Active	No Fault	Fault	See Fault list 70
11	LCL OverTemp Warning Active	No Alarm	Alarm	See Fault list 70
12	User Defined Temperature Limit Exceeded	No Alarm	Alarm	See Fault list 99
13	Analog Input <4mA Fault	No Fault	Fault	See Fault list 50
14	Analog Input <4mA Alarm	No Alarm	Alarm	See Fault list 50
15	Reserved			

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Statusword 5, ID1823

Table 61. Warnings status word 5

Bit	Name	Value = 0	Value = 1	Description
0	Grid code High Voltage Alarm	No Alarm	Alarm	See Fault list 90
1	Grid code Low Voltage Alarm	No Alarm	Alarm	See Fault list 91
2	Grid code High Frequency Alarm	No Alarm	Alarm	See Fault list 92
3	Grid code Low Frequency Alarm	No Alarm	Alarm	See Fault list 93
4	Grid code Re Connect time Alarm	No Alarm	Alarm	See Fault list 94
5	Reserved			
6	Reserved			
7	Reserved			
8	Reserved			
9	Reserved			
10	Reserved			
11	Reserved			
12	Reserved			
13	Reserved			
14	Reserved			
15	Reserved			

3.3.6.5 Monitoring values for Fieldbus use

Table 62. Monitoring values for Fieldbus use

Values	Min	Max	Unit	ID	Description
DC Start Level			V	1642	
Run Time Yesterday			h	1643	
Grid Connections (High Word)			-	1644	
Grid Connections (Low Word)			-	1645	
Energy Yesterday			kWh	1646	
Runtime Today			h	1647	
Total Runtime (High Word)			h	1648	
Total Runtime (Low Word)			h	1649	
DC Voltage			V	1650	
AC Voltage			V	1651	
AC Frequency			Hz	1652	
Output Power			kW	1653	
Output Power			%	1654	
Output Current			A	1655	
Used Q/Cos Phi reference			%/-	1656	
Fault Code + Subcode			-	1657	
Unit Temperature			°C	1658	
Energy Today			kWh	1659	

Total Energy (High Word)			kWh	1660	
Total Energy (Low Word)			kWh	1661	
Status Word 1			-	1662	
Status Word 2			-	1663	
Status Word 3			-	1664	
Status Word 4			-	1665	
Status Word 5			-	1666	

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4. APPLICATION FAULT CODES

Fault tables and descriptions of faults. Main reasons what possible causes fault

Fault code	Fault	Possible cause	Correcting measures	Auto Reset
1	Overcurrent	AFE has detected too high a current (>4*I_H) in the cables:		X
2	Overvoltage	The DC-link voltage has exceeded the inverter limit. See User manual. - high overvoltage spikes in supply	- Check DC voltage	X
3	Earth fault	Current measurement has detected that the sum of phase currents is not zero. - insulation failure in cables	- Check cables.	---
4	Inverter fault			---
5	Charging switch	The charging switch is open, when the START command has been given. – faulty operation – component failure	- Reset the fault and restart. - Should the fault re-occur, contact your local distributor.	---
7	Saturation trip	Various causes: – defective component	- Cannot be reset from the keypad. - Switch off power. - DO NOT RE-CONNECT POWER! - Contact your local distributor.	---
8	System fault	- component failure - faulty operation Note exceptional fault data record Subcode in T.14: S1 = Reserved S2 = Reserved S3 = Reserved S4 = Reserved S5 = Reserved S6 = Reserved S7 = Charging switch S8 = No power to driver card S9 = Power unit communication (TX) S10 = Power unit communication (Trip) S11 = Power unit comm. (Measurement)	Reset the fault and restart. Should the fault re-occur, contact your local distributor.	---
9	Undervoltage	DC-link voltage is under the inverter fault voltage limit. See user manual. – most probable cause: too low a supply voltage – Inverter internal fault – One of input fuse is broken.	- In case of temporary supply voltage break, reset the fault and restart the inverter - Check the supply voltage. - If it is adequate, an internal failure has occurred. - Check input fuses - Check DC charge function	---

Fault code	Fault	Possible cause	Correcting measures	Auto Reset
10	*Line Sync Fail*	Output line phase is missing. Subcode in T.14: S1 = Phase supervision diode supply S2 = Phase supervision active front end	Check supply voltage, fuses and cable.	X
11	Output phase supervision	Output line phase is missing.	Check supply voltage, fuses and cable.	---
13	Inverter under-temperature	Heatsink temperature is under –10°C		---
14	Inverter over-temperature	Heatsink temperature is over 90°C Overtemperature warning is issued when the heatsink temperature exceeds 85°C.	- Check the correct amount and flow of cooling air. - Check the heatsink for dust. - Check the ambient temperature.	---
18	Unbalance (Warning only)	Unbalance between power modules in paralleled units. Subcode in T.14: S1 = Current unbalance S2 = DC-Voltage unbalance	Should the fault re-occur, contact your local distributor.	---
22	EEPROM checksum fault	Parameter save fault – faulty operation – component failure	Should the fault re-occur, contact your local distributor.	---
24	Counter fault	Values displayed on counters are incorrect	Have a critical attitude towards values shown on counters.	---
25	Microprocessor watchdog fault	– faulty operation – component failure	Reset the fault and restart. Should the fault re-occur, contact your local distributor.	---
26	Start-up prevented	- Start-up of the inverter has been prevented. - Run request is ON when new application is loaded to inverter	- Cancel prevention of start-up if this can be done safely. - Remove Run Request.	---
29	Thermistor fault	The thermistor input of option board has detected too high temperature	Check thermistor connection (If thermistor input of the option board is not in use it has to be short circuited)	---
31	IGBT temperature (hardware)	IGBT Inverter Bridge over temperature protection has detected too high a short term overload current	- Check loading.	X
32	Fan cooling	Cooling fan of the inverter does not start, when ON command is given	Contact your local distributor.	---
35	Application	Problem in application software	Contact your distributor. If you are application programmer check the application program.	---
36	Control unit	NXS Control Unit cannot control NXP Power Unit and vice versa	Change control unit	---
37	Device changed (same type)	Option board or power unit changed. New device of same type and rating.	Reset. Device is ready for use. Old parameter settings will be used.	---

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Fault code	Fault	Possible cause	Correcting measures	Auto Reset
38	Device added (same type)	Option board added.	Reset. Device is ready for use. Old board settings will be used.	---
39	Device removed	Option board removed.	Reset. Device no longer available.	---
40	Device unknown	Unknown option board or inverter. Subcode in T.14: S1 = Unknown device S2 = Power1 not same type as Power2	Contact the distributor near to you.	---
41	IGBT temperature	IGBT Inverter Bridge overtemperature protection has detected too high a short term overload current	- Check loading.	X
44	Device changed (different type)	Option board or power unit changed. New device of different type or different rating than the previous one.	Reset Set the option board parameters again if option bard changed. Set inverter parameters again if power unit changed.	---
45	Device added (different type)	Option board of different type added.	Reset Set the option board parameters again.	---
48	Parameter Fault	Parameter Fault	Check parameters value	---
49	Division by zero in application	Division by zero has occurred in application program	Contact your distributor if the fault re-occurs while the inverter is in run state. If you are application programmer check the application program.	---
50	Analog Input Fault	Analog Input has been set to work between 4-20mA or 2-10V and the signal has dropped below tripping limit. Subcode gives more info which signal(s) has been lost: - bit0 (+1): Power Limit - bit1 (+2): AC Voltage - bit2 (+4): Digital Input 1 - bit3 (+8): Digital Input 2 - bit4 (+16): DC Ground	- Check the wiring - Check for loose connections - Check the current / voltage source	---
51	External Trip	Trip signal from digital input.	Remove fault situation from external device.	X
53	Fieldbus Board	A Fieldbus card in slot D or E has status “Faulted”	Check installation. If installation is correct contact the nearest distributor.	---
54	Slot Communication	A option board in slot B,C,D or E has status “Communication Lost”	Check board and slot. Contact the nearest Vacon distributor.	---
55	SB Board Fault	A systembus card in slot D or E has status “Faulted”	Check the System bus Board	---
59	SB Heartbeat	An inverter is activated as a slave inverter in array configuration without a heartbeat signal on the bus, Hence, no master inverter active.	Check the System bus	---

Fault code	Fault	Possible cause	Correcting measures	Auto Reset
64	MCC Fault	Contactor acknowledgment is used through digital input and close command is given without response within the time set with parameter “MCont FaultDelay”	Check the main power switch of the Inverter and Acknowledge input.	---
70	LCL Temperature	LCL Overtemp trip from digital input.	Check the LCL filter and signal connection. Check fan	---
72	AC VoltMax Trip	AC voltage on line side is above the max limit.	Check AC Voltage	Delayed
73	AC VoltMin Trip	AC voltage on line side is below the min limit.	Check AC Voltage	Delayed
74	FreqOverLimit	AC frequency on line side is above the max limit.	Check AC Frequency	Delayed
75	FreqUnderLimit	AC frequency on line side is below the min limit.	Check AC Frequency	Delayed
76	DC Ground Warning	DC Insulation measurement signal has gone above the warning limit.	Check DC Insulation	---
77	DC Ground Fault	DC Insulation measurement signal has gone above the fault limit.	Check DC Insulation	Delayed
83	Surge Alarm	Surge alarm from digital input.	Remove fault situation from external device.	---
85	Fieldbus	Heartbeat signal from touchpad panel is missing while running in array configuration. Warning = inverter not active Fault = inverter active	Check touchpad panel. Check the control place	Delayed
86	Input Switch	Input Switch in wrong state	Check the input Switch	---
87	Unknown Power Size	Drive initialized wrong	Contact Vacon	---
88	No Power Size	1) Power unit has not been powered up after application loading 2) Drive initialized wrong	1) Power up the Power Unit 2) Contact Vacon	---
90	High Voltage	Time limit at HIGH voltage level reached. Grid Code	Check grid voltage	---
91	Low Voltage	Time limit at LOW voltage level reached. Grid Code	Check grid voltage	---
92	High Frequency	Time limit at HIGH frequency level reached. Grid Code	Check grid frequency	---
93	Low Frequency	Time limit at LOW voltage level reached. Grid Code	Check grid frequency	---
94	Re Connect Time	Grid has been faulty and Unit has delay when that is reconnection to grid.	Wait 0-10 minutes depending Grid standard.	---
95	Emergency Switching	Command for emergency stop received from digital input.	New run command is accepted after reset.	---
97	Power Limit Warning	Power is limited by temperature. Temperature is over 75degrees	Check Cooling systems.	---
99	TemperaRising (Only Warning)	Temperature has risen above user defined temperature warning level, P2.4.1.4	Check air circulation of the drive	---

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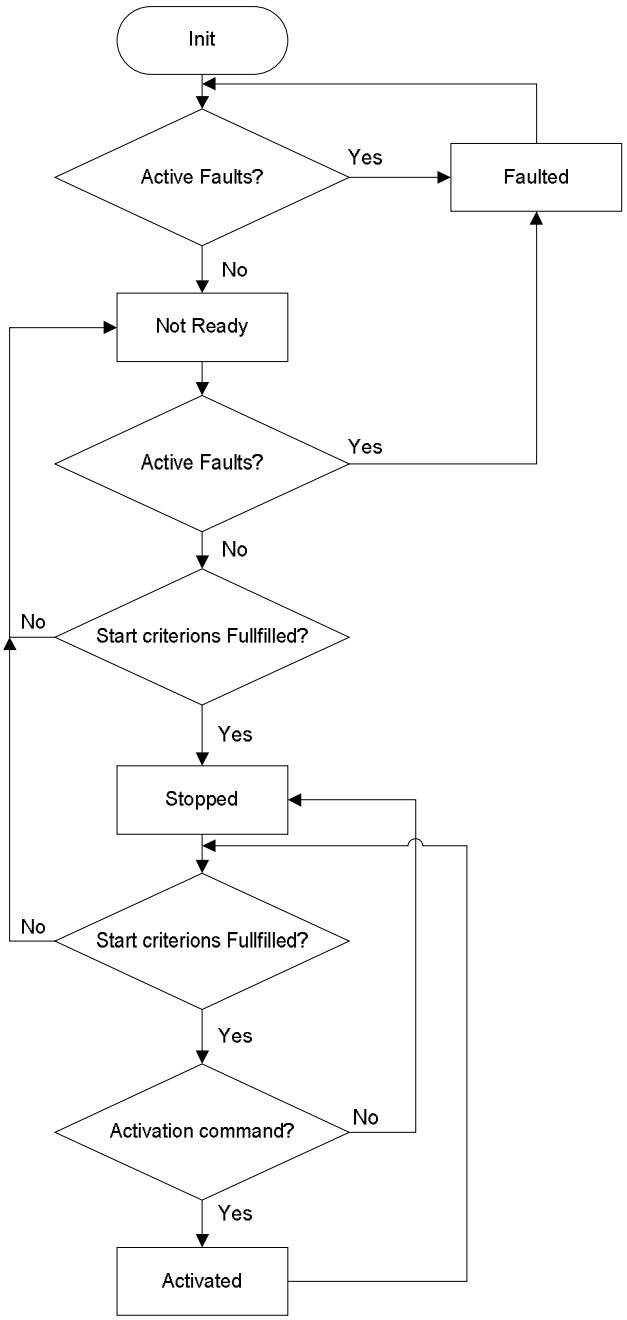
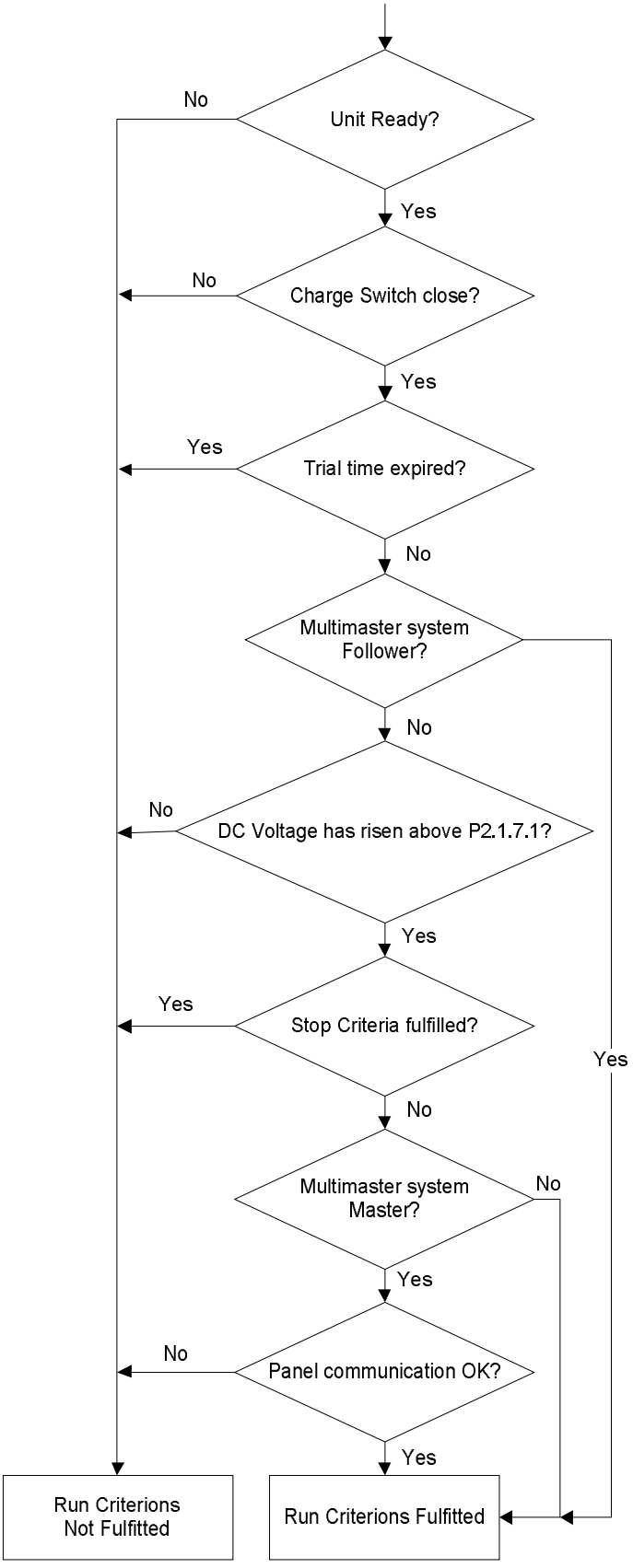
5. STATE MACHINE:

5.1 General state machine:



5.1.1 Start Criterions:



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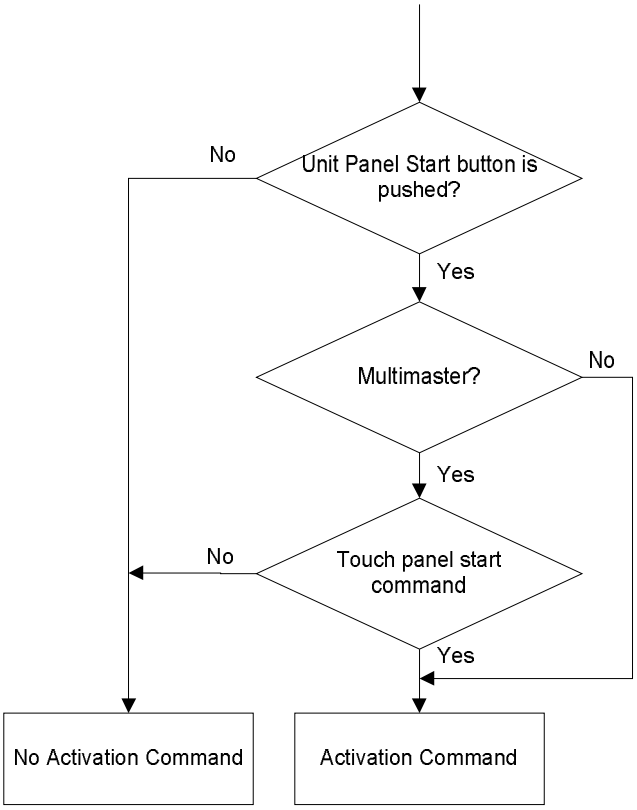
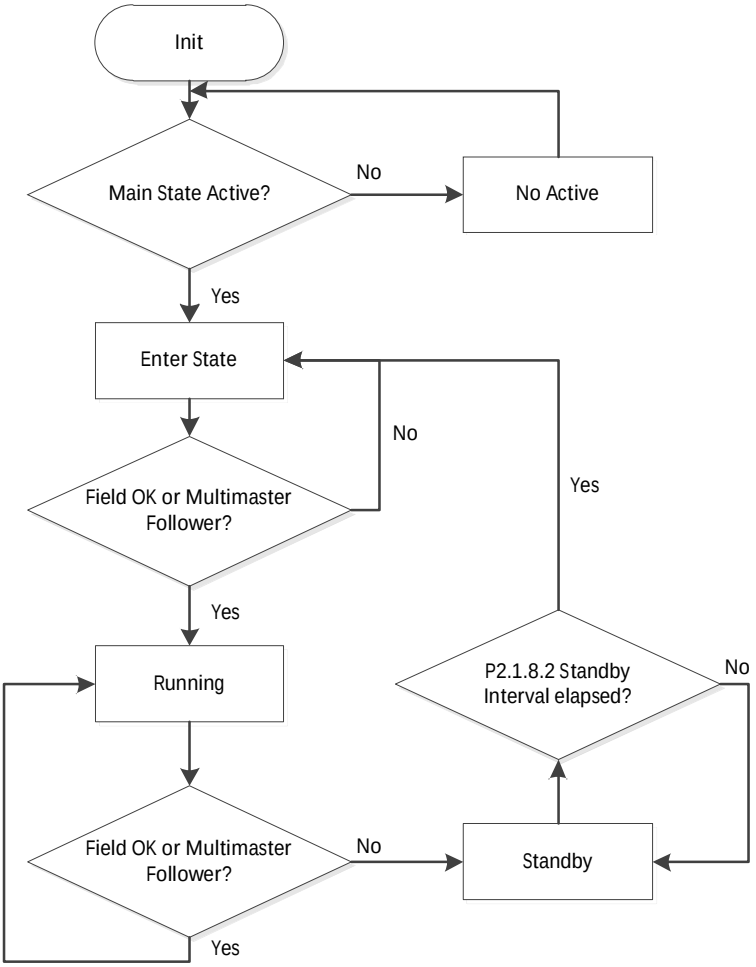
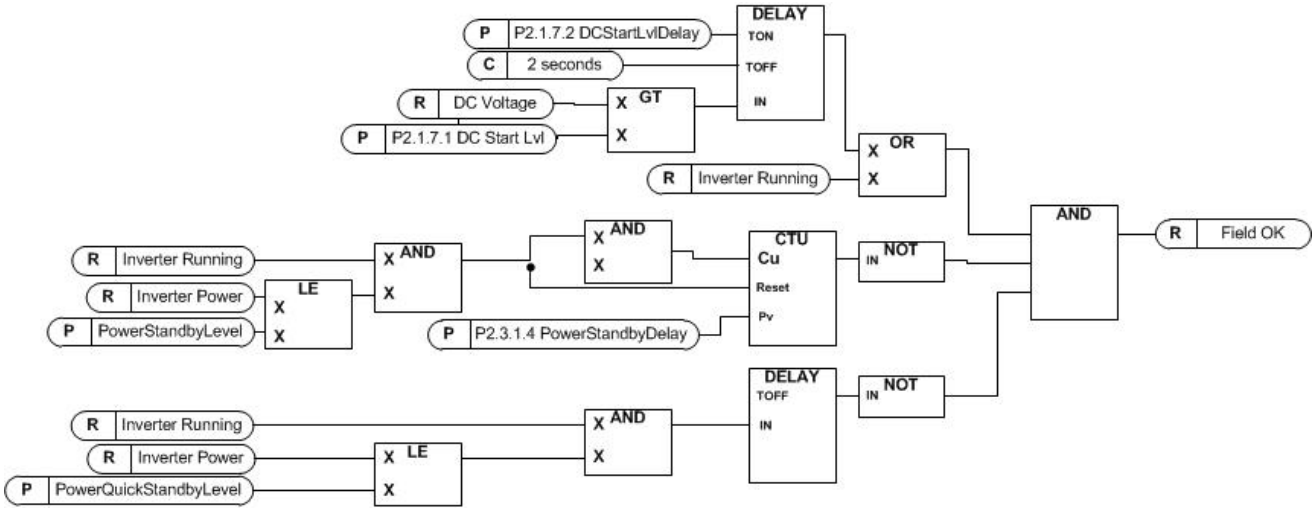
5.1.2 Activation command:



5.2 General Substate Machine



5.2.1 Field OK



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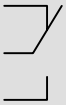
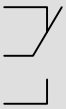
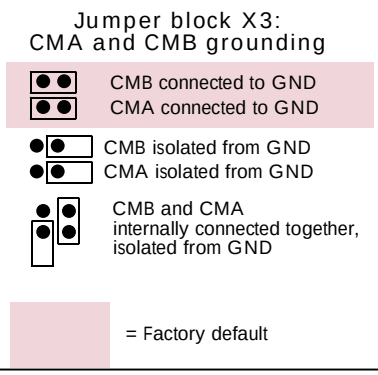
6. IO-CONNECTIONS

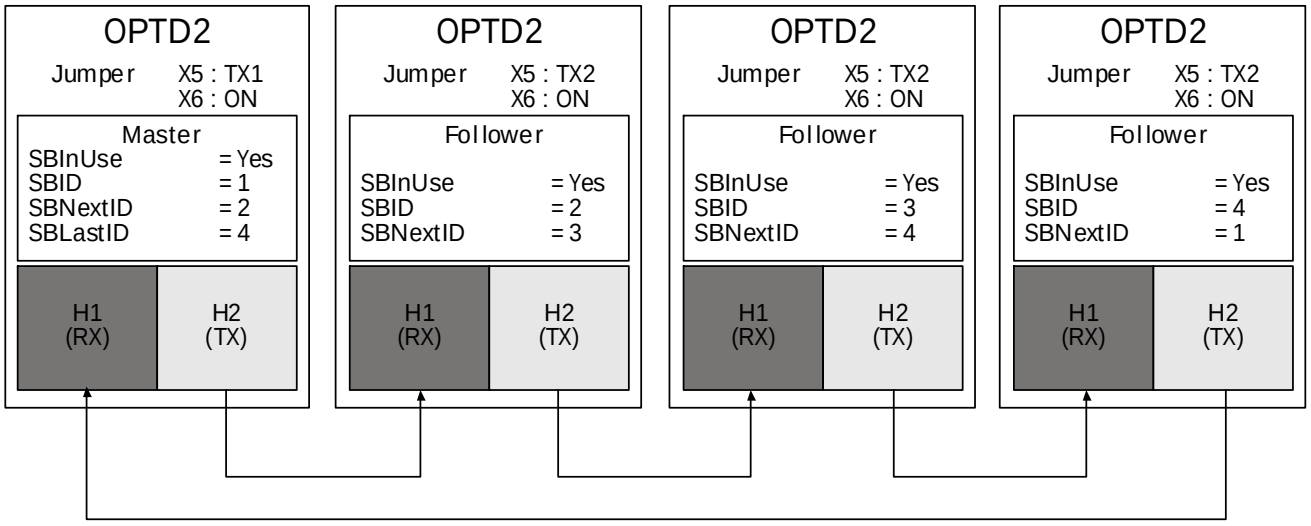
OPTA1			
Terminal		Signal	Description
1	$+10V_{ref}$	Reference output	Voltage for potentiometer, etc.
2	AI1+	DC Ground Analogue input, voltage range 0—10V DC	Voltage input DC Ground
3	AI1-	I/O Ground	Ground for reference and controls
4	AI2+	AC Measurement range 0—10V DC	Current input AC Measurement
5	AI2-		
6	+24V	Control voltage output	Voltage for switches, etc. max 0.1 A
7	GND	I/O ground	Ground for reference and controls
8	DIN1	External trip (programmable)	Normal closed = external trip
9	DIN2	Surge alarm (programmable)	Normal closed = Surge alarm
10	DIN3	Filter over temperature (programmable)	Contact open = Filter over temperature Contact closed = No fault
11	CMA	Common for DIN 1—DIN 3	Connect to GND or +24V
12	+24V	Control voltage output	Voltage for switches (see #6)
13	GND	I/O ground	Ground for reference and controls
14	DIN4	Main contactor acknowledge (programmable)	Contact closed = Main contactor closed
15	DIN5	DC Ground trip (programmable)	Normal closed= DC Ground trip
16	DIN6	Emergency switching off (programmable)	Normal Close = Emergency switching
17	CMB	Common for DIN4—DIN6	Connect to GND or +24V
18	AO1+	Analogue output	Set the ID ID no. Of a signal to be connected to AO1 Programmable Range 0—20 mA/R_L, max. 500Ω
19	AO1-		
20	DO1	Digital output External Fan	Programmable Open collector, I≤50mA, U≤48 VDC
OPTA2			
21	RO1	 Relay output 1 DC supply ready	Programmable
22	RO1		
23	RO1		
24	RO2	 Relay output 2 Main contactor control	Non-Programmable
25	RO2		
26	RO2		

6.1 Appendix

Note: See jumper selections below. More information can be found in Vacon NX Option Board Manual, Chapter 6.2.2.2.



The OPTD2 board in the Master has default jumper selections, i.e. X6:1-2, X5:1-2. For the followers, the jumper positions have to be changed: X6:1-2, X5:2-3. This board also has a CAN communication option that is useful for multiple Inverter monitoring with NCDrive PC software when commissioning Master Follower functions or line systems.



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