VACON® NX

AC DRIVES

ARFIFF08 POWER GENERATION WITH GENERAL GRID CODES APPLICATION MANUAL

VACON®

VACON® POWER GENERATION APPLICATION MANUAL

INDEX

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1. INTRODUCTION

In this application is kept backwards compatibility with ARFIFF07. The power generation application is used to generate power to grid using the maximum power point tracker (MPPT) or manual DC reference.

1.1 Grid Code Support Information

In this application is used general grid codes.

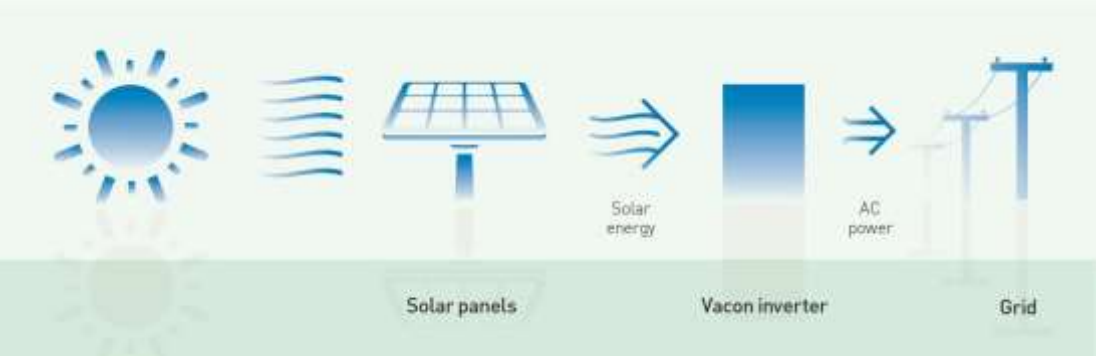
1.2 Compatibility issues in parameters between versions

NOTE! This application is not kept backwards compatible. See release notes and this chapter before updating the application.

Update Note 1: When you update the application do not use NCDrive parameter download function. Instead upload parameters from the unit and compare them to the old parameter file. The application is constantly developed, and it includes changing parameter default values. If parameters are directly downloaded to drive, improved default values will be lost.

2. GENERAL

The power generation application is an answer to growing renewable energy market. The inverters need only DC voltage and the grid to start producing energy.



Picture 1. Basic solar system.

2.1 Basic features

The power generation 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

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 ... 8 x inverter size)

The multi master functionality is used in bigger systems. There are two to eight 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 the multi master system there is one inverter which is controlling other inverters' DC side behavior and that inverter is called master inverter. Master inverter collects information of the DC bus and makes decisions regarding what DC reference is used.

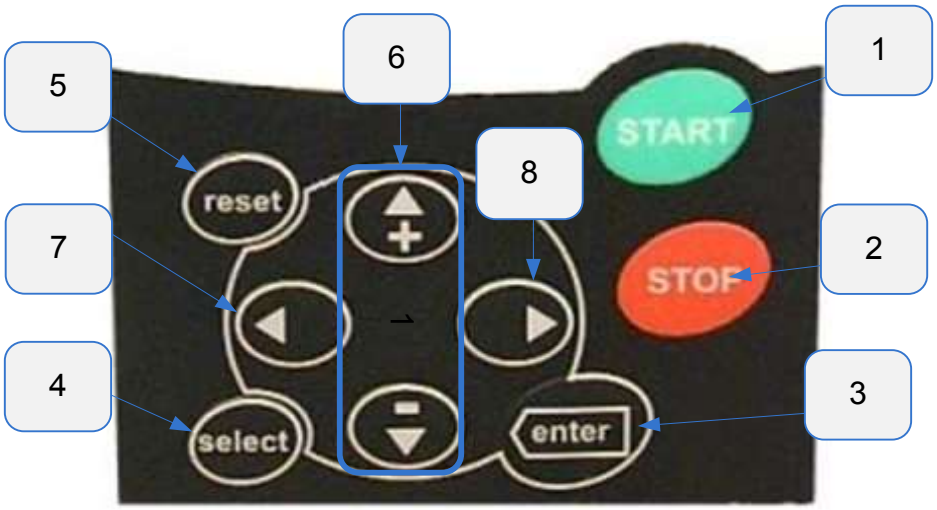
Other inverters are slave inverters and they follow DC reference coming from the master inverter. Each of the inverters is responsible of its own behavior on the Grid side, i.e. complying with Grid Code Standard.

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

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

4 = Select 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.

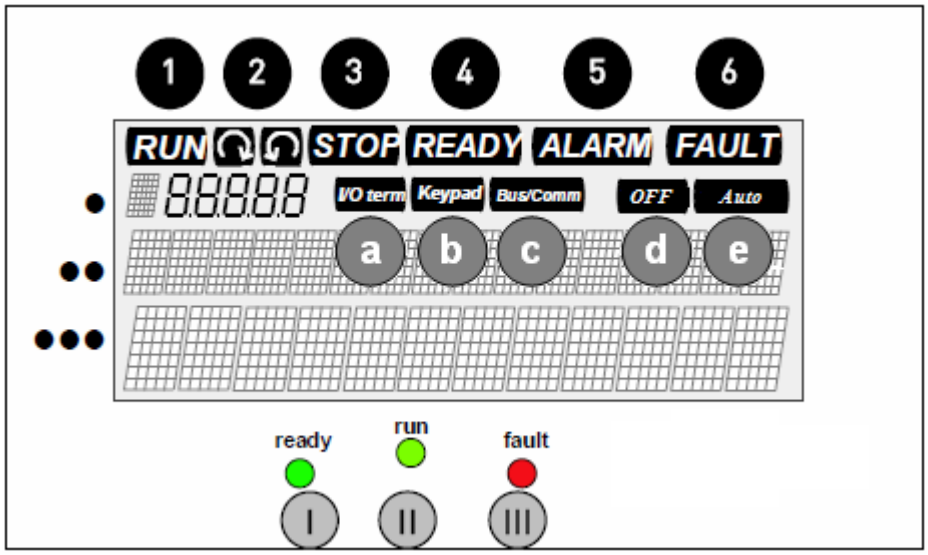
5 = Reset button is used to reset active faults.

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 = Inverter is running;

2 = Indicates the direction of current flow.

3 STOP = Start command has been disabled from unit's control panel.

4 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.

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

6 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.

Steady OFF: Start command has been disabled from unit's control panel.

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

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

III (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.

3. APPLICATION

3.1 Quick Application Commissioning Guide

The Power generation 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 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 1. Application Commissioning Steps

Step #	Step	Description
1	If you are updating the application to newer version, write down the following counter values before updating: V1.1.10 Total Energy kWh V1.1.13 RunTime Total V1.1.16 Grid Connections V1.1.17 IntFanRunHours V1.1.18 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: P2.10.2 TotalEnergyPreset P2.10.3 GridConnPreset P2.10.4 TotalRunTimPrese P2.10.5 IntFanRuntPresVa P2.10.6 ExtFanRuntPresVa Change parameter P2.10.1 LoadSaveCountVal to "Save values"	This will set the counters to the values before application update.
3	Define right grid settings P2.1.1 Grid Nom Voltage P2.1.2 Grid Nom Freq P2.1.6 Transf inv. side P2.1.7 Transf grid side	When grid settings are right drive voltage is calculated correct.
4	Set parameters P2.1.7 and P2.1.8 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.
5	If commissioning is done before large scale power production is possible, set P2.1.9.1 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.
6	Set the I/O parameters in G2.3 as required.	Some fault or warning may have been triggered due to wiring in customized cabinet solutions.
7	Reset any possible faults.	Reset the possible wiring related faults / warnings.
8	Set P2.9.2.1 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.
9	Set P2.9.1.1 Simulation Mode to "SimModSimDC" in all units and press start in the Beijer panel	This activates the simulation mode 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.
10	When every drive in the system has ran, press stop in the Beijer panel and set P2.9.1.1 Simulation Mode to "Disable"	This disables the simulation mode and enables the drive to run normally.
11	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 P2.1.9.1 DC Start Level the drive will start. Pressing the Start button for 5 seconds forces the drive to start regardless of DC level.
12	Make sure parameter P2.1.9.6 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!	P2.1.9.6 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.
13	In Multimaster system when power production is ~75 % from system maximum, use P2.2.2 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

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 P2.1.8 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. 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.	The drives start up and start producing power.

4. MONITORING SIGNALS

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 25.

Column explanations:

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

4.1 Basic monitor values

4.1.1 Monitoring values 1

Table 2. Monitoring values 1

Code	Values	Unit	ID	Description
V1.1.1	DC-Link Voltage	V	1108	Measured DC Link voltage in volts, filtered.
V1.1.2	DC Voltage Ref.	%	1200	Used DC voltage reference by the regenerative unit in % of Nominal DC voltage. Nominal DC voltage = 1.35 * supply voltage
V1.1.3	Output Current	A	1834	Output current of the inverter coming out of the cabinet.
V1.1.4	Reactive Current	%	1157	
V1.1.5	Power kW	kW	1707	Output Power in the drive's output terminals.
V1.1.6	Supply Frequency	Hz	1123	Drive output frequency
V1.1.7	Supply Voltage	V	1107	Drive output voltage
V1.1.8	Grid Frequency	Hz	1835	Measured line frequency
V1.1.9	Grid Voltage	V	1709	Measured line voltage
V1.1.10	Total Energy kWh	kWh	1837	Total energy produced.
V1.1.11	Energy Today kWh	kWh	1708	Energy produced today.
V.1.1.12	Energy Yesterday	kWh	1733	Energy produced yesterday.
V1.1.13	Run Time Total	h	1836	Total time the inverter has been running.
V1.1.14	RunTime Today	h	1731	The time the inverter has been running today.
V.1.1.15	RunTimeYesterday	h	1732	The time the inverter was running yesterday.
V1.1.16	Grid Connections		1706	Total number of times the inverter has closed the main contactor and connected to the grid.
V1.1.17	Int Fan Run Hours	h	1511	Total time internal fan has been running
V1.1.18	Ext Fan Run Hours	h	1512	Total time external fan has been running
V1.1.19	StandbyRemaining	s	1201	Remaining time in standby mode, if standby mode is activated.

4.1.2 Monitoring values 2

Table 3. Monitoring values 2

Code	Values	Unit	ID	Description
V1.2.1	Cos Phii Actual		1717	
V1.2.2	Unit Temperature	°C	1109	
V1.2.3	Reactive Current Reference	%	1389	
V1.2.4	Active Current	%	1125	
V1.2.5	InverterStatus 1		1819	Diagnostic statusword 1
V1.2.6	InverterStatus 2		1820	Diagnostic statusword 2
V1.2.7	InverterStatus 3		1821	Diagnostic statusword 3
V1.2.8	InverterStatus 4		1822	Diagnostic statusword 4
V1.2.9	EEPROMSaveStatus		1106	Status of the nonvolatile memory (EEPROM) storing activated by the application 0 = IDLE 1 = ACTIVE 2 = RESOURCE ERROR 3 = WRITE ERROR 4 = NOT FOUND 5 = NOT SUPPORTED (e.g. NXP2)
V1.2.10	Status Word		43	
V1.2.11	Used DC start level	V	1965	Monitoring Value for the currently used DC Start Level value.
V1.2.12	Mindex	%	1874	Modulation Index
V1.2.13	Calibrated DC Voltage	V	1839	

4.1.3 Fieldbus monitoring values

Table 4. Fieldbus

Code	Values	Unit	ID	Description
V1.3.1	FB Control Word		1478	Control word from fieldbus
V1.3.2	FB Status Word		1479	Status word to fieldbus
V1.3.3	FB GenPowerLim		1481	Power limit sent by the fieldbus
V1.3.4	FB Q/PF Ref	Q: % PF: -	1480	Reactive Current or Power Factor reference sent by the fieldbus
V1.3.5	Day from PLC		1719	Day index sent from the PLC

4.1.4 I/O monitoring values

Table 5. I/O Monitor

Code	Values	Unit	ID	Description
V1.4.1	DIN1, DIN2, DIN3		15	
V1.4.2	DIN4, DIN5, DIN6		16	
V1.4.3	DIN Status 1		56	
V1.4.4	DIN Status 2		57	
V1.4.5	Analogue Input 1	%	13	
V1.4.6	Analogue Input 2	%	14	
V1.4.7	Custom AnOut 1	%	1240	

4.1.5 MPPT

Table 6. MPPT

Code	Values	Unit	ID	Description
V1.5.1	MPPT Reference		1816	The DC reference from the MPP tracker. Shows without ramping if ramping is used.
V1.5.2	Actual Step Size		1815	This value shows the actual momentary step size of the MPP tracker.
V1.5.3	Actual Step Ratio		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.
V1.5.4	Actual Step State		1817	State of the MPP tracker. For debugging purpose only.
V1.5.5	Power Window On		0	Power window status.
V1.5.6	Optimal DC Point		1724	Estimated optimal DC Point is the DC Reference point which giving the best simulated power.

4.1.6 License key activation

Table 7. License key activation

Code	Values	Unit	ID	Description
V1.6.1	Serial Number Key		1997	Give this number to the technical support of the manufacturer in case of licence key problems.

4.1.7 Grid code

Code	Parameter	Unit	Form.	ID	Description
V1.7.1	Line State		#	2202	
V1.7.2	Line Voltage GC	%	#,##	1912	Line Voltage used by Grid Code
V1.7.3	Line Frequency GC	%	#,##	1913	Line Frequency used by Grid Code
V1.7.4	Line Voltage L1-L2	%	#,##	2203	
V1.7.5	Line Voltage L2-L3	%	#,##	2204	
V1.7.6	Line Voltage L3-L1	%	#,##	2205	
V1.7.7	Trip State			2206	

4.1.8 PID Controller

Code	Parameter	Unit	Form.	ID	Description
V1.8.1	PID Reference		#,#	20	
V1.8.2	PID Actual Value		#,#	21	
V1.8.3	PID Output		#,##	23	

4.2 Monitor Values descriptions

4.2.1 Monitoring values 1

V1.1 *DC-link Voltage* *V* *ID 1108*

Filtered DC Link voltage in Volts.

V1.2 *DC Voltage Reference* *%* *ID 1200*

Used DC voltage reference. 100 % = 1,35 x Nominal AC Voltage.

V1.3 *Output Current* *A* *ID 1834*

Output current of the inverter coming out of the cabinet.

V1.4 *Reactive Current* *%* *ID 1157*

The reactive current of the regenerative drive in % of System Rated Current.

V1.5 *Output Power* *kW* *ID 1707*

Output Power in the drive's output terminals.

V1.6 *Supply Frequency* *Hz* *ID 1123*

The drive output frequency.

V1.7 *Supply Voltage* *V* *ID 1107*

The drive output voltage.

V1.8 *Grid Frequency* *Hz* *ID 1835*

Grid frequency in ##.## Hz. The sign indicates the phase order. Can be monitored only when UNIT is in RUN state.

V1.9 *Grid Voltage* *V* *ID 1709*

AC Voltage measured on the grid side of the main contactor by an external measurement circuit.

V1.10 *Total Energy kWh* *kWh* *ID 1837*

Total produced energy to the grid

V1.11 *Energy Today kWh* *kWh* *ID 1708*

Amount of energy produced today.

V1.12 *Energy Yesterday* *kWh* *ID 1733*

Amount of energy produced yesterday.

V1.13 *Run Time Total* *h* *ID 1836*

Total time the inverter has been running.

V1.14 *Run Time Today* *h* *ID 1731*

The time the inverter has been running today.

V1.15 *Run Time Yesterday* *h* *ID 1732*

The time the inverter was running yesterday.

V1.16 *Grid Connections* *ID 1706*

Total number of times the inverter has closed the main contactor and connected to the grid.

V1.17 *Int Fan Run Hours* *h* *ID 1511*

Total time internal fan has been running

V1.18 *Ext Fan Run Hours* *h* *ID 1512*

Total time external fan has been running

V1.19 *Standby Remaining* *s* *ID 1201*

Remaining time in standby mode, if standby mode is activated.

4.2.2 Monitoring values 2

V1.2.1	*CosPhiiActual*		*ID 1717*

The calculated Cos Phi.

V1.2.2	*Unit Temperature*	*°C*	*ID 1109*

The heatsink temperature of the drive.

V1.2.3	*Reactive Current Reference*	*%*	*ID1389*

The final reactive current reference.

V1.2.4	*Active Current*	*%*	*ID 1125*

The active current in % of System Rated Current.

A negative value means that the current is flowing to AC side from DC side.

V1.2.5 Inverter statusword 1 ID 1819

Diagnostic statusword 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 87
12	UnBalance	No Alarm	Alarm	See Fault list 18
13	Thermistor Fault	No Fault	Fault	See Fault list 29
14	Safe Disable	No Fault	Fault	See Fault list 30
15	*Reserved*	No Fault	Fault	

V1.2.6 Inverter statusword 2 ID 1820

Diagnostic statusword 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

V1.2.7 Inverter statusword 3 ID 1821

Diagnostic statusword 3.

Bit	Name	Value = 0	Value = 1	Description
0	Processor Watchdog	No Fault	Fault	See Fault list 25
1	*Reserved*			
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*	No Fault	Fault	
15	*Reserved*	No Fault	Fault	

V1.2.8 Inverter statusword 4 ID 1822

Diagnostic statusword 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 Temp Alarm	No Alarm	Alarm	Fault code 99
13	Analog Signal Too Low Fault active	No Fault	Fault	Fault code 50
14	Analog Signal Too Low Warning active	No Alarm	Alarm	Fault code 50
15	*Reserved*			

V1.2.9 EEPROM Saving Status ID 1106

Status of the nonvolatile memory (EEPROM) storing activated by the application

0 = IDLE

1 = ACTIVE

2 = RESOURCE ERROR

3 = WRITE ERROR

4 = NOT FOUND

5 = NOT SUPPORTED (e.g. NXP2)

V1.2.10 Status Word ID 43

Application Status Word combines different drive statuses to one data word.

	Application Status Word ID43	
	FALSE	TRUE
b0		
b1	Not in Ready state	Ready
b2	Not Running	Running
b3	No Fault	Fault
b4		
b5		
b6	Run Disabled	Run Enable
b7	No Warning	Warning
b8		Charging Switch closed (internal)
b9		MCB Control (DO Final)
b10		MCB Feedback
b11		DO Charging Active
b12	No Run Request	Run Request
b13		
b14		PV Field OK
b15		

V2.1.2.11 Used DC start level ID 1965

Monitoring Value for the currently used DC Start Level value.

V2.1.2.12 Mindex ID 1874

This value can be used to recognize low Dc-Link voltage when operating in island mode. If the value is above 90%, the drive is in limits to make correct voltage to the AC side.

V2.1.2.13 Calibrated DC Voltage ID 1839

Calibrated DC Voltage is used in the parallel drives

4.2.3 Fieldbus monitoring values

V1.3.1 FB Control Word ID 1478

Control Word received from the Fieldbus Master.

	FB Control Word	
	Signal	Comment
b0	Start	0 = Stop Command 1 = Start Command
b1		
b2	Reset	0>1 Reset fault.
b3		
b4		
b5		
b6		
b7		
b8	Master	Master command
b9		
b10		
b11		
b12		
b13	ReactCurrOr CosPhiiRefSel	0 = Reactive Current Control 1 = CosPhii Control
b14	FB Force start	0 = Normal Start 1 = Force Start regardless of DC voltage level
b15		

V1.3.2 FB Status Word ID 1479

Status Word sent to the upper system/PLC via Fieldbus.

	FB Status Word	
	Signal	Comment
b0	StartCriterions FullFilled	Not only if Inverter control is ready, but if all "Ready Criterions" are also fulfilled
b1	Inverter Activated	When active, the inverter can be in either in Standby or Inverter Running mode.
b2		
b3	Fault	
b4	Warning	
b5	Inverter Activated Standby	
b6		
b7	Main contactor close command	
b8	Master	Master command
b9	Pulse 1s	Heartbeat bit. The inverter toggles this bit on and off. 1s on, 1s off.
b10	ChargeSwState	**0** = Open **1** = Closed
b11		
b12		
b13		
b14		
b15		

V1.3.3 FB GenPowerLim ID 1481

Power limit sent by the fieldbus.

V1.3.4 FB Q/PF Ref ID 1480

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

V1.3.5 Day From PLC ID 1719

Day index sent from the PLC.

4.2.4 I/O monitoring values

V1.4.1 DIN1, DIN2, DIN3 ID 15

V1.4.2 DIN4, DIN5, DIN6 ID 16

	DIN1/DIN2/DIN3 status	DIN4/DIN5/DIN6 status
b0	DIN3	DIN6
b1	DIN2	DIN5
b2	DIN1	DIN4

V1.4.3 DIN Status 1 ID 56

V1.4.4 DIN Status 2 ID 57

	DIN StatusWord 1	DIN StatusWord 2
b0	DIN: A.1	DIN: C.5
b1	DIN: A.2	DIN: C.6
b2	DIN: A.3	DIN: D.1
b3	DIN: A.4	DIN: D.2
b4	DIN: A.5	DIN: D.3
b5	DIN: A.6	DIN: D.4
b6	DIN: B.1	DIN: D.5
b7	DIN: B.2	DIN: D.6
b8	DIN: B.3	DIN: E.1
b9	DIN: B.4	DIN: E.2
b10	DIN: B.5	DIN: E.3
b11	DIN: B.6	DIN: E.4
b12	DIN: C.1	DIN: E.5
b13	DIN: C.2	DIN: E.6
b14	DIN: C.3	
b15	DIN: C.4	

V1.4.5 Analogue Input 1 % ID 13

V1.4.6 Analogue Input 2 % ID 14

V1.4.7 Custom AnOut 1 % ID 1240

Customized analogue output

4.2.5 MPPT

V1.5.1 MPP Reference ID 1816

The DC reference of the MPP tracker.

V1.5.2 Actual Step Size ID 1815

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

V1.5.3 Actual Step Ratio ID 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.

V1.5.4 MPPT State ID 1817

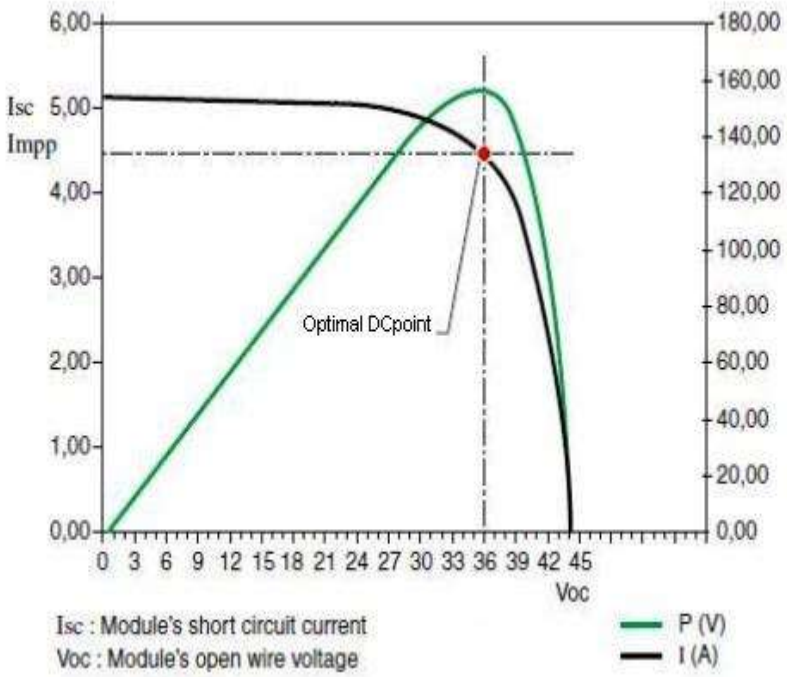
State of the MPP tracker. For debugging purposes only.

P1.5.5 Power Window On

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.

V1.5.6 Simulated Optimal DC point ID 1724

Estimated optimal DC Point is the DC Reference point which giving the best simulated power.



Picture xx. Optimal DC point.

4.2.6 License key activation

V1.6.1 Serial Number Key ID 1997

Give this number to the technical support of the manufacturer when there is a problem in the activation of a function. The drive shows a licence fault.

4.2.7 Gird code

V1.7.1 Line State ID 2202

Give this number to the technical support of the manufacturer when there is a problem in the activation of a function. The drive shows a licence fault.

	Line State	
	Signal	
b0	LineVoltageHighFast_Act	
b1	LineVoltageHighSlow_Act	
b2	LineVoltageLowSlow_Act	
b3	LineVoltageLowFast_Act	
b4	LineFreqHighFast_Act	
b5	LineFreqHighSlow_Act	
b6	LineFreqLowSlow_Act	
b7	LineFreqLowFast_Act	
b8	LVRTTimerStart	
b9	LVRTBiTimerStart	
b10	SeparateLimitOrForces	
b11	LineFreqRate	
b12	10minAverageTrip	
b13	FALSE	
b14	FALSE	
b15	FALSE	

V1.7.2 Line Voltage GC % #,## 1912

V1.7.3 Line Frequency GC % #,## 1913

V1.7.4 Line Voltage L1-L2 % #,## 2203

V1.7.5 Line Voltage L2-L3 % #,## 2204

V1.7.6 Line Voltage L3-L1 % #,## 2205

V1.7.7 Trip State 2206

4.2.8 PID Controller

Monitoring values for power controller

V1.8.1 PID Reference ID 20

Active Current reference

V1.8.2 PID Actual Value ID 21

Active current

V1.8.3 PID Output ID 23

PID controller output for DC Voltage reference, gives an offset for DC Voltage Reference.

5. PARAMETERS

On the next pages you will find the lists of parameters within the respective parameter groups. The parameter descriptions are given in the chapter 6. 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

All parameters is possible to control from fieldbus by ID number

5.1 P2.1 Basic parameters

Table 9. Basic parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.1	Grid Nom Voltage	200	1000	Vac	500V:400 690V:690	110	Set the nominal voltage of the grid.
P2.1.2	Grid Nom Frequency	-320,00	320,00	Hz	50,00	1532	Initial start frequency
P2.1.3	Unit nom Current	0.0	Ih	A	Il	113	Used to scale % values.
P2.1.4	Parallel AFE	0	1		0	1501	**0** = Single AFE **1** = Parallel AFE
P2.1.5	Transformer: Inverter Side	0	3200	Vac	400	1850	
P2.1.6	Transformer: Grid Side	0	3200	Vac	400	1851	
P2.1.7	Number Of Units	0	8		1	1604	Number of units in array mode system. Needed e.g. for system bus communication
P2.1.8	Configuration	-1	9		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.

5.1.1 DC Level Setup

Table 10. DC Level Setup

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.9.1	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.
P2.1.9.2	DCStartLvlDelay	1,00	320,00	s	10,00	1964	Delay for when the DC rises above P2.1.7.2 before DC level is considered high enough for starting.
P2.1.9.3	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.
P2.1.9.4	DCStartLvlOffset	0	300	V	15	1967	Offset value to be used when P2.1.7.4 is set to "ShutdownDC".
P2.1.9.5	DCStartMaxLimit	0	2000	V	590	1968	Absolute maximum value for the Strt/Stp Level when P2.1.7.4 is set to "ShutdownDC"

5.2 Reference Handling

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.1	Cos phi ref	-1,0	1,0		1,0	2304	Cos phi reference
P2.2.2	Reactive Current Reference	-300	300	%	0	1459	Regenerative reactive current reference 100.0 = Nominal current. Positive =Inductive Negative = Capacitive

5.2.1 DC Reference

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.3.1	DC Drooping	0,00	100,00	%	0,00	620	DC Drooping for balancing current output.
P2.2.3.2	DC Calibration	-5,00	5,00	%	0,00	1777	DC calibration for balancing the outputs of parallel drives
P2.2.3.3	Manual DC	0	1		0	1808	0 = Disable 1 = Enable
P2.2.3.4	Manual DC Reference	0,00	320.00	%	150,00	1809	Reference for manual DC control

5.2.2 Power/frequency reference

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.4.1	Gen Power Ref.	0	170.0	%	0.0	1533	
P2.2.4.2	ReferenceMode	0	1		0	1914	0 = Pure Iq ref 1 = Volt comp Iq

5.2.2.1 ***PID Power Controller***

Code	Parameter	Min	Max	Unit	Default	ID	Description
2.2.4.3.1	PID Power Activation	0.1	W.10	DigIN	0.1	1907	
2.2.4.3.2	PID Kp	0,00	1e6	%	100,00	1911	
2.2.4.3.3	PID Ti	0	1e5	ms	1000	1906	
2.2.4.3.4	PID DC Low	-50,00	50,00	%	-5,00	1903	
2.2.4.3.5	PID DC High	-50,00	50,00	%	5,00	1904	
2.2.4.3.6	Reference Down Rate	-1,00	100	%/s	-1,00	1842	
2.2.4.3.7	Reference Up Rate	-1,00	100	%/s	-1,00	1843	

5.2.3 AC Voltage reference

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.5.1	Capacitor Size	0,0	100,0	%	5,4	1460	Regen filter capacitor size in ###.# %
P2.2.5.2	Inductor Size	0,0	100,0	%	3,0	1461	Regen total filter inductance in ###.# %
P2.2.5.3	Capacitor Size 2nd	0,0	100,0	%	0,0	3330	
P2.2.5.4	Capacitor Size 2nd Voltage	0,0	1100,0	%	0,0	3331	

5.3 IO Signals

5.3.1 Digital Inputs

Note! Check also G2.3.1.13 Configuration parameters for inverted inputs!
Note! If Digital Input signal source is set to DigIn:F.1 or DigIn:F.2, the application uses "ANIN as DIGIN1" or "ANIN as DIGIN2" 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 12. Digital Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.3.1.1	External Trip	DigIN:0.1	DigIN:F.10	DigIN:0.1	1214	Select the digital input to activate External Trip.
P2.3.1.2	Surge Alarm	DigIN:0.1	DigIN:F.10	DigIN:0.1	1806	Select the digital input to Activate Surge Alarm.
P2.3.1.3	Main Cont Ack	DigIN:0.1	DigIN:F.10	DigIN:0.1	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.
P2.3.1.4	Fault Reset	DigIN:0.1	DigIN:F.10	DigIN:0.1	1208	Select digital input used for fault reset.
P2.3.1.5	DCSwitchFeedback	DigIN:0.1	DigIN:F.10	DigIN:0.2	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.
P2.3.1.6	FilterOverTemp	DigIN:0.1	DigIN:F.10	DigIN:0.1	1179	Digital input for trigging a LCL filter over temperature fault.
P2.3.1.7	DC Insulation	DigIN:0.1	DigIN:F.10	DigIN:0.1	1180	Digital input for trigging DC Insulation.
P2.3.1.8	Emergency Switch	DigIN:0.1	DigIN:F.10	DigIN:0.1	1181	Digital input for trigging Emergency Switch.
P2.3.1.9	Start Ok	DigIN:0.1	DigIN:F.10	DigIN:0.2	1974	Digital input for giving external Start Ok signal.
P2.3.1.10	Power Limit 1	DigIN:0.1	DigIN:F.10	DigIN:0.1	1182	Digital Input to activate DI Power Limit 1 (P2.3.1.13.11)
P2.3.1.11	Power Limit 2	DigIN:0.1	DigIN:F.10	DigIN:0.1	1183	Digital Input to activate DI Power Limit 2 (P2.3.1.13.13)
P2.3.1.12	Custom DIN 1	DigIN:0.1	DigIN:F.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 P2.3.1.13.15)

5.3.1.1 *Configuration*

These signals are used to specify are the G2.3.1 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 13. Digital Input configuration parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.1.13.1	Input inversion	0	65535	-	33	1091	Inversion control of the input I/O signals. B0: Invert external fault B1: Invert surge protection B2: Invert main contactor feedback B3: Invert IO fault reset B4: Invert DC switch closed B5: Invert LCL over temp B6: Invert DC insulation B7: Invert emergency stop B8: Invert IO start OK B9: Invert power limit 1 B10: Invert power limit 2 B11: Invert custom DIN
P2.3.1.13.2	PowerLim 1 Value	0,0	110,0	%	110,0	767	
P2.3.1.13.3	PowerLim 2 Value	0,0	110,0	%	110,0	769	
P2.3.1.13.4	CustomDIN1 ID	0	65535	-	0	771	

5.3.1.2 *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.

5.3.1.3 *Power Limitation*

Table 14. Power Limitation Analog Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.3.2.1.1	Power Lim Input	AnIN:0.1	AnIN:E.10	AnIN:0.1	1787	This parameter specifies which Analog Input is used for Power Limitation.
P2.3.2.1.2	Power Lim Max	Power Lim Min	110,0 %	110,0 %	1788	This parameter specifies what is the Power Limitation value at maximum input level.
P2.3.2.1.3	Power Lim Min	0,0 %	Power Lim Max	0,0 %	1789	This parameter specifies what is the Power Limitation value at minimum input level.
P2.3.2.1.4	PLimInput Filter	0,00 s	10,00 s	0,2 s	1791	Filter Time for Power Limitation measurement.
P2.3.2.1.5	AnPLimOnFault	0,0 %	110,0 %	110,0 %	1792	Specifies what Power Limit value from Analog Input is given to the system when Analog Input Fault for this signal has been detected.

5.3.1.4 *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 G2.3.2.2 has parameters for Digital Input #1 and G2.3.2.3 for #2.

If any signal in G2.3.1 is set as DigIN:F.1 it is then controlled by Analog Input specified in G2.3.2.2 (Digital Input #1), DigIN:F.2 corresponds to G2.3.2.3 (Digital Input #2).

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

Table 15. Parameters for using an Analog Input as Digital Input #1

Code	Parameter	Min	Max	Default	ID	Description
P2.3.2.2.1 P2.3.2.3.1	AnalogDIN1 Input	AnIN:0.1	AnIN:E.10	AnIN:0.1	#1: 1770 #2: 1766	This parameter specifies which Analog Input is used as Digital Input.
P2.3.2.2.2 P2.3.2.3.2	AnalogDIN1 Filt	0,00 s	10,00 s	0,2 s	#1: 1771 #2: 1767	Filter Time for Digital Input.
P2.3.2.2.3 P2.3.2.3.3	AnalogDIN1 Hyst	0,00 %	20,00 %	5,00 %	#1: 1772 #2: 1768	Hysteresis for the input.
P2.3.2.2.4 P2.3.2.3.4	AnDIGIN1FaultVal	False	True	False	#1: 1773 #2: 1769	Specifies what this Digital Input is set to in Analog Input Fault situation

5.3.1.5 *DC Ground Measurement*

Table 16. DC Ground Analog Input parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.3.2.4.1	DCGroundMonInput	AnIN:0.1	AnIN:E.10	AnIN:0.1	1763	This parameter specifies which Analog Input is used for DC Ground Monitoring.
P2.3.2.4.2	DCGrdInputFilter	0,00 s	10,00 s	0,2 s	1764	Filter Time for DC Ground Monitoring.
P2.3.2.4.3	AnDCGrndFaultVal	0,00 %	100,00 %	100,00 %	1765	Specifies the DC Ground measurements value in Analog Input Fault situation.

5.3.1.6 *Customizable Analog Input*

Table 17. Customizable Analog Input's Parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.3.2.5.1	CustomANINInput	AnIN:0.1	AnIN:E.10	AnIN:0.1	1757	Used to select which analog input is used as Custom Analog Input
P2.3.2.5.2	CustomANINFiltT	0,00 s	10,00 s	0,05 s	1758	Filter Time setting for the analog input signal
P2.3.2.5.3	CustomANINMax	P2.3.2.5.4	32767	10000	1759	Defines the maximum value set to the variable defined by P2.3.2.5.6 when the Analog Input is feed with maximum signal
P2.3.2.5.4	CustomANINMin	-32768	P2.3.2.5.3	0	1760	Defines the minimum value set to the variable defined by

						P2.3.2.5.6 when the Analog Input is feed with minimum signal
P2.3.2.5.5	CustomANINID	0	1999	0	1761	ID of the variable this analog input is controlling
P2.3.2.5.6	CustomANINInv	0	1	0	1762	No = The stronger the input signal's strength, the bigger value is set to the selected variable Yes = The stronger the input signal's strength, the smaller value is set to the selected variable

5.3.2 Digital Outputs

Table 18.Digital Output parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.3.3.1	Ready	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	432	Open: Drive is not ready Closed: Drive is ready
P2.3.3.2	Run	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	433	Open: Drive is not running Closed: Drive is running
P2.3.3.3	Fault	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	434	Open: Drive is not faulted Closed: Drive is faulted
P2.3.3.4	Fault, Inverted	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	435	Open: Drive is faulted Closed: Drive is not faulted
P2.3.3.5	Warning	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	436	Open: Drive has no warnings active Closed: Drive has active warnings
P2.3.3.6	MContControl	DigOUT:B.2	DigOUT:B.2	DigOUT:B.2	445	Open: Drive commands the main contactor open Closed: Drive commands the main contactor closed
P2.3.3.7	DC Supply Ready	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	440	Open: DC Supply not ready Closed: DC Supply ready
P2.3.3.8	DC Earth Fault	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	441	Open: DC Grounding Ok Closed: DC Grounding Faulted
P2.3.3.9	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
P2.3.3.10	Ext Fan Control	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	443	Open: Drive commands the external fan to stop Closed: Drive commands the external fan to run
P2.3.3.11	FollOpenMCont	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	444	Closed: Drive is a multimaster follower and Grid disconnection is forced
P2.3.3.12	PLimitationActive	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	446	Closed: Selected Power Limit Reference (P2.3.3.19.1) is lower than the trigger level (P2.3.3.19.2)
P2.3.3.13	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.

P2.3.3.14	Drive Charged	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	450	Closed: Drive is Charged Open: Drive is not Charged
P2.3.3.15	Drive Ok	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	451	With power generation 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.
P2.3.3.16	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.
P2.3.3.17	Fault or GCStop	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	453	The drive is stopped due to fault or Grid Code related issue.
P2.3.3.18	Charging Pulse	DigOUT:0.1	DigOUT:E.10	DigOUT:0.1	454	Charging Pulse for external devices.

5.3.2.1 Configuration

Table 19. Digital Output configuration parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.3.19.1	PLimActTrigLevel	0,0	300,0	%	110,0	447	Trigger level for Power Limitation Active Digital Output (P2.3.3.12)
P2.3.3.19.2	PLimActTrigSel	0	2		0	448	Monitored Power Limit Reference: 0 = External Power Limit Reference 1 = Grid Code Power Limit Value 2 = Both
P2.3.3.19.3	ChargPulseLength	10	100	s	15	455	Length of the charging pulse from output specified by P2.3.3.18

5.3.3 Analog Outputs

Table 20.Analog Output parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.4.1	AnOut Sel	AnOUT:0.1	AnOUT:E.10		AnOUT:0.1	1232	Specify the port for analog output
P2.3.4.2	AnOut ID	0	2000		0	1233	Set the ID of the signal to be connected to the Analog Output specified by P2.3.4.1. To connect e.g. DC-link voltage to the analog output, enter 1839 as parameter value.
P2.3.4.3	AnOut FilterTime	0,00	10,00	s	0,10	1235	Filter time for the selected signal in seconds.
P2.3.4.4	AnOutputVarMax	P2.3.4.5	32767		32767	1236	Maximum value of a signal selected for Analog Output.
P2.3.4.5	AnOutputVarMin	-32768	P2.3.4.4		0	1237	Minimum value of a signal connected to the Analog Output.
P2.3.4.6	AnOutOutpuMax	P2.3.4.7	100,00	%	100,00	1238	The analog output's signal strength corresponding with P2.3.4.4 AnOutputVarMax
P2.3.4.7	AnOutOutpuMin	0,00	P2.3.4.6	%	0,00	1234	The analog output's signal strength corresponding with P2.3.4.5 AnOutputVarMin
P2.3.4.8	AnOut Inverted	0	1		0	1239	If this is enabled, the analog output's signal strength is at maximum, when the linked variable's value is at its minimum and vice versa.

5.4 Limit Settings

5.4.1 Current Limit

Table 21. Current limit

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.1.1	Current Limit	0	Varies	A	Varies	107	Total current limit
P2.4.1.2	LCL OvertTempFact	40	100	%	70	1748	Factor multiplied to current limit when LCL Over Temp input is active.

5.4.2 Generator Power Limit

Table 22. Generator power limit

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.2.1	Power Lim Gen	0,1	130,0	%	110,0	1290	Power limit for the generator side operation.
P2.4.2.2	GenLimRampStart	-0,1	110,0	%	-0,1	1786	Generator limit starting ramp rate %/s.
P2.4.2.3	GenLimRampStop	-0,1	110,0	%	10,0	1785	Generator limit stopping ramp rate %/s.
P2.4.2.4	MinGenPowerLimit	0	300,0	%	4,0	1938	Minimum Power limit for generator side power limitter
P2.4.2.5	PowLimStartLevel	P2.4.2.6	20,0	%	6,0	1983	Drive can start to generate power when power limit over this parameter.
P2.4.2.6	PowLimStopLevel	-1,0	P2.4.2.5	%	4,0	1977	Drive stop to generate power when power limit below this parameter.
P2.4.2.7	Disable TempLimit	0	1		0	1756	Disabled temperature power limit

5.5 Inverter Control

5.5.1 Standby Control

Table 23 Standby control

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.1.1	PwrStandbyLevel	-0,1	1000,0	%	4,0	1540	The Inverter will stop if power is below this level for a time longer than "PwrStandbyDelay". When level is negative then standby is not used
P2.5.1.2	PwrStandbyDelay	0	32000	s	120	1541	Delay before stopping when power is below "PwrStandbyLevel"
P2.5.1.3	PwrQuickStandby	-0.1	10.0	%	0	1549	Inverter will stop without any ramps after delay stated in P2.5.1.4, 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. When level is negative then standby is not used
P2.5.1.4	PwrQuickStdbyDel	0.00	10.00	s	3,00	1560	Delay time for the quick standby functionality.
P2.5.1.5	QuickStandbyDC	0	1		0	1905	Use quick standby DC level in the DC start level
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.

5.5.2 MPP Tracker

Table 24. MPP Tracker parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.2.1	MinStepSize	0,05	P2.3.2.2	%	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.
P2.5.2.2	MaxStepSize	P2.5.2.1	20,00	%	0,80	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.
P2.5.2.3	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.
P2.5.2.4	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.
P2.5.2.5	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.
P2.5.2.6	Step Time	10	10000	ms	2500	1812	This parameter defines how often the MPP tracker will take a step in any direction. Default varies depending on the inverter size class.
P2.5.2.7	PowerFilterTime	0,00	320,00	s	0,00	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.
P2.5.2.8	UseAveragedPMeas	0	1		1	1831	This parameter enables or disables the 10 sample averaging of the output power figure to filter out noise from the measurement.
P2.5.2.9	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.
P2.5.2.10	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 one third of the step time (StepTime/3). 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.)
P2.5.2.11	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.
P2.5.2.12	DC Reference at Start	50	100	%	100	1595	Percentage of start moments open circuit DC Voltage, which is going to be used as DC Reference at start up.
P2.5.2.13	DCRampT%StepT	0	100	%	33	1829	DC Reference Ramp rate compared to the Step Time P2.5.2.6.
P2.5.2.14	PowerWindow(Dec)	0	100,00	%	0,12	1842	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. Power Window size when decreasing DC reference.
P2.5.2.15	PowerWindow(Inc)	0	100,00	%	0,05	1843	Power Window size when increasing DC reference.
P2.5.2.16	FastCondTreshold	0,0	100,0	%	2,0	1946	Fine tuning
P2.5.2.17	PDiffGIncTresh	-100,0	100,0	%	0,0	1944	Fine tuning
P2.5.2.18	PDiffGDecTresh	-100,0	100,0	%	0,2	1943	Fine tuning

5.5.3 Bypass Control

Table 25. Bypass Control parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.3.1	PC Control Mode	0	3		1	1807	0 = Disable 1 = Start 2 = Reference 3 = Start/Ref

5.5.4 Multimaster Follower Control

Table 26. Multimaster follower Control parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.4.1	Foll Start Lvl	P2.5.4.3	100,0	%	70,0	1984	Follower start level
P2.5.4.2	Foll Start Delay	0,00	300	s	5	1985	Follower start delay
P2.5.4.3	Foll Stop Lvl	-1,0	P2.5.4.1	%	27,0	1986	Follower stop level
P2.5.4.4	Foll Stop Delay	0,00	300	s	300	1987	Follower stop delay

5.5.5 Power Adjust

Table 27. Field Adjustable Power Scaling Parameter

Code	Parameter	Min	Max	Defa ult	ID	Description
P2.5.5.1	a*Power^2	-5,0000	5,0000	0	1523	Power calculation fine tuning
P2.5.5.2	b*Power	-50,000	50,000	1,000	1524	Power calculation fine tuning
P2.5.5.3	c	-50,000	50,000	0	1525	Power calculation fine tuning

5.6 Drive Control

Table 28. Drive control

Code	Parameter	Min	Max	Unit	Default	ID	Description
P 2.6.1	Switching Freq	2	6	kHz	3.6	601	
P 2.6.2	AFE Options 1	0	65535		32	1463	
P 2.6.3	AFE Options 2	0	65535		0	1464	
P 2.6.4	AFE Options 3	0	65535		0	1466	
P 2.6.5	Start Delay	0	320	s	0	1500	
P 2.6.6	Modulator Type	0	4		1	1516	
P 2.6.7	App Controlword1	0	65535		0	1900	

5.6.1 Control

Code	Parameter	Min	Max	Unit	Default	ID	Description
P 2.6.8.1	Active Current Kp	0	4000		400	1455	
P2.6.8.2	Active Current Ti	0	1000	ms	1,5	1456	
P2.6.8.3	Sync Kp	0	32000		2000	1457	
P2.6.8.4	Sync Ti	0	1000		50	1458	

5.7 Protections

5.7.1 General

Table 29.Protections, General parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.1.1	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
P2.7.1.2	Input Ph. Superv	0	2		2	1518	The input phase supervision ensures that the input phases of the Inverter have an approximately equal current. 0 = No response 1 = Warning 2 = Fault
P2.7.1.3	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
P2.7.1.4	UserTempWarnLimit	40	100	°C	78	1853	Limit for giving the temperature rising warning.
P2.7.1.5	DCSwitchNOKDelay	0,00	100,00	s	0,20	1971	Delay for dropping DC Switch digital input signal to FALSE.
P2.7.1.6	StartNOKDelay	0,00	100,00	s	0,20	1973	Delay for dropping Start Ok digital input signal to FALSE.

5.7.2 DC Earth Fault

Table 30.DC Earth Fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.2.1	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
P2.7.2.2	DCGroundFaultLev	0,00	100,00	%	13,00	1715	Fault level of analog input.
P2.7.2.3	DCGoundWarnLevel	0,00	100,00	%	8,00	1716	Warning level of analog input.
P2.7.2.4	DCGroundHysteres	0,00	2,00	%	0,00	1714	Hysteresis for warning and fault levels.
P2.7.2.5	DCGround Delay	0,00	100,00	s	60,00	1782	Delay for warning and fault.
P2.7.2.6	DCGroundRstDelay	1	3600	s	180	1750	Reset delay of fault, if fault conditions no longer active.

5.7.3 AC Earth Fault

Table 31.AC Earth Fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description

P2.7.3.1	Earth fault	0	1		1	1332	Action in case of Earth Fault. 0 = No response 1 = Fault
P2.7.3.2	Earth Fault Curr	0,0	100,0	%	50,0	1333	Max level of Earth current in % of unit current.

5.7.4 Main Contactor

Table 32.Main Contactor parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.4.1	MCont FaultDelay	0,00	10,00	s	0,50	1521	Delay for Main contactor fault. Delay between main contactor control relay close command and main contactor acknowledge signal. If acknowledge signal is not received within this time, then fault 64 is trigged.
P2.7.4.2	Start Delay	0,00	10,00	s	0,40	1519	Main contactor ON delay. Delay from Main contactor acknowledge to modulation start.

5.7.5 Fieldbus

Table 33. Field bus fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.5.1	HeartbeatTimeout	0,000	65,000	s	3,000	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.
P2.7.5.2	TimeoutRstDelay	0	65000	s	30	1841	The heartbeat timeout fault will be reset automatically after this time if the heartbeat signal re-appears.

5.7.6 System bus

Table 34.System bus fault parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.6.1	HeartbtFltDelay	0,000	65,00	s	3,000	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.
P2.7.6.2	CommFaultDelay	0,00	65,00	s	3,000	1601	Trip delay from communication problems with systembus option board.

5.7.7 Auto reset

Table 35.Automatic reset parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.7.1	Wait Time	0,10	10,00	s	0,50	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.
P2.7.7.2	Trial Time	0,00	60,00	s	30,00	718	If the fault trigger appears more often than defined by parameters P2.7.7.3 to P2.7.7.7 inside the trial time
P2.7.7.3	Overvolt. Tries	0	10		10	721	This parameter determines how many automatic restarts can be made during the trial time set by parameter P2.7.7.2. 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.
P2.7.7.4	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 P2.7.7.2. 0 = No automatic restart after overcurrent fault trip >0 = Number of automatic restarts after overcurrent trip and IGBT temperature faults.
P2.7.7.5	Ext.Trip Tries	0	10		0	725	This parameter determines how many automatics restarts can be made during the trial time set by P2.7.7.2. 0 = No automatic restart after External fault trip >0 = Number of automatic restarts after External trip.

P2.7.7.6	Input Ph. Tries	0	10		10	726	This parameter determines how many automatics restarts can be made during the time set by P2.7.7.2.

5.7.8 Analog Inputs

Table 36. Analog Input Supervision Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.8.1	AnInputFaultMode	0	2	-	1	1947	Analog Input Fault Mode: 0 = No Action 1 = Warning 2 = Fault
P2.7.8.2	AnInFaultDelay	0,000	10,000	s	1,000	1941	The Analog Input fault will be triggered after this delay when faulty operation has been detected.

5.7.9 AC Voltage Protections

Note! This is only visible when Grid code functionality is turned OFF

Table 37. AC Voltage Protection Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.9.1	AC Voltage Max	0	200	%	110	1710	Max AC Voltage Limit.
P2.7.9.2	AC Voltage Min	0	200	%	70	1711	Min AC Voltage Limit.
P2.7.9.3	AC Max TripDelay	0	300	s	0	1796	Trip delay if voltage above max limit.
P2.7.9.4	AC Min TripDelay	0	300	s	0	1797	Trip delay if voltage below min limit.
P2.7.9.5	AC Volt RstDelay	1	3600	s	185	1703	Reset delay of fault if fault conditions no longer active.

5.7.10 AC Frequency Protections

Note! This is only visible when Grid code functionality is turned OFF

Table 38. AC Frequency Protection Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.10.1	AC Freq Max	0	200	%	103	1752	Max AC Frequency Limit.
P2.7.10.2	AC Freq Min	0	200	%	98	1753	Min AC Frequency Limit.
P2.7.10.3	AC Freq TripDelay	0	300	s	0	1805	Trip delay if frequency is above or below limits.
P2.7.10.4	AC Freqt RstDelay	1	3600	s	185	1751	Reset delay of fault, if fault conditions no longer active.

5.8 Fieldbus

Table 39. Fieldbus

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.8.1	FB Data Out1 Sel	0	10000		1650	852	
P2.8.2	FB Data Out2 Sel	0	10000		1651	853	
P2.8.3	FB Data Out3 Sel	0	10000		1652	854	
P2.8.4	FB Data Out4 Sel	0	10000		1653	855	
P2.8.5	FB Data Out5 Sel	0	10000		1654	856	
P2.8.6	FB Data Out6 Sel	0	10000		1655	857	
P2.8.7	FB Data Out7 Sel	0	10000		1656	858	
P2.8.8	FB Data Out8 Sel	0	10000		1657	859	
P2.8.9	FB Data In 1 Sel	0	10000		1481	876	
P2.8.10	FB Data In 2 Sel	0	10000		1480	877	
P2.8.11	FB Data In 3 Sel	0	10000		0	878	
P2.8.12	FB Data In 4 Sel	0	10000		0	879	
P2.8.13	FB Data In 5 Sel	0	10000		0	880	
P2.8.14	FB Data In 6 Sel	0	10000		0	881	
P2.8.15	FB Data In 7 Sel	0	10000		0	882	
P2.8.16	FB Data In 8 Sel	0	10000		0	883	
P2.8.17	FB Control Slot	0	4		0	1979	0 = Slots D & E 1 = Slot D 2 = Slot E 3 = Slot D + Fast PB 4 = Slot E + Fast PB

5.9 System Tests

5.9.1 Power Simulation

Table 40.System test Power simulation parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.9.1.1	Simulation Mode	0	2		0	1720	0 = Disable 1 = Enable 2 =SimModSimDC
P2.9.1.2	BreakDownPoint	0,00	320,00	V	190,00	1721	
P29.1.3	BreakDownPower	0,0	3200,0	%	70,0	1722	
P2.9.1.4	BreakDownRatio	0,00	320,00	%	1,35	1723	
P2.9.1.5	Simulation DC	400	1500	V	600	1577	Simulation without DC works with this Value

5.9.2 System bus

Table 41.System test, System bus parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.9.2.1	SystemBus Test	0	1		0	1780	Parameter for testing if system bus configuration is ok. 0 = Disable 1 = Enable

5.9.3 Simulated Grid

Table 42.Simulated grid parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.9.3.1	SimGridFreq	0,00	100,00	Hz	50,00	1725	Simulated Grid Frequency
P2.9.3.2	SimGridVoltage	0	1000	V	400	1726	Simulated Grid Voltage, default value varies between power sizes.
P2.9.3.3	UseSimulatedFreq	0	1		1	1728	Enable or disable the use of simulated frequency in simulation mode.
P2.9.3.4	UseSimulatedVolt	0	1		1	1729	Enable or disable the use of simulated voltage in simulation mode.

5.10 Counters

Table 43.Countes parameters

Code	Parameter	Min	Max	Unit	Defa ult	ID	Description
P2.10.1	LoadSaveCountVal	0	2		0	1861	Counters Values Load or Save Functionality 0 = Idle Do nothing 1 = Load Values; Load inverter counters values to parameters P2.10.2-6 2 = Save Values; Save parameters P2.10.2-6 values to the inverter counters values.
P2.10.2	TotalEnergyPrese	0,0	42949 6729,5	kWh	0	1858	Value to save to Total Energy counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.10.3	GridConnPreset	0	42949 67295		0	1730	Value to load into GridConnection counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.10.4	TotalRuntimPrese	0	42949 67295	h	0	1859	Value to load into Runtime total counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.10.5	IntFanRuntPresVa	0	42949 67295	h	0	1894	Value to load into Internal Fan Runtime counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.10.6	ExtFanRuntPresVa	0	42949 67295	h	0	1896	Value to load into External Fan Runtime total counter when "LoadSaveCountVal" parameter is set to 2/Save.
P2.10.7	EnergyProdIntegT	0,200	1,000	s	0,200	1856	Energy Counter algorithm's integration interval

5.11 Admin Parameters

5.11.1 Ext Fan Control

Table 54. External fan control parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.11.1.1	Start temp	30	60	°C	45	1727	The temperature level of the inverter unit, at which the external fan control signal will be activated. The external fan signal can be selected for any digital/relay output.
P2.11.1.2	Stop temp	25	45	°C	40	1734	The temperature level of the inverter unit, at which the external fan control signal will be deactivated. Notice! The deactivation can also be delayed with the "Stop Delay" parameters. (If the inverter stops the unit temperature might decrease much faster than e.g. the LCL's, then a delay to get some more cooling time might be appropriate.)The external fan signal can be selected for any digital/relay output.
P2.11.1.3	Stop delay	1	3600	s	120	1857	The deactivation of the external fan control signal after unit temperature has decreased below "Stop Temp" can be delayed with this parameter. (If the inverter stops the unit temperature might decrease much faster than e.g. the LCL's, then a delay to get some more cooling time might be appropriate.)The external fan signal can be selected for any digital/relay output.

5.11.2 Datalogger

5.11.2.1 ***Trigger***

Table 55. Datalogger trigger parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.11.2.1.1	Trigger signal	0	65535	0	2704	Trigger signal definition (ID or index). If set to 0 and DL_TriggerOptions B0 is 0, then MCStatus.B3 (fault bit) is used as trigger signal / value.
P2.11.2.1.2	Trigger value low	0	65535	0	2705	Trigger value as level or bitmask depending on trigger options
P2.11.2.1.3	Trigger value high	0	65535	0	2706	High word of trigger value, in case trigger variable is of DINT/UDINT type
P2.11.2.1.4	Trig on fault	0	1	1	2712	0 = no fault trig 1 = trig on fault
P2.11.2.1.5	Trigger is	0	1	1	2713	0 = trigger value is level 1 = trigger value is bitmask

P2.11.2.1.6	Trigger level is	0	1	1	2711	0 = trigger level is negative 1 = trigger level is positive
P2.11.2.1.7	Trigger on	0	1	1	2710	0 = trig on rising edge 1 = trig on falling edge
P2.11.2.1.8	Pre-trig	0	3	3	2707	pre-trig %: 00 = 70%, 01 = 50%, 10 = 25%, 11 = 10%
P2.11.2.1.9	Trigger mode	0	1	0	2708	0 = continuous mode 1 = single mode
P2.11.2.1.10	Store settings	0	1	1	2709	0 = don't store settings (reset at power down) 1 = store settings.

5.11.2.2 ***Settings***

Table 56. Datalogger setting parameters

Code	Parameter	Min	Max	Default	ID	Description
P2.11.2.2.1	Sample period	0	65535	1	2703	Sample period in ms. If 0, then set to default (1 ms).
P2.11.2.2.2	Max samples	0	65535	0	2702	Number of samples in DataLogger. Set to nonzero value to limit size of log. DataLogger must be set again for change to take effect.
P2.11.2.2.3	DL signal 1	0	65535	14589	2714	Signal definition (ID or index): 1 - 9999 = variable ID 10001 - 19999 = fw interface variable index (10001 = index 1) 20001 - 29999 = application variable index (20001 = index 1)
P2.11.2.2.4	DL signal 2	0	65535	14367	2715	Signal definition (ID or index)
P2.11.2.2.5	DL signal 3	0	65535	14544	2716	Signal definition (ID or index)
P2.11.2.2.6	DL signal 4	0	65535	14508	2717	Signal definition (ID or index)
P2.11.2.2.7	DL signal 5	0	65535	14509	2718	Signal definition (ID or index)
P2.11.2.2.8	DL signal 6	0	65535	14592	2719	Signal definition (ID or index)
P2.11.2.2.9	DL signal 7	0	65535	10401	2720	Signal definition (ID or index)
P2.11.2.2.10	DL signal 8	0	65535	10463	2721	Signal definition (ID or index)
P2.11.2.2.11	DL signal 9	0	65535	14590	2722	Signal definition (ID or index)
P2.11.2.2.12	DL signal 10	0	65535	14591	2723	Signal definition (ID or index)
P2.11.2.2.13	DL signal 11	0	65535	14547	2724	Signal definition (ID or index)
P2.11.2.2.14	DL signal 12	0	65535	14548	2725	Signal definition (ID or index)
P2.11.2.2.15	DL signal 13	0	65535	11095	2726	Signal definition (ID or index)
P2.11.2.2.16	DL signal 14	0	65535	43	2727	Signal definition (ID or index)
P2.11.2.2.17	DL signal 15	0	65535	14837	2728	Signal definition (ID or index)
P2.11.2.2.18	DL signal 16	0	65535	14362	2729	Signal definition (ID or index)
P2.11.2.2.19	DL Controlword	0	65535	0	2730	DataLogger control word. bit 0 = external trigger bit 1 = restart bit 2 = PC trigger (don't set in application code) bit 3 = Reserved (disable flash store) bit 4 = pause logging after RUN state trigs bit 5 = set datalogger to system software de

5.12 Grid Codes

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.1	GGC License	0	65535		0		3201	
P2.17.2	EnableGridCode	0	2		0		3254	0 = Disabled 1 = Enabled; No Trip. 2 = Enabled
P2.17.3	Anti-islanding	0	2		0 / Disabled		3250	
P2.17.4	Power RampUp Rate	-1,00	320,00	%/s	50		3324	Negative value means no limitation in power increase.

5.12.1 FRT

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.5.1	FRT Function	0	4		0 / No		3251	0 = Disabled; Both 1 = Enabled; Limits 2 = Enabled; Curve 3 = Enabled; Neither 4 = Enabled; Both
P2.17.5.2	ReactivInjection	0	2		0 / Tri:N, Bi:N		3252	
P2.17.5.3	Symmetrical Reactive	0	1		0 / No		3323	

5.12.2 Reconnection

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.6.1	ReConnectTime	1,1	1000	s	2		3253	
P2.17.6.2	ReConnTimeStop	1,1	1000	s	2		3255	
P2.17.6.3	ReConRampUpRate	-1	320	%/s	20		3297	

5.12.3 Line Voltage

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.7.1	Voltage Monitor	0	1		1		3364	0 = Average 1 = Phase Min Max
P2.17.7.2	LV High 1	0	200	%	115		3256	
P2.17.7.3	LV High 1 Delay	0	60000	ms	0		3257	
P2.17.7.4	LV High 2	0	200	%	0		3258	
P2.17.7.5	LV High 2 Delay	0	120000	ms	0		3259	
P2.17.7.6	LV High 3	0	200	%	0		3361	
P2.17.7.7	LV High 3 Delay	0	120000	ms	0		3362	
P2.17.7.8	LV High 3 PLim	0	300	%	300,0		3363	
P2.17.7.9	LV Low 1	0	200	%	0		3260	
P2.17.7.10	LV Low 1 Delay	0	120000	ms	0		3261	
P2.17.7.11	LV Low 2	0	200	%	80		3262	
P2.17.7.12	LV Low 2 Delay	0	120000	ms	0		3263	
P2.17.7.13	LV Low 3	0	200	%	0		3365	
P2.17.7.14	LV Low 3 Delay	0	120000	ms	0		3366	
P2.17.7.15	LV Low 3 PLim	0	300	%	300,0		3367	
P2.17.7.16	10 Min Average High Voltage	0	200	%	0		3353	
P2.17.7.17	10 min Average trip delay	0	10000	ms	50		3376	
P2.17.7.18	10 Min Average Trip Act	0.1	E.10		0.1		3375	

5.12.4 Line Frequency

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.8.1	LF High 1	0	200	%	103		3264	
P2.17.8.2	LF High 1 Delay	0	120000	ms	0		3265	
P2.17.8.3	LF High 2	0	200	%	0		3266	
P2.17.8.4	LF High 2 Delay	0	120000	ms	0		3267	
P2.17.8.5	LF High 3	0	200	%	0		3368	
P2.17.8.6	LF High 3 Delay	0	12000	ms	0		3369	
P2.17.8.7	LF Low 1	0	200	%	0		3268	
P2.17.8.8	LF Low 1 Delay	0	120000	ms	0		3269	
P2.17.8.9	LF Low 2	0	200	%	95		3270	
P2.17.8.10	LF Low 2 Delay	0	120000	ms	0		3271	
P2.17.8.11	LF Low 3	0	200	%	0		3370	
P2.17.8.12	LF Low 3 Delay	0	120000	ms	0		3371	
P2.17.8.13	LF MaxChangeRate	0	20	Hz/s	0		3322	

5.12.5 Voltage Time Trip

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.9.1	Voltage X0	0	110	%	0		3272	
P2.17.9.2	Time Y0	0	20000	ms	0		3273	
P2.17.9.3	Voltage X1	0	110	%	0		3274	
P2.17.9.4	Time Y1	0	20000	ms	0		3275	
P2.17.9.5	Voltage X2	0	110	%	0		3276	
P2.17.9.6	Time Y2	0	20000	ms	0		3277	
P2.17.9.7	Voltage X3	0	110	%	0		2278	
P2.17.9.8	Time Y3	0	20000	ms	0		3279	
P2.17.9.9	Voltage X4	0	110	%	0		3280	
P2.17.9.10	Time Y4	0	20000	ms	0		3281	
P2.17.9.11	Voltage X5	0	110	%	30		3282	
P2.17.9.12	Time Y5	0	20000	ms	400		3283	
P2.17.9.13	Voltage X6	0	110	%	80		3284	
P2.17.9.14	Time Y6	0	20000	ms	2500		3285	

5.12.6 Line OK Limits

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.10.1	LF OK High	0	200	%	0		3287	
P2.17.10.2	LF OK Low	0	110	%	0		3286	
P2.17.10.3	LV OK High	0	200	%	0		3289	
P2.17.10.4	LV OK Low	0	110	%	0		3288	
P2.17.10.5	Line OK Delay	0	20000	ms	0		3290	

5.12.7 Reactive Injection

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.1	UV Reactive Mode	0	1		0 / Linear		3314	
P2.17.11.2	OV Reactive Mode	0	1		0 / Linear		3377	

5.12.7.1 ***Linear UV***

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.3.1	UV High Corner	0	200	%	0		3291	
P2.17.11.3.2	UV Low Corner	0	200	%	0		3292	
P2.17.11.3.3	UV Reac. Ref	0	150	%	0		3293	
P2.17.11.3.4	UV Bi Reac. Ref	0	150	%	0		3294	

5.12.7.2 ***Linear OV***

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.4.1	OV Low Corner	0	150	%	0		3300	
P2.17.11.4.2	OV Max Reactiv	0	150	%	0		3301	
P2.17.11.4.3	OV React Slope	0	150	%	0		3302	
P2.17.11.4.4	OV React PLim In	0	150	%	0		3303	
P2.17.11.4.5	OV React PLim Out	0	150	%	0		3329	

5.12.7.3 ***Power Lock UV***

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.5.1	PowerLockIn	0	200	%	0		3315	
P2.17.11.5.2	PowerLockOut	0	200	%	0		3316	
P2.17.11.5.3	Power Log In Mode	0	1		0		3372	
P2.17.11.5.4	UV High Corner	0	200	%	0		3291	
P2.17.11.5.5	UV Low Corner	0	200	%	0		3292	
P2.17.11.5.6	UV LockOutVoltag	0	200	%	0		3317	
P2.17.11.5.7	UVReacRefHighCor	0	200	%	0		3318	
P2.17.11.5.8	UV Reac. Ref	0	150	%	0		3293	
P2.17.11.5.9	UV Bi Reac. Ref	0	150	%	0		3294	

5.12.7.4 ***Power Lock OV***

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.6.1	OV Low Corner	0	150	%	0		3300	
P2.17.11.6.2	OV High Corner	0	200	%	0		3320	
P2.17.11.6.3	OVReacRefLowCorn	0	200	%	0		3321	
P2.17.11.6.4	OV Max Reactiv	0	150	%	0		3301	
P2.17.11.6.5	OV LockOutVoltag	0	200	%	0		3319	

5.12.7.5 *Q(U) Power*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.11.7.1	High Max Q Power	-300	300	%	0,0		3341	
P2.17.11.7.2	High Max Voltage	0	200	%	105,00		3340	
P2.17.11.7.3	High Min Voltage	0	200	%	100,00		3339	
P2.17.11.7.4	Low Max Q Power	-300	300	%	0,0		3344	
P2.17.11.7.5	Low Max Voltage	0	200	%	100,00		3343	
P2.17.11.7.6	Low Min Voltage	0	200	%	95,00		3342	

5.12.8 Power Limit

5.12.8.1 *High Frequency*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.12.1.1	HighFreqModes	0	1		0		3307	0 = High Limit 1 = Minimum
P2.17.12.1.2	HighFreqLowCornr	0	200	%	0,00		3295	
P2.17.12.1.3	HighFreqPLimSlop	-1	300	%/Hz	50,0		3239	End corner mode activated by setting this to zero -> - P2.17.12.1.7 - P2.17.12.1.8
P2.17.12.1.4	HighFreqLockOut	0	150	%	0,00		3308	
P2.17.12.1.5	HighFreqPLimRamp	-1	320	%/s	-1,00		3298	
P2.17.12.1.6	HighFreqPReleDel	0	1000000	ms	50		3299	
P2.17.12.1.7	HighLFFullPRelDe	0	400000	ms	0		3374	
P2.17.12.1.8	HighFreqHigCornr	0	200	%	0,00		3296	
P2.17.12.1.9	HighFreqPowRatio	0	100	%	0,0		3309	

5.12.8.2 *High Voltage*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.12.2.1	Log In Voltage	0,00	320,00	%	0		3325	
P2.17.12.2.2	Log Out Voltage	0,00	320,00	%	0		3326	
P2.17.12.2.3	Limit Slope	-1,0	3200,0	%/%	0,0		3327	
P2.17.12.2.4	PowerLm VoltMode	0	1		0		3360	

5.12.8.3 *Low Frequency Power*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.12.5.1	Power Increase High Frequency	0,00	150,00	%	0,00		3334	
P2.17.12.5.2	Power Increase Slope	0,0	200,0	%/%	15,0		3335	
P2.17.12.5.3	Power Increase Max	0,0	200,0	%	200,0		3336	

5.12.8.4 *Cos Phii Control*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.13.1	CosPhiiMode	0	3		0		3345	**0** = Direct Reference **1** = Volt LogIn LogOut **2** = Act. Current
P2.17.13.2	CosPhiiRef	-1	1		0		3304	
Code	**Parameter**	**Min**	**Max**	**Unit**	**Default**	**Cust**	**ID**	**Description**
P2.17.13.3.1	Lock In Voltage	0	150	%	0		3305	
P2.17.13.3.2	Lock Out Voltage	0	150	%	0		3306	
P2.17.13.3.3	Max Cos Ref	-1	1		1,000		3346	
Code	**Parameter**	**Min**	**Max**	**Unit**	**Default**	**Cust**	**ID**	**Description**
P2.17.13.4.1	Min Cos Ref Min Power	-150	150	%	15,0		3357	
P2.17.13.4.2	Min Cos Ref	-1	1		1,000		3356	
P2.17.13.4.3	CosRefMidPower	-150	150	%	50,0		3358	
P2.17.13.4.4	Max Cos Ref Max Power	-150	150	%	150,0		3359	
P2.17.13.4.5	Max Cos Ref	-1	1		1,000		3346	

5.12.8.5 *External Input*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.14.1	Ext GC Trip In	0.1	E.10	DI	0.1		3310	
P2.17.14.2	SeparateFLimMon	0.1	E.10	DI	0.1		3311	
P2.17.14.3	SepFreqHighLim	0	150	%	0		3312	
P2.17.14.4	SepFreqLowLim	0	150	%	0		3313	

5.12.8.6 *Options*

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Description
P2.17.15.1	GC Options 1	0	65535		0		3328	
P2.17.15.2	Voltage Filt. TC	0	10000	ms	20		3332	
P2.17.15.3	Frequency Filt. TC	0	10000	ms	35		3333	
P2.17.15.4	FRT Options	0	65535		0		3400	
P2.17.15.5	Vac Stop Offset	-10,00	10,00	%	0,00		3337	
P2.17.15.6	Vac Run Offset	-10,00	10,00	%	0,00		3338	
P2.17.15.7	Power Follower Hysteresis	0,0	100,0	%	3,0		1529	
P2.17.15.8	Line Voltage High Filter TC	0	10000	ms	100		3373	

5.13 Control

Table 57.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 2=Systembus

5.14 System menu

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 the Vacon NX User Manual.

5.15 Expander boards (Control keypad: Menu M7)

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

Note! These parameters are set automatically when parameter Configuration is set

6. PARAMETERS AND DESCRIPTIONS

6.1 Basic Parameters

P2.1.1 Grid Nominal Voltage ID 110

This parameter sets the incoming line voltage for the regenerative drive. Set this parameter to the nominal line voltage at the installation site. Used also as a reference point for grid voltage protection functions.

P2.1.2 Grid Nominal Frequency ID 1532

Grid Nominal frequency. Used for frequency protection functions and initial guess for synchronization frequency.

P2.1.3 Unit Nominal Current ID 113

The rated current capacity of the supply or the transformer. It can be necessary to set it if AFE is overdesigned compared to the supply or feeding transformer capacity.

The active current and the reactive current are scaled to this parameter as is the current cutter level.

For testing purposes (FAT) feeding transformer should not be less than 20% of the unit nominal current or following breakers or fuses.

P2.1.4 Parallel AFE ID 1501

Set this to 1 if more than one unit is connected to same DC bus.

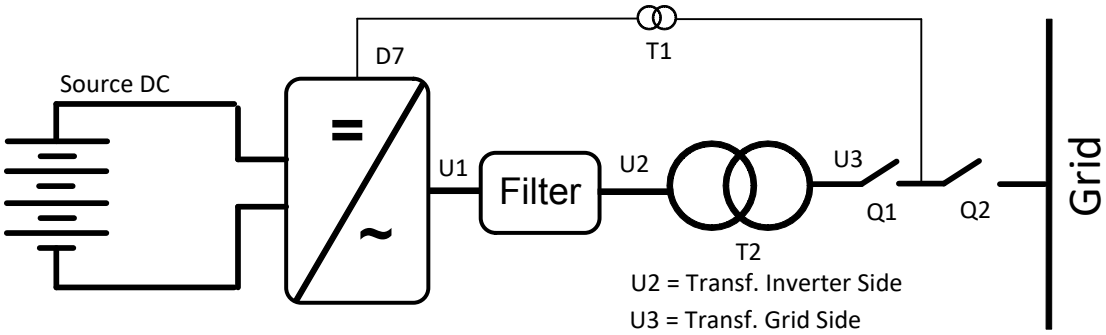
0 = Single AFE

1 = Parallel AFE

Parallel AFE parameter is used for reducing the circulating current between the parallel connected AFEs. If the AFEs are fed from the isolated transformers then there is no need parallel AFE activation. That means parallel AFE is required to be enabled in all AFEs only when DC links of more than one AFE are connected together and AFEs are fed from the same incoming source without the isolation transformer. Each AFE must have its own LCL filter. The drooping parameter (P2.3.1.7) is set to 5 % also in all AFEs when parallel AFE is enabled.

6.1.1 Transformer Parameters

These parameters are used to scale voltage so that the parameter P2.1.1 Grid Nominal Voltage can be given a value as actual grid voltage. The drive will calculate the actual drive terminal voltage based on these values.



Picture 5. D7 measurements.

P2.1.5 *Transformer inverter side* *ID 1850*

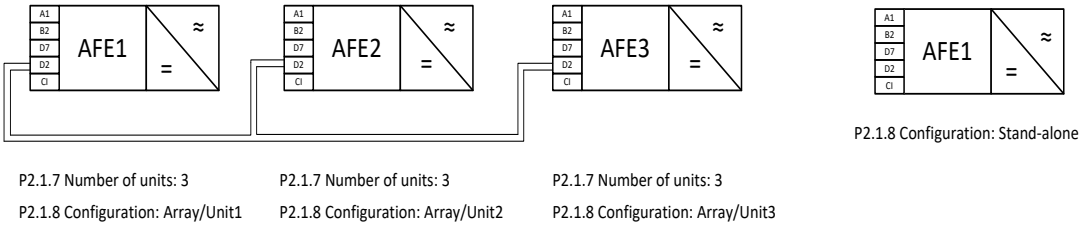
Set the transformer nominal voltage on inverter side (U2).

P2.1.6 *Transformer grid side* *ID 1851*

Set the transformer nominal voltage on grid side (U3).

6.1.2 Configuration Parameters

These parameters are used to define stand-alone and multi master system.



Picture 6. Multimaster and stand-alone configurations.

P2.1.7 Number of units ID 1604

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.

P2.1.8 Configuration ID 1531

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.

-1 = SB Master

0 = Undefined

1 = Stand-alone

2 = Array/Unit 1

3 = Array/Unit 2

4 = Array/Unit 3

5 = Array/Unit 4

6 = Array/Unit 5

7 = Array/Unit 6

8 = Array/Unit 7

9 = Array/Unit 8

6.1.3 DC Level Setup

Using these parameters it is possible to modify the awakening level of the drive.

P2.1.9.1 DC start level *ID 1962*

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.

P2.1.9.2 DC start level delay *ID 1964*

Delay for when the DC rises above used DC start level before DC level is considered high enough for starting.

P2.1.9.3 DC start level source *ID 1966*

0 = "Panel", if this is enabled the drive will always use the user-set value in P2.1.9.1 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 P2.1.9.5 as the new Start Level. The new level is shown in V2.1.9.2

P2.1.9.4 DC start level offset *ID 1967*

Offset value to be used when P2.1.9.4 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.

P2.1.9.5 DC start max limit *ID 1968*

Absolute maximum limit for the Start Level when P2.1.9.4 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.

6.2 Reference Handling

P2.2.1 Cosphii reference *ID 2304*

Direct cosphii reference. If P2.11.13.1 lock in and P2.11.13.2 out is used this function is not active.

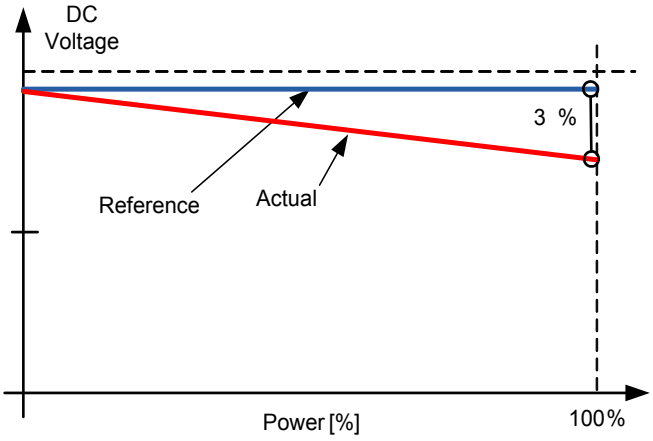
P2.2.2 Reactive current reference *ID 1459*

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

6.2.1 DC Reference

P2.2.3.1 DC drooping *ID 620*

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.



Picture 7. DC drooping.

P2.2.3.2 DC calibration *ID 1777*

In multi master system inverters are connected to same DC-bus. 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.

P2.2.3.3 Manual DC *ID 1808*

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

0 = Disable
1 = Enable

P2.2.3.4 Manual DC Reference *ID 1809*

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

$$DC_{Ref\%} = \frac{V_{DC\ Ref}}{V_{AC} \times 1{,}35} \cdot 100\%$$

6.2.2 **Power/ Frequency reference**

P2.2.4.1 Generator Power Reference *ID 1533*

Power reference for PID controller.

P2.2.4.2 Reference Mode *ID 1533*

0 = Pure Iq Ref

1 = Voltage Compensated Iq

6.2.2.1 *PID Power Controller*

PID Controller is forced to zero when DI: PID Power Activation is low or drive is in stop state or drive is not operating in AFE mode. PID Controller will adjust power flow by giving offset to given DC Voltage Reference. It's recommended to use some drooping to make controller smoother.

2.2.4.3.1 PID Power Activation *ID1907*

Select digital input to activate PID Power control function.

2.2.4.3.2 PID Kp *ID1911*

Gain for PID controller.

2.2.4.3.3 PID Ti *ID1906*

Integration time for PID controller.

2.2.4.3.4 PID DC Low *ID1903*

This parameter defined how low PID controller can adjust DC Voltage Reference from P2.2.3.4 Manual DC Voltage Ref.

2.2.4.3.5 PID DC High *ID1904*

This parameter defined how high PID controller can adjust DC Voltage Reference from P2.2.3.4 Manual DC Voltage Ref.

2.2.4.3.6 Reference Down Rate %/s *ID1842*

Power reference ramp rate when increasing the reference

2.2.4.3.7 Reference Up Rate %/s *ID1843*

Power reference ramp rate when decreasing the reference

6.2.3 AC Voltage reference

P2.2.5.1 Capacitor size *ID 1460*

This parameter defines the reactive current going to the LCL filter capacitor. It compensates the LCL effect to the reactive current by adjusting the reactive current reference internally. The inductor size is also added to compensation. If set correctly, the power factor on the grid side will be 1.

$$I_{CAP} = \left(\frac{V_{Grid}}{\sqrt{3}}\right)(2\pi f C_Y)$$

$Where\ C_Y = Filter\ capacitance$

$$Capacitor\ size\ [\%] = \frac{I_{CAP} * [CurrenScale]}{System\ Rated\ Current} * 100$$

CurrentScale; if no decimals in current value then current scale is 1. If one decimal in current value then current scale is 10. If two decimals in current value, then current scale is 100.

P2.2.5.2 Inductor size *ID 1461*

This parameter defines voltage losses in percentage of the nominal voltage at 100% active current. This value is internally added to the reactive current reference thus giving power factor 1 on the grid side, if set correctly together with Capacitor Size. The transformer and feeding cables can be compensated by increasing this value.

$$Inductor\ size\ [\%] = \frac{2\pi f L * 100}{\left(\frac{\frac{V_{Grid}}{\sqrt{3}} * [CurrenScale]}{System\ Rated\ Current}\right)}$$

P2.2.5.3 Capacitor Size 2nd *ID3330*

Capacitor size can be adjusted based on voltage level. Set here the capacitor size at voltage level defined by ID3331

P2.2.5.4 Capacitor Size 2nd Voltage *ID3331*

Set here the voltage level where Capacitor Size 2nd is used ID3330

6.3 IO signals

6.3.1 Digital inputs

Note! Check also G2.3.1.13 Configuration parameters for inverted inputs!

Note! If Digital Input signal source is set to DigIn:F.1 or DigIn:F.2, the application uses "ANIN as DIGIN1" or "ANIN as DIGIN2" 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).

P2.3.1.1 External trip *ID 1214*

Select the digital input to activate External Trip fault.

P2.3.1.2 Surge Alarm Input *ID 1806*

Select the digital input to trigging Activate Surge Alarm.

P2.3.1.3 Main Contactor Feedback *ID 1453*

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.

P2.3.1.4 Fault Reset Input *ID 1208*

Select digital input used for fault reset

P2.3.1.5 DC Switch Feedback *ID 1212*

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.

P2.3.1.6 Filter over Temperature *ID 1179*

Digital input for trigging a LCL filter over temperature fault

P2.3.1.7 DC Insulation fault input *ID 1180*

Digital input for trigging DC Insulation fault.

P2.3.1.8 Emergency Switch Input *ID 1181*

Digital input for trigging Emergency Switch fault.

P2.3.1.9 Start Ok *ID 1974*

External signal for Start permission.

P2.3.1.10 DI Power Limit 1 Activation *ID 1182*

Digital input for activating Power Limit 1. Limitation can be adjusted using P2.3.11.13.2.

P2.3.1.11 DI Power Limit 2 Activation *ID 1183*

Digital input for activating Power Limit 2. Limitation can be adjusted using P2.3.11.13.3.

P2.3.1.12 DI signal for controlling custom variable *ID 1184*

Digital input which can be used to control any other variable which has an ID. Give ID to be controlled in P2.3.11.13.4.

6.3.1.1 *Configuration*

These signals are used to specify are the G2.3.1 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

P2.3.1.13.1 Input inversion *ID 1091*

Bit selection to invert input signal logic.

E.g. If you need to invert external fault and surge protection you need to set value 3.

B0 (+1): Invert external fault
B1 (+2): Invert surge protection
B2 (+4): Invert main contactor feedback
B3 (+8): Invert IO fault reset
B4 (+16): Invert DC switch closed
B5 (+32): Invert LCL over temp
B6 (+64): Invert DC insulation
B7 (+128): Invert emergency stop
B8 (+256): Invert IO start OK
B9 (+512): Invert power limit 1
B10 (+1024): Invert power limit 2
B11 (+2048): Invert custom DIN
B12 (+4096): Reserved
B13 (+8192): Reserved
B14 (+16384): Reserved
B15 (+32768): Reserved

P2.3.1.13.2 Power limit value 1 *ID 767*

Power limit value when DI power limit 1 activate

P2.3.1.13.3 Power limit value 2 *ID 769*

Power limit value when DI power limit 2 activate

P2.3.1.13.4 Custom DIN 1 ID *ID 771*

ID number when Custom DIN 1 activate

6.3.2 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.

6.3.2.1 ***Power limitation***

P2.3.2.1.1 Power Limitation Input ***ID 1787***

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

P2.3.2.1.2 Maximum Power Limitation Value ***ID 1788***

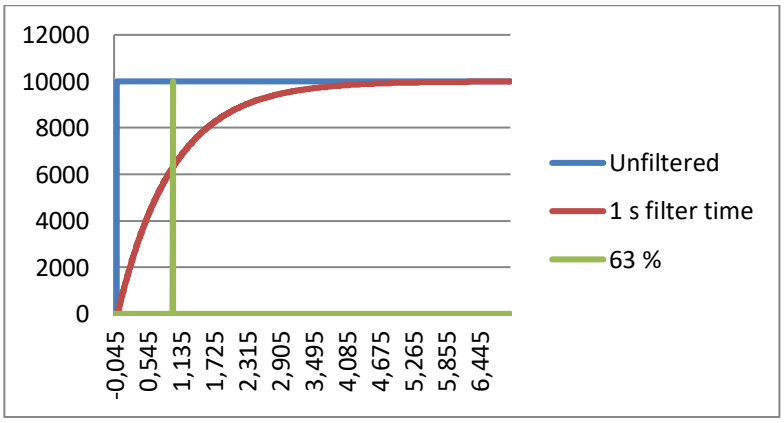
Specifies the Power Limit setting at maximum input.

P2.3.2.1.3 Minimum Power Limitation Value ***ID 1789***

Specifies the Power Limit setting at minimum input.

P2.3.2.1.4 Power Limit Input's Filter Time ***ID 1791***

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



Picture 5. Analog input filter.

P2.3.2.1.5 Power Limit value from Analog Input Fault situation ***ID 1792***

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.

6.3.2.2 *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 G2.3.2.2 has parameters for Digital Input #1 and G2.3.2.3 for #2.

If any signal in G2.3.1 is set as DigIN:F.1 it is then controlled by Analog Input specified in G2.3.2.2 (Digital Input #1), DigIN:F.2 corresponds to G2.3.2.3 (Digital Input #2).

P2.3.2.2.1 Analog DIN 1 input *ID 1770*

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

P2.3.2.2.2 Filter Time *ID 1771*

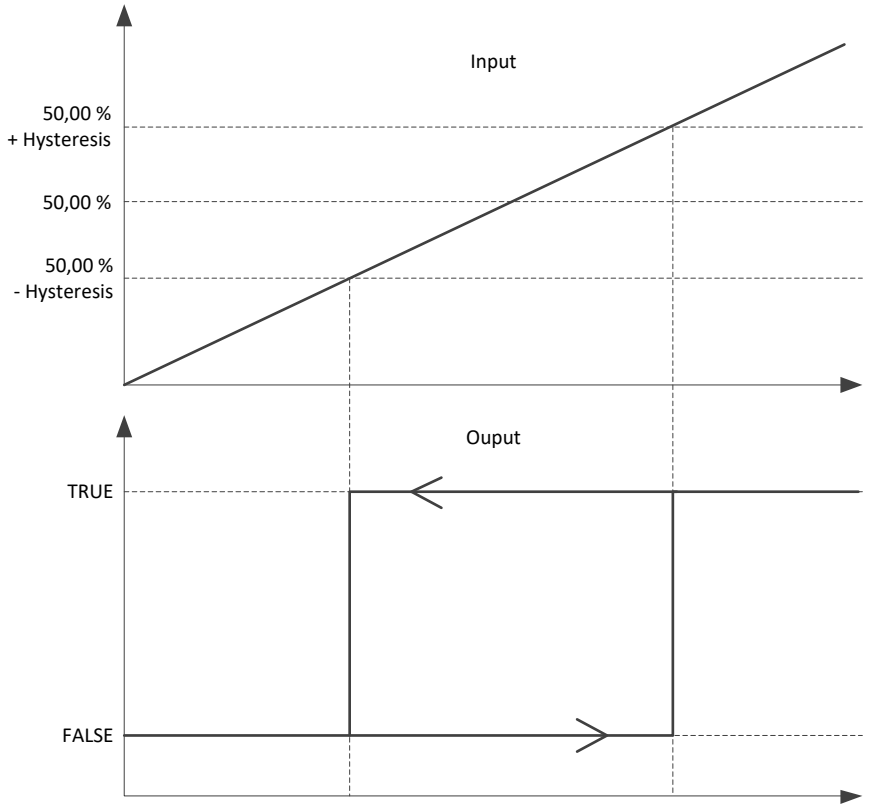
Filter time in seconds for the Analog Input. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.3.2.2.3 Hysteresis *ID 1772*

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

P2.3.2.2.4 Digital Input's state in Analog Input Fault situation *ID 1773*

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



Picture 6. Operation principle of the Analog Input usage as Digital Input.

P2.3.2.3.1 Analog DIN 2 input *ID 1766*

This parameter can be used to select which Analog Input is used Digital Input #2.

P2.3.2.3.2 Filter Time *ID 1767*

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

P2.3.2.3.3 Hysteresis *ID 1768*

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

P2.3.2.3.4 Digital Input's state in Analog Input Fault situation *ID 1769*

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

6.3.2.3 ***DC ground measurement***

P2.3.2.4.1 DC Ground Monitoring Input *ID 1763*

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

P2.3.2.4.2 DC Ground Monitoring Filter Time *ID 1764*

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

P2.3.2.4.3 DC Ground input in Analog Input Fault Situation *ID 1765*

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

6.3.2.4 *Custom analog input*

P2.3.2.5.1 Custom Analog Input's Signal Selection **ID 1757**

Used to select which analog input is used as Custom Analog Input.

P2.3.2.5.2 Custom Analog Input's Filter Time s **ID 1758**

Filter Time setting for the analog input signal. The range of the time can be selected from 0.01 sec to 10.00 sec.

P2.3.2.5.3 Custom maximum value **ID 1759**

Defines the maximum value set to the variable defined by P2.3.2.5.5 when the Analog Input is feed with maximum signal

P2.3.2.5.4 Custom minimum value **ID 1760**

Defines the minimum value set to the variable defined by P2.3.2.5.5 when the Analog Input is feed with minimum signal.

P2.3.2.5.5 Custom Analog Input ID **ID 1761**

ID of the variable this analog input is controlling.

P2.3.2.5.6 Custom Analog Signal's Inversion **ID 1762**

No = The stronger the input signal's strength, the bigger value is set to the selected variable

Yes = The stronger the input signal's strength, the smaller value is set to the selected variable

6.3.3 Digital outputs

P2.3.3.1	*Ready Signal DO Selection*	*ID 432*
P2.3.3.2	*Run Signal DO Selection*	*ID 433*
P2.3.3.3	*Fault Signal DO Selection*	*ID 434*
P2.3.3.4	*"No Fault" Signal DO Selection*	*ID 435*
P2.3.3.5	*Warning Signal DO Selection*	*ID 436*
P2.3.3.6	*Main Contactor Control Signal DO Selection*	*ID 445*
P2.3.3.7	*"DC Supply Ready" Signal DO Selection*	*ID 440*
P2.3.3.8	*DC Earth Fault Signal DO Selection*	*ID 441*
P2.3.3.9	*Ready/Warning Blink Signal DO Selection*	*ID 442*
P2.3.3.10	*External Fan Control Signal DO Selection*	*ID 443*
P2.3.3.11	*Follower's Main Contactor Open Command Signal*	*ID 444*

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.

P2.3.3.12 *Power Limitation Active Signal DO Selection* *ID 446*

This signal indicates if selected Power Limit Reference (P2.3.3.19.2) is lower than trigger level (P2.3.3.19.1).

P2.3.3.13 *Power Limit Reference Too Low DO Selection* *ID 449*

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.

P2.3.3.14	*Drive Charged Signal DO Selection*	*ID 450*
P2.3.3.15	*Drive Ok Signal DO Selection*	*ID 451*
P2.3.3.16	*Drive Ok/Warning Blink Signal DO Selection*	*ID 452*
P2.3.3.17	*Fault or Grid Code related stop*	*ID 453*
P2.3.3.18	*Charging Pulse for External Devices*	*ID 454*

The length of the this pulse can be set by P2.3.3.19.3

6.3.3.1 Configuration

P2.3.3.19.1 Power Limit Active Signal's Trigger Level **ID 447**

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

P2.3.3.19.2 Power Limit Level Selection **ID 448**

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

P2.3.3.19.3 Charging Pulse's Length **ID 455**

Length of the charging pulse from output specified by P2.3.3.18.

6.3.4 Analog outputs

P2.3.4.1 Analog Output Selection ID 1232

Select's the used Analog Output terminal.

P2.3.4.2 Analog Output Signal ID ID 1233

Set the ID of a signal to be connected to the Analog Output.

To connect e.g. DC-link voltage to Analog terminal, use 1839 as parameter value.

P2.3.4.3 Analog Output Filter Time ID 1235

Filter Time for the Analog Output.

P2.3.4.4 Variable's value which will correspond to the output signal's maximum strength ID 1236

Maximum value of a signal selected for Analog Output.

P2.3.4.5 Variable's value which will correspond to the output signal's minimum strength ID 1237

Minimum value of a signal connected to the Analog Output.

P2.3.4.6 Signal strength corresponding with variable's maximum value ID 1238

The analog output's signal strength corresponding with P2.3.4.4 AnOutputVarMax

P2.3.4.7 Signal strength corresponding with variable's minimum value ID 1234

The analog output's signal strength corresponding with P2.3.4.5 AnOutputVarMin

P2.3.4.8 Analog Output Inversion ID 1239

If this is enabled, the analog output's signal strength is at maximum, when the linked variable's value is at its minimum and vice versa.

6.4 Limit settings

6.4.1 Current limit

P2.4.1.1 Current Limit *ID 107*

Sets the current limit for the regenerative supply unit. Set this to correspond to the maximum required load or peak overload for the unit, bearing in mind that the load might consist of several motor drive units.

Maximum value 2 * IH depends on the unit size.

P2.4.1.2 LCL Over temperature factor *ID 1748*

Factor multiplied to current limit when LCL Over Temp input is active.

6.4.2 Generator power limit

P2.4.2.1 Generator power limit *ID 1290*

Power limit for the generator side operation.

P2.4.2.2 Generator limit ramp start *ID 1786*

Generator starting ramp rate %/s.

P2.4.2.3 Generator limit ramp stop *ID 1785*

Generator stop ramp time sets by %/s.

P2.4.2.4 Minimum generator power limit *ID 1938*

Minimum Power limit for generator side power limitter,1000 equals 100.0% of Nominal power

P2.4.2.5 Power limit start level *ID 1983*

Drive can start to generate power when power limit over this parameter.

P2.4.2.6 Power limit stop level *ID 1977*

Drive stop to generate power when power limit below this parameter.

P2.4.2.7 Disable temp limit *ID 1756*

Disabled temperature power limit

6.5 Inverter Control

6.5.1 Standby settings

P2.5.1.1 Power standby level ID 1540

The Inverter will stop if power is below this level for a time longer than standby delay.

When standby level is negative then standby is not used

P2.5.1.2 Power standby delay ID 1541

Delay before stopping, when power is below standby level

P2.5.1.3 Power quick standby ID 154

Inverter will stop within the time specified in power quick standby delay 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. When quick standby level is negative then quick standby is not used

P2.5.1.4 Power quick standby delay ID 1560

Delay for power quick standby.

P2.5.1.5 Power quick standby DC-level ID 1905

Quick standby DC-level is used in the wake up DC-level calculation.

P2.5.1.6 Standby interval ID 1754

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.

6.5.2 MPP tracker

MPPT idea is to find maximum power point in any conditions. This MPPT tracker recognizes when there are stable or fast moving conditions.

P2.5.2.1 Minimum Step Size ID 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 between MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.5.2.2 Maximum Step Size ID 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.

P2.5.2.3 Minimum Step Ratio ID 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 between MinStepSize and MaxStepSize when step ratio is between MinStepRatio and MaxStepRatio respectively.

P2.5.2.4 Maximum Step Ratio ID 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.

P2.5.2.5 Min DC Reference ID 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.

P2.5.2.6 Step Time ID 1812

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

P2.5.2.7 Power Filter Time ID 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.

P2.5.2.8 Use Averaged Power Measurement ID 1831

This parameter enables or disables the 10 sample averaging of the output power figure to filter out noise from the measurement.

P2.5.2.9 Reference Window *ID 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 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.

P2.5.2.10 Ramped DC Reference *ID 1826*

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. 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.)

P2.5.2.11 Actual DC Following Power Limit *ID 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.

P2.5.2.12 DC Reference at Start *ID 1595*

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

P2.5.2.13 DC Reference Ramp Time as % of Step Time *ID 1829*

DC Reference Ramp rate compared to the Step Time. When the DC Reference is changed that 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: The MPPT makes 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.

P2.5.2.14 Power Window (Dec) *ID 1945*

Power Window size when decreasing DC reference.

P2.5.2.15 Power Window (Inc) *ID 1939*

Power Window size when increasing DC reference.

P2.5.2.16 Fast condition threshold *ID 1946*

Fast moving condition threshold limit.

P2.5.2.17 Fast condition intensity increase threshold *ID 1944*

Limit when no changes are made to DC reference in the fast moving conditions

P2.5.2.18 Fast condition intensity decrease threshold *ID 1943*

Limit when no changes are made to DC reference in the fast moving conditions

6.5.3 Bypass control

P2.5.3.1 PC Control Mode *ID 1807*

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

6.5.4 Multimaster follower control

The master can be programmed to start the followers according to the power production using application control word B2. The master unit can be any of the units, but the master has to be changed manually if/when needed.

P2.5.4.1 Follower start level *ID 1984*

P2.5.4.2 Follower start delay *ID 1985*

P2.5.4.3 Follower stop level *ID 1986*

P2.5.4.4 Follower stop delay *ID 1987*

6.5.5 Power adjust

These parameters can be used to calculate more precise power figures. These parameters are the arguments a quadratic equation:

$$P_{adjusted} = aP^2 + bP + c,$$

where *P* equals measured power and $P_{adjusted}$ is shown as monitor value output power. The same scaling works also output current figures and the adjusted current can be seen in monitor value output current

*P2.5.5.1 a*Power^2* *ID 1523*

*P2.5.5.2 b*Power* *ID 1524*

P2.5.5.3 c *ID 152*

6.6 Drive Control

P2.6.1 Switching Frequency *ID 601*

The switching frequency of the IGBT Bridge in kHz. Changing the default value can have an impact on the LCL filter operation.

P2.6.2 AFE Options *ID 1463*

This packed bit word is made for enabling/disabling different control options for the regeneration control.

B5 = Disable all harmonic elimination compensation.

This is active by default. When activated, this function will reduce little 5th and 7th harmonics. This will not reduce harmonics of the grid, only the harmonics of the drive.

B13 = Enable use of D7 board for start synchronisation.

When an OPT-D7 board is installed, this bit will activate the synchronisation by using a voltage angle and frequency information from the D7 board. The phase order must be same in both the OPT-D7 and input phases. It is also necessary to keep the frequency on the positive side. The frequency of the D7 board can be the same as a Supply Frequency but the phase order can be still wrong.

P2.6.3 AFE Options 2 *ID 1464*

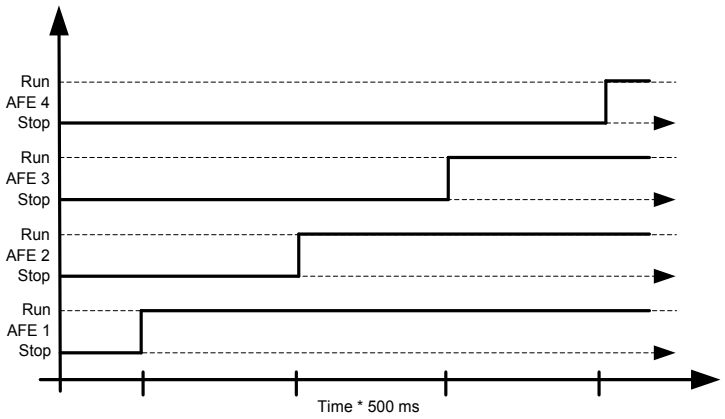
This packed bit word is made for enabling/disabling different control options for the regeneration control.

P2.6.4 AFE Options 3 *ID 1466*

This packed bit word is made for enabling/disabling different control options for the regeneration control.

P2.6.5 Start Delay *ID 1500*

This parameter defines a starting delay when a run command is given. When programming different delays to parallel units, the units will start in sequence. This is necessary in parallel units to make sure that the synchronisation does not happen simultaneously in all the drives. A simultaneous start can lead to a failed synchronisation. The recommended value between the drives is 500 ms.



Picture 10. Start delay.

P2.6.6 Modulator Type *ID 1516*

With this parameter you can change the modulator type. With an ASIC (HW) modulator, the current distortion is lower, but losses are higher compared to a software modulator. It is recommended to use Software modulator 1 as a default option.

0 = Hardware modulator: an ASIC modulator, with a classical third harmonic injection. The spectrum is slightly better compared to Software 1 modulator.

1 = Software modulator 1: A symmetric vector modulator with symmetrical zero vectors. The current distortion is smaller than with Software modulator 2 if boosting is used.

2 = Software modulator 2: A symmetric BusClamb, in which one switch always conducts 60 degrees either to a negative or a positive DC-rail. Switching losses are reduced without different heating of upper and lower switches. The spectrum is narrow. Not recommended for parallel units.

3 = Software modulator 3: An unsymmetric BusClamb, in which one switch always conducts 120 degrees to a negative DC-rail to reduce switching losses. The upper and lower switches are unevenly loaded and the spectrum is wide. Not recommended for parallel units.

4 = Software modulator 4: A pure sine wave, sinusoidal modulator without harmonic injection. It is dedicated to be used, for example, in back-to-back test benches to avoid a circulating third harmonic current. The required DC voltage is 15% higher compared to other modulator types.

P2.6.7 Application control word *ID 1900*

This packed bit word is made for enabling/disabling different application control options.

E.g. If you need to activate B0 and B1 then you need to set value 3.

B0 (+1): Calculate total capacitor size. This must be active when there is LC-filter connected in multi master system

B1 (+2): Enable Dynamic Active Current Limit Handling

B2 (+4): SB master acts like normal multi master

B3 (+8): Reserved

B4 (+16): Reserved

B5 (+32): Use Normal AFE Charging levels

B6 (+64): Activate Double sampling when Grid Code is not active

B7 (+128): Use simulated energy production

B8 (+256): Reserved

B9 (+512): Reserved

B10 (+1024): Reserved

B11 (+2048): Reserved

B12 (+4096): Reserved

B13 (+8192): Reserved

B14 (+16384): Reserved

B15 (+32768): Reserved

6.6.1 Control

P2.6.8.1 Active current Kp *ID 1455*

Regen active current controller gain.

P.2.6.8.2 Active current Ti *ID 1456*

Regen active current controller integral time.

P2.6.8.3 Sync Kp *ID 1457*

Regen synchronization gain.

P2.6.8.4 Sync Ti *ID 1458*

Regen synchronization integral time.

6.7 Protections

6.7.1 General

P2.7.1.1 External Trip ID 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

P2.7.1.2 Input Phase Supervisor ID 1518

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

0 = No response
1 = Warning
2 = Fault

P2.7.1.3 Input Filter Temp ID 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

P2.7.1.4 UserTempWarnLimit ID 1853

Limit for giving the temperature rising warning

P2.7.1.5 DCSwitchNOKDelay ID 1603

Delay for dropping DC Switch digital input signal to FALSE.

P2.7.1.6 StartNOKDelay ID 1602

Delay forpping Start Ok digal input signal to FALSE.

6.7.2 DC Earth fault

P2.7.2.1 DC Ground Source *ID 1801*

Used to select the input method for DC Ground Fault.

P2.7.2.2 DC Ground Fault Level *ID 1715*

Fault level of analog input.

P2.7.2.3 DC Ground Warning Level *ID 1716*

Warning level of analog input.

P2.7.2.4 DC Ground Hysteresis *ID 1714*

Hysteresis for warning and fault levels.

P2.7.2.5 DC Ground Delay *ID 1782*

Delay for warning and fault.

P2.7.2.6 DC Ground Reset Delay *ID 1750*

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

6.7.3 AC Earth Fault

P2.7.3.1 Earth fault *ID 1332*

Action in case of Earth Fault.

0 = No response
1= Fault

P2.7.3.2 Earth Fault Current *ID 1333*

Max level of Earth current in % of unit current.

6.7.4 Main Contactor

P2.7.4.1 Main Contactor Fault Delay *ID 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.

P2.7.4.2 Start Delay *ID 1519*

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

6.7.5 Control Panel

P2.7.5.1 Heartbeat Timeout *ID 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.

P2.7.5.2 Timeout Reset Delay *ID 1841*

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

6.7.6 Systembus

P2.7.6.1 Heartbeat Filter Delay *ID 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.

P2.7.6.2 Communication Fault Delay *ID 1601*

Trip delay from communication problems with systembus option board.

6.7.7 Auto reset

P2.7.7.1 Automatic reset Wait Time ID 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.

P2.7.7.2 Automatic reset Trial Time ID 718

If the fault trigger appears more often than defined by parameters P2.7.7.3 to P2.7.7.6 inside the trial time

P2.7.7.3 Over voltage Autoreset tries ID 721

This parameter determines how many automatic restarts can be made during the trial time set by parameter P2.7.7.2. "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.

P2.7.7.4 Over current Autoreset tries ID 722

NOTE! IGBT temp fault also included. This parameter determines how many automatics restarts can be made during the trial time set by P2.7.7.2. "Trial Time"

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

P2.7.7.5 External Trip Autoreset tries ID 725

This parameter determines how many automatics restarts can be made during the trial time set by P2.7.7.2. "Trial Time"

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

P2.7.7.6 Input Phase Autoreset Tries ID 726

This parameter determines how many automatics restarts can be made during the time set by P2.7.7.2. "Trial Time"

6.7.8 Analog Inputs

P2.7.8.1 Response for Analog Input Malfunction ID 1947

How the inverter responses to Analog Input malfunction:

0 = No Action

1 = Warning

2 = Fault

P2.7.5.2 Reaction Time for Analog Input Malfunction ID 1941

If P2.7.8.1 is set to "Warning" or "Fault", this parameter sets the response time.

6.7.9 AC Voltage Protection

P2.7.9.1 AC Voltage Maximum ID 1710

Max AC Voltage Limit.

P2.7.9.2 AC Voltage Minimum ID 1711

Min AC Voltage Limit.

P2.7.9.3 AC Maximum Trip Delay ID 1796

Trip delay if voltage above max limit.

P2.7.9.4 AC Minimum Trip Delay ID 1797

Trip delay if voltage below min limit.

P2.7.9.5 AC Voltage Reset Delay ID 1703

Reset delay of fault if fault conditions no longer active.

6.7.10 AC Frequency Protection

P2.7.10.1 AC Frequency Maximum ID 1752

Max AC Frequency Limit.

P2.7.10.2 AC Frequency Minimum ID 1753

Min AC Frequency Limit.

P2.7.10.3 AC Frequency Trip Delay ID 1805

Trip delay if frequency is above or below limits.

P2.7.10.4 AC Frequency Reset Delay ID 1751

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

6.8 Fieldbus

P2.8.1	*FB Data Out1 Sel*	*ID 852*
P2.8.2	*FB Data Out2 Sel*	*ID 853*
P2.8.3	*FB Data Out3 Sel*	*ID 854*
P2.8.4	*FB Data Out4 Sel*	*ID 855*
P2.8.5	*FB Data Out5 Sel*	*ID 856*
P2.8.6	*FB Data Out6 Sel*	*ID 857*
P2.8.7	*FB Data Out7 Sel*	*ID 858*
P2.8.8	*FB Data Out8 Sel*	*ID 859*

Using these parameters, you can monitor any monitoring or parameter value from the fieldbus. Enter the ID number of the item you wish to monitor as the value of these parameters.

P2.8.9	*FB Data In 1 Sel*	*ID 876*
P2.8.10	*FB Data In 2 Sel*	*ID 877*
P2.8.11	*FB Data In 3 Sel*	*ID 878*
P2.8.12	*FB Data In 4 Sel*	*ID 879*
P2.8.13	*FB Data In 5 Sel*	*ID 880*
P2.8.14	*FB Data In 6 Sel*	*ID 881*
P2.8.15	*FB Data In 7 Sel*	*ID 882*
P2.8.16	*FB Data In 8 Sel*	*ID 883*

Using these parameters, you can control any parameter value from the fieldbus. Enter the ID number of the item you wish to control as the value of these parameters.

P2.8.17 FB Control Slot *ID 1979*

This parameter defines which slot is used as the main control place when two fieldbus boards have been installed in the drive.

0 = Slots D & E

1 = Slot D

2 = Slot E

3 = Slot D + Fast PB

4 = Slot E + Fast PB

6.9 System Tests

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.

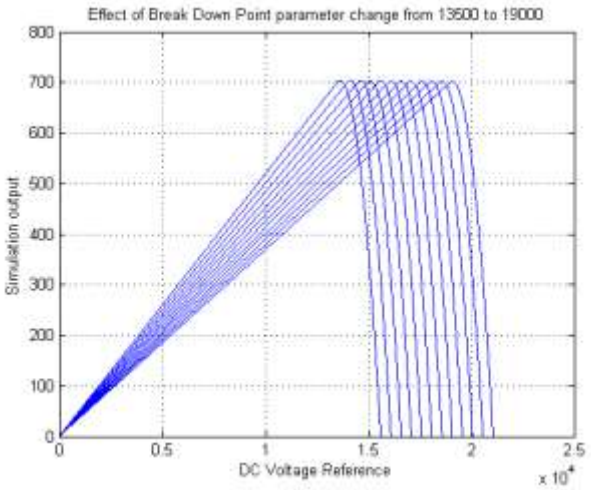
6.9.1 Power Simulation

P2.9.1.1 Simulation mode *ID1720*

0 = Simulation Mode Disabled *"Disable"*
1 = Simulation Mode with Real DC Voltage *"Enable"*
2 = Simulation Mode with Simulated DC Voltage (P2.9.1.6) *"SimModSimDC"*

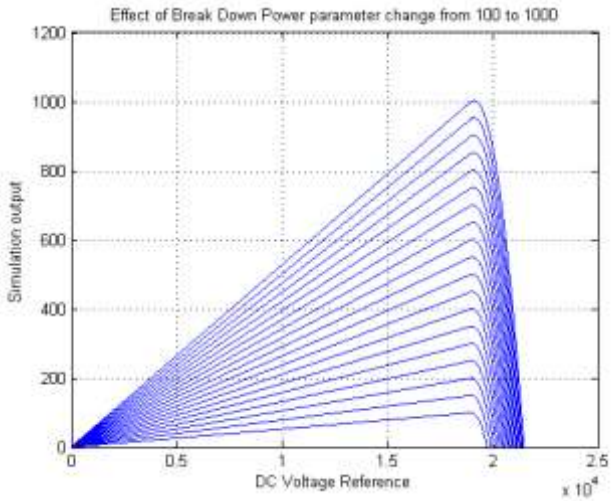
P2.9.1.2 Break down point *ID 1721*

This parameter defines break down point voltage.



Picture 11. Break down point.

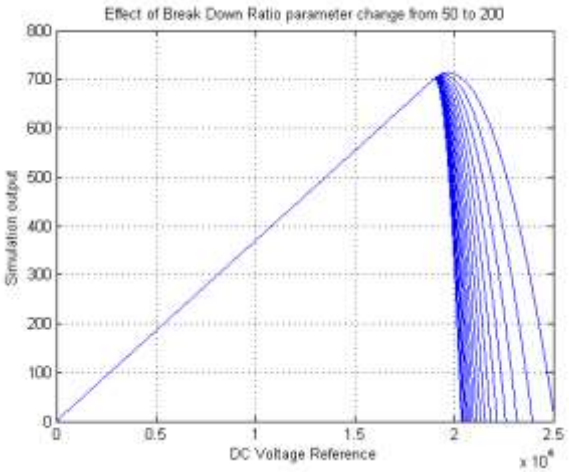
P2.9.1.3 Break down power *ID 1722*



Picture 12. Break down power.

P2.9.1.4 Break down ratio *ID 1723*

This parameter defines break down ratio.



Picture 13. Break down ratio.

P2.9.1.6 Simulation DC *ID 1577*

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

6.9.2 **Systembus test**

P2.9.2.1 Systembus test *ID 1780*

Parameter for testing if systembus configuration and connections are ok. The test can be started from any inverter in multimaster system. The inverter where test is started sends test pulses first to itself and after 5 seconds, to the next and so on, until all inverters have been tested. When the pulse is received in the inverter, the LEDs in the NX panel are flashing, so if the LEDs in all of the inverter flash during the test, the test is successful.

0 = Disable
1 = Enable

6.9.3 Simulated grid

P2.9.3.1 Simulated Grid Frequency ID 1725

This parameter specifies the simulated grid frequency if the application is tested without actual AC grid present.

P2.9.3.2 Simulated Grid Voltage ID 1726

This parameter specifies the simulated grid voltage if the application is tested without actual AC grid present.

P2.9.3.3 Use Simulated Grid Frequency ID 1728

Enable or disable the use of simulated frequency in simulation mode.

P2.9.3.4 Use Simulated Grid Voltage ID 1729

Enable or disable the use of simulated Voltage in simulation mode.

6.10 Counters

P2.10.1 Load or Save Counters Value ID 1861

Counters Values Load or Save Functionaly:

0 = Idle; "Do nothing"

1 = Load Values; Counter current values to parameters P2.10.2-6

2 = Save Values; Save values in parameters P2.10.2-6 as the inverter's counters values.

P2.10.2 Total Energy Preset value ID 1858

Value to save to Total Energy counter when "LoadSaveCountVal" parameter save is activated.

P2.10.3 Grid Connection Preset value ID 1730

Value to save to Grid Connection counter when "LoadSaveCountVal" parameter save is activated

P2.10.4 Total Runtime Preset value ID 1859

Value to save to Runtime total counter when "LoadSaveCountVal" parameter save is activated

P2.10.5 Internal Fan Runtime Preset Value ID 1894

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

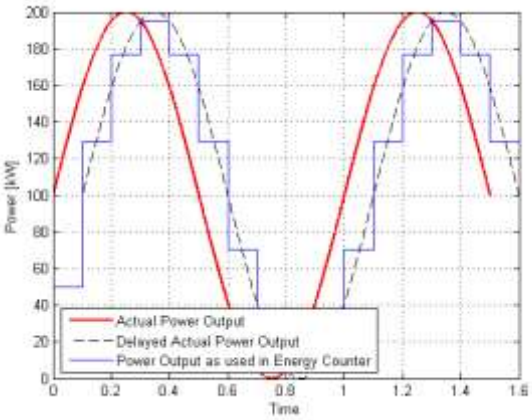
P2.10.6 External Fan Runtime Preset Value ID1896

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

P2.10.7 Integration interval for energy counter ID 1856

This parameter defines how often the current power output is added to the energy counters.

$$E = \int_0^{\infty} P_{real}(t)\mathrm{d}t \approx \sum_{i=0}^{\infty}\left[\left(P_{measured}(i-1) + \frac{P_{measured}(i) - P_{measured}(i-1)}{2}\right)\cdot t_{int}\right]$$



Picture 15. Energy production counter principle.

6.11 Admin parameters

6.11.1 External fan control

P2.11.1.1 Start temp ID 1727

The temperature level of the inverter unit, at which the external fan control signal will be activated. The external fan signal can be selected for any digital/relay output.

P2.11.1.2 Stop temp ID 1734

The temperature level of the inverter unit, at which the external fan control signal will be deactivated.

Notice! The deactivation can also be delayed with the "Stop Delay" parameters. (If the inverter stops the unit temperature might decrease much faster than e.g. the LCL's, then a delay to get some more cooling time might be appropriate.)The external fan signal can be selected for any digital/relay output.

P2.11.1.3 Stop delay ID 1857

The deactivation of the external fan control signal after unit temperature has decreased below "Stop Temp" can be delayed with this parameter. (If the inverter stops the unit temperature might decrease much faster than e.g. the LCL's, then a delay to get some more cooling time might be appropriate.)The external fan signal can be selected for any digital/relay output.

6.11.2 Datalogger

6.11.2.1 *Datalogger trigger*

P2.11.2.1.1 Trigger signal *ID 2704*

Trigger signal definition (ID or index). If set to 0 and DL_TriggerOptions B0 is 0, then MCStatus.B3 (fault bit) is used as trigger signal / value.

P2.11.2.1.2 Trigger value low *ID 2705*

Trigger value as level or bitmask depending on trigger options

P2.11.2.1.3 Trigger value high *ID 2706*

High word of trigger value, in case trigger variable is of DINT/UDINT type

P2.11.2.1.4 Trig on fault *ID 2712*

0 = no fault trig

1 = trig on fault

P2.11.2.1.5 Trigger is *ID 2713*

0 = trigger value is level

1 = trigger value is bitmask

P2.11.2.1.6 Trigger level is *ID 2711*

0 = trigger level is negative

1 = trigger level is positive

P2.11.2.1.7 Trigger on *ID 2710*

0 = trig on rising edge

1 = trig on falling edge

P2.11.2.1.8 Pre-trig *ID 2707*

pre-trig %: 00 = 70%, 01 = 50%, 10 = 25%, 11 = 10%

P2.11.2.1.9 Trigger mode *ID 2708*

0 = continuous mode

1 = single mode

P2.11.2.1.10 Store settings *ID 2709*

0 = don't store settings (reset at power down)

1 = store settings.

6.11.2.2 Datalogger settings

P2.11.2.2.1 Sample period *ID 2703*

Sample period in ms. If 0, then set to default (1 ms).

P2.11.2.2.2 Max samples *ID 2702*

Number of samples in DataLogger. Set to nonzero value to limit size of log. DataLogger must be set again for change to take effect.

P2.11.2.2.3-18 Datalogger signals 1-16 *IDs 2714 - 2729*

Signal definition (ID or index):

1 - 9999 = variable ID

10001 - 19999 = fw interface variable index (10001 = index 1)

20001 - 29999 = application variable index (20001 = index 1)

P2.11.2.2.19 Datalogger controlword *ID 2701*

DataLogger control word.

bit 0 = external trigger

bit 1 = restart

bit 2 = PC trigger (don't set in application code)

bit 3 = Reserved (disable flash store)

bit 4 = pause logging after RUN state trigs

bit 5 = set datalogger to system software de

6.12 Grid Code parameters

P 2.17.1 GGC License ID 3201

Enter here license code to activate General Grid Code functionality.

P 2.17.2 EnableGridCode ID 3254

Parameter to enable Grid Codes if correct license is given.

0 = Disabled

Grid Code functions are disabled.

1 = Enabled; No Trip.

Grid Code functions are active but do not cause drive to trip.

2 = Enabled

Grid Code functions are active and drive will stop modulating if trip limit is reached.

P 2.17.3 Anti-islanding ID 3250

Enables or disables anti-islanding functions.

0 = Disabled

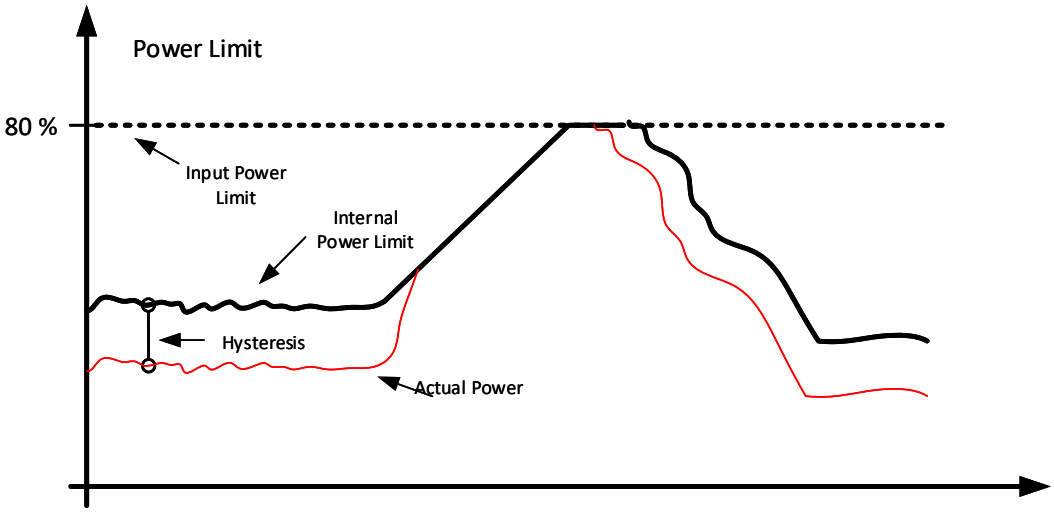
In islanding situation frequency may stay inside acceptable operation.

1 = Active

In islanding situation frequency will change rapidly and frequency limit will trip the drive.

P 2.17.4 Power Ramp Up Rate ID3324

Limit power increase rated when using positive values. Negative value will disable power increase rate limiter.



6.12.1 FRT

P2.17.5.1 FRT Function ID 3251

Enables FRT functionality.

0 = Disabled; Both

FRT is disabled but voltage level and curve are active at the same time.

1 = Enabled; Limits

FRT is enabled, voltage levels makes the trip but not curve.

2 = Enabled; Curve

FRT is enabled, curve makes the trip but not voltage levels.

3 = Enabled; Neither

FRT is enabled, but neither curve or voltage levels are not making trip.

4 = Enabled; Both

FRT is enabled, Both curve and levels make trip

P2.17.5.2 ReactivInjection ID 3252

Select the grid fault types when reactive current is injected.

0 = Tri:N, Bi:N

Reactive current is not injected.

1 = Tri:Y, Bi:Y

Reactive current is injected

2 = Tri:Y, Bi:N

Reactive current is injected to three phase fault but not bi-phase faults.

P2.17.5.3 Symmetrical Reactive ID3323

Select if unsymmetrical fault will be few by symmetrical current.

6.12.2 Reconnection

P 2.17.6.1 ReConnectTime s ID 3253

Reconnection time when fault happens on run state.

P 2.17.6.2 ReConnTimeStop s ID 3255

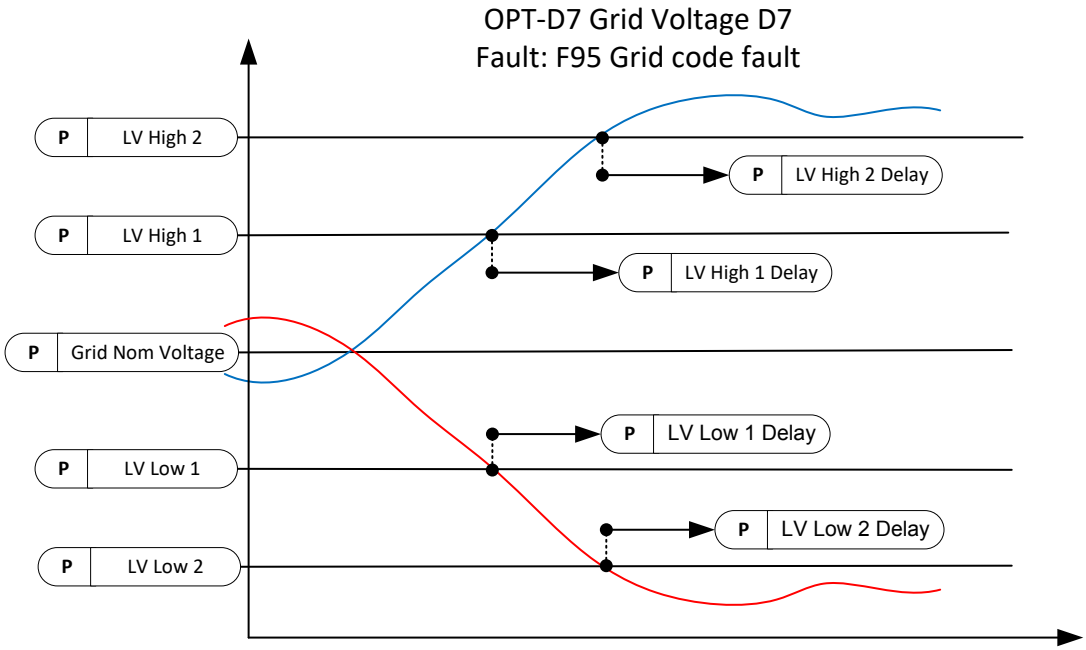
Reconnection time when fault happens in stop state.

P 2.17.6.3 ReConRampUpRate %/s ID 3297

Power ramp up rate on reconnection.

6.12.3 Line Voltage

Line voltage trip levels and times to tripping. Times defines delay when drive sees that voltage has exceed set limit. Monitored signal may have hardware and/or software filtering function that will need to be considered when estimating total tripping time.
Reference voltage is P2.1.1 Grid Nom. Voltage



P 2.17.7.1	*Voltage Monitor*	*%*	*ID*	*3364*

Line Voltage monitoring type
0 = Average voltage from phase voltages
1 = Minimum and Maximum from phase voltages.

P 2.17.7.2	*LV High 1*	*%*	*ID*	*3256*

Line Voltage High Limit 1 [%] of Grid Nominal Voltage. Trip after delay defined by ID3257.

P 2.17.7.3	*LV High 1 Delay*	*ms*	*ID*	*3257*

Delay to trip when voltage above ID3256.

P 2.17.7.4	*LV High 2*	*%*	*ID*	*3258*
P 2.17.7.5	*LV High 2 Delay*	*ms*	*ID*	*3259*

This parameter defines 10-minute average voltage trip limit.

P 2.17.7.6	*LV High 3*	*%*	*ID*	*3258*
P 2.17.7.7	*LV High 3 Delay*	*ms*	*ID*	*3259*
P 2.17.7.7	*LV High 3 PLim*	*%*	*ID*	*3363*

Active Current limit activated when voltage goes above LV High 3

P 2.17.7.9	*LV Low 1*	*%*	*ID*	*3260*

Line Voltage Low Limit 1 [%] of Grid Nominal Voltage. Trip after delay defined by ID3261.

P 2.17.7.10	*LV Low 1 Delay*	*ms*	*ID*	*3261*

Delay to trip when voltage below ID3260.

P 2.17.7.11	*LV Low 2*	*%*	*ID*	*3262*
P 2.17.7.12	*LV Low 2 Delay*	*ms*	*ID*	*3263*
P2.17.7.13	*LV Low 3*	*ID3365*		
P2.17.7.14	*LV Low 3 Delay*	*ID3366*		
P2.17.7.15	*LV Low 3 PLim*	*ID3367*		

Low voltage 3 has option to activate power limit when the limit is exceeded.

P 2.17.7.16	*10 Min average voltage trip level*	*%*	*ID3353*

This parameter defines 10-minute average voltage trip limit.

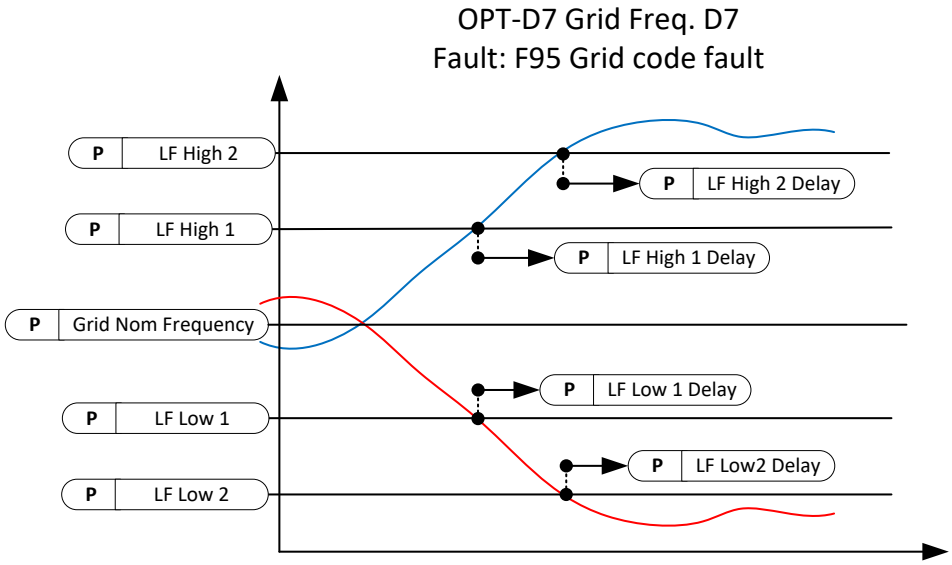
P 2.17.7.17	*10 Min Average Voltage Trip Delay*	*ID3376*

Defines delay for 10 min average voltage monitoring.

P 2.17.7.18	*10 Min Average Voltage Trip Act DO selection*	*ID3375*

6.12.4 Line Frequency

Line frequency trip levels and times to tripping. Times defines delay when drive sees that frequency has exceed set limit. Monitored signal may have hardware and/or software filtering function that will need to be considered when estimating total tripping time.
Reference frequency is P2.1.2 Grid Nom Freq.



P 2.17.8.1	*LF High 1*	*%*	*ID*	*3264*

Line Frequency High Limit 1 [%] of Grid Nominal Frequency.

P 2.17.8.2	*LF High 1 Delay*	*ms*	*ID*	*3265*

Delay to trip when frequency above ID3264.

P 2.17.8.3	*LF High 2*	*%*	*ID*	*3266*
P 2.17.8.4	*LF High 2 Delay*	*ms*	*ID*	*3267*

P 2.17.8.5	*LF High 3*	*%*	*ID*	*3368*
P 2.17.8.6	*LF High 3 Delay*	*ms*	*ID*	*3369*

P 2.17.8.7	*LF Low 1*	*%*	*ID*	*3268*

Line Frequency Low Limit 1 [%] of Grid Nominal Frequency.

P 2.17.8.8	*LF Low 1 Delay*	*ms*	*ID*	*3269*

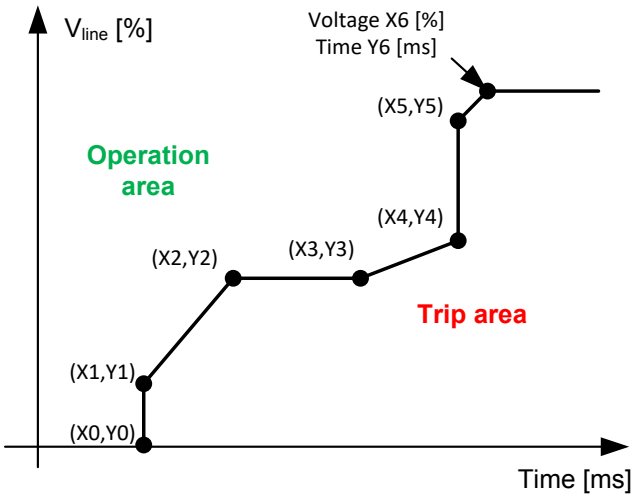
Delay to trip when frequency below ID3268.

P 2.17.8.9	*LF Low 2*	*%*	*ID*	*3270*
P 2.17.8.10	*LF Low 2 Delay*	*ms*	*ID*	*3271*
P 2.17.8.11	*LF Low 3*	*%*	*ID*	*3370*
P 2.17.8.12	*LF Low 3 Delay*	*ms*	*ID*	*3371*
P 2.17.8.9	*LF MaxChangeRate*	*Hz/s*	*ID*	*3322*

Tripping if line frequency has changed more than set value inside one (1) second.

6.12.5 Voltage Time Trip

Define voltage drop curve, drive will trip if curve is exceeded. All values needs to be fill. Timer start when Voltage is below Voltage X6 point.



P 2.17.9.1	*Voltage X0*	*%*	*ID*	*3272*
	Lowest voltage level.			
P 2.17.9.2	*Time Y0*	*ms*	*ID*	*3273*
P 2.17.9.3	*Voltage X1*	*%*	*ID*	*3274*
P 2.17.9.4	*Time Y1*	*ms*	*ID*	*3275*
P 2.17.9.5	*Voltage X2*	*%*	*ID*	*3276*
P 2.17.9.6	*Time Y2*	*ms*	*ID*	*2277*
P 2.17.9.7	*Voltage X3*	*%*	*ID*	*3278*
P 2.17.9.8	*Time Y3*	*ms*	*ID*	*3279*
P 2.17.9.9	*Voltage X4*	*%*	*ID*	*3280*
P 2.17.9.10	*Time Y4*	*ms*	*ID*	*3281*
P 2.17.9.11	*Voltage X5*	*%*	*ID*	*3282*
P 2.17.9.12	*Time Y5*	*ms*	*ID*	*3283*
P 2.17.9.13	*Voltage X6*	*%*	*ID*	*3284*
	Highest voltage level. Below this level timer is started.			
P 2.17.9.14	*Time Y6*	*ms*	*ID*	*3285*
	Time to trip when voltage is below X6 point and above X5 point. Trip time is scaled between X6 and X5 points.			

6.12.6 Line OK Limits

Grid OK levels when reconnection is allowed. If zero values from Line Voltage and Line frequency are used.

P 2.17.10.1	*LF OK High*	*%*	*ID*	*3287*
P 2.17.10.2	*LF OK Low*	*%*	*ID*	*3286*
P 2.17.10.3	*LV OK High*	*%*	*ID*	*3289*
P 2.17.10.4	*LV OK Low*	*%*	*ID*	*3288*
P 2.17.10.5	*Line OK Delay*	*ms*	*ID*	*3290*

Minimum time that line needs to be inside acceptable limits before reconnection counter is started.

6.12.7 Reactive Injection

Reactive current injection is activated by ID3252.

P 2.17.11.1 UV Reactive Mode ID 3314

Select the operation mode for reactive reference handling for under voltage.

1. Linear
2. Power Lock In and Lock Out.

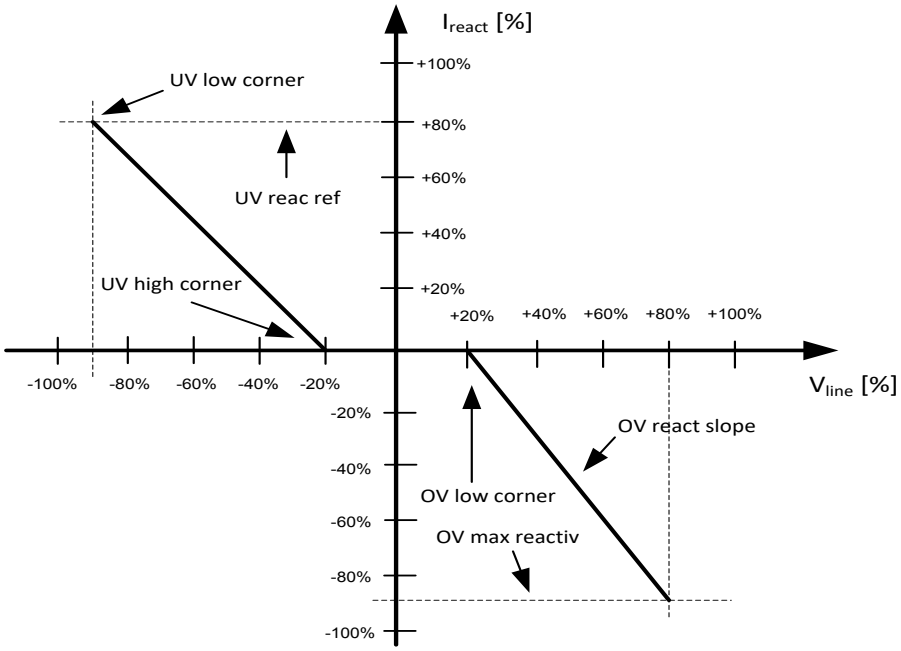
P 2.17.11.1 OV Reactive Mode ID 3377

Select the operation mode for reactive reference handling for over voltage.

1. Linear
2. Power Lock In and Lock Out.

6.12.7.1 Linear reference under voltage

Injected reactive current is changing linearly between high and low voltage corners.



P 2.17.11.3.1	*UV High Corner*	*%*	*ID*	*3291*

Defines voltage level where reactive current injection is started.

P 2.17.11.3.2	*UV Low Corner*	*%*	*ID*	*3292*

Defines voltage level where full Reactive Current, specified in ID3293, is injected to the grid.

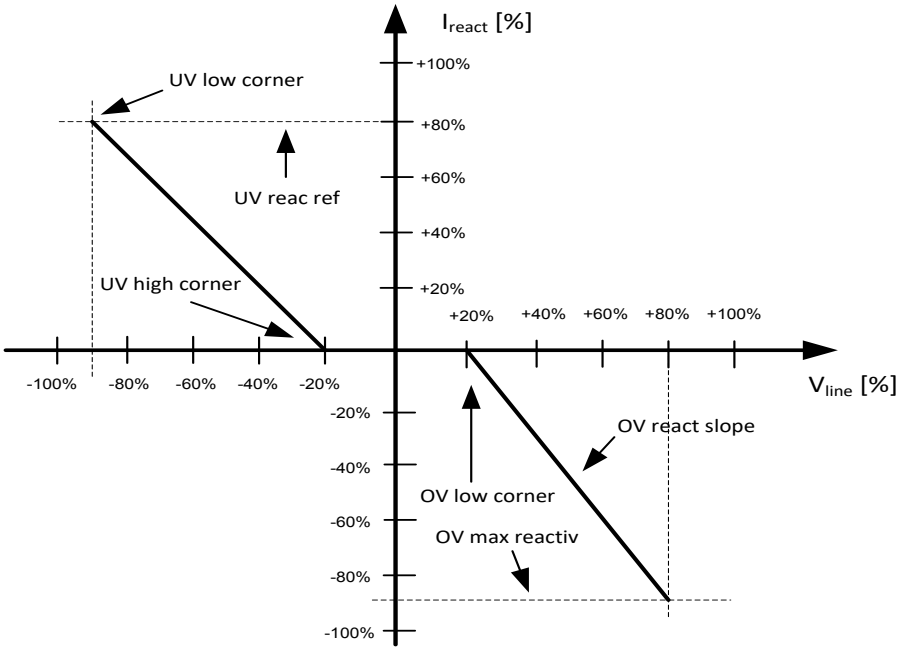
P 2.17.11.3.3	*UV Reac. Ref*	*%*	*ID*	*3293*

Reactive current reference at low voltage corner.

P 2.17.11.3.4	*UV Bi Reac. Ref*	*%*	*ID*	*3294*

Reactive current reference at low voltage corner on bi phase fault situation.

6.12.7.2 *Linear reference over voltage*



P 2.17.11.4.1	*OV Low Corner*	*%*	*ID*	*3300*

Voltage corner where reactive current injection is started on line over voltage situation.

P 2.17.11.4.2	*OV Max Reactiv*	*%*	*ID*	*3301*

Maximum reactive current reference on over voltage situation.

P 2.17.11.4.3	*OV React Slope*	*%/%*	*ID*	*3302*

Slope for reactive current reference, started at ID2300.
100 %/% means that reactive current is increase 100 % by 1 % voltage increase.

P 2.17.11.4.4	*OV React PLim In*	*%*	*ID*	*3303*

If drive output power is below this reactive current injection is not started on over voltage.

P 2.17.11.4.5	*OV React PLim Out*	*%*	*ID*	*3329*

When drive output power falls below this level reactive injection is stopped.

*6.12.7.3 **Power Lock In and Out Reference under voltage.***

P 2.17.11.5.1 Under Voltage PowerLockIn % ID 3315

Power level where reactive current injection is started if Line Voltage is below ID3291.

P 2.17.11.5.2 Under Voltage PowerLockOut % ID 3316

Reactive current injection is stopped if power is below this value.

P 2.17.11.5.3 Under Voltage PowerLogInMode ID 3372

0 = Voltage Level Trip
1 = Linear

P 2.17.11.5.4 UV High Corner % ID 3291

If power is above ID3315 and voltage below this value but above ID3292 reactive current set by ID3318 is injected to grid.

P 2.17.11.5.5 UV Low Corner % ID 3292

If power is above ID3315 and voltage below this value, reactive current set by ID3293 is injected to grid.

P 2.17.11.5.6 UV LockOutVoltag % ID 3317

Voltage limit for disabling the reactive current injection in overvoltage situation

P 2.17.11.5.7 UV Reac RefHighCor % ID 3318

Reactive current injected to grid when power is above ID3315 and Line voltage below ID3291 but above ID3292.

P 2.17.11.5.8 UV Reac. Ref % ID 3293

Reactive current injected to grid when power is above ID3315 and voltage below ID3292. This level is kept until voltage is above ID3311.

P 2.17.11.5.9 UV Bi Reac. Ref % ID 3294

Reactive reference used when Bi-phase fault, in both voltage levels.

*6.12.7.4 **Power Lock In and Out Reference over voltage.***

P 2.17.11.6.1 Over Voltage PowerLockIn % ID 3378

Power level where reactive current injection is started if Line Voltage is above ID3300.

P 2.17.11.6.2 Over Voltage PowerLockOut% ID 3379

Reactive current injection is stopped if power is below this value.

P 2.17.11.5.3 Over Voltage PowerLogInMode ID 3380

0 = Voltage Level Trip
1 = Linear

P 2.17.11.6.4 OV Low Corner % ID 3300

If power is above ID3315 and voltage above this value but below ID3320 reactive current set by ID3321 is injected to grid.

P 2.17.11.6.5 OV High Corner % ID 3320

If power is above ID3315 and voltage above this value, reactive current set by ID3301 is injected to grid.

P 2.17.11.6.6 OV LockOutVoltag % ID 3319

Reactive current injection is stopped if voltage is below this value.

P 2.17.11.6.7 OVReacRefLowCorn % ID 3321

Reactive current injected to grid when power is above ID3315 and Line voltage above ID3300 but below ID3320.

P 2.17.11.6.8 OV Max Reactiv % ID 3301

Reactive current injected to grid when power is above ID3315 and voltage above ID3320. This level is kept until voltage is below ID3319.

*6.12.7.5 **Q(U) Power***

Reactive power reference based on grid voltage

P2.17.11.4.1 High Max Q Power ID3341

Maximum reactive power when over voltage is at Max.

P2.17.11.4.2 High Max Voltage ID3340

Over voltage level when maximum reactive power is injected to grid.

P2.17.11.4.3 High Min Voltage ID3339

Over voltage level when reactive power is started to inject to grid.

P2.17.11.4.4 Low Max Q Power ID3344

Maximum reactive power when under voltage is at min.

P2.17.11.4.5 Low Max Voltage ID3343

Under voltage level when reactive power is started to inject to grid.

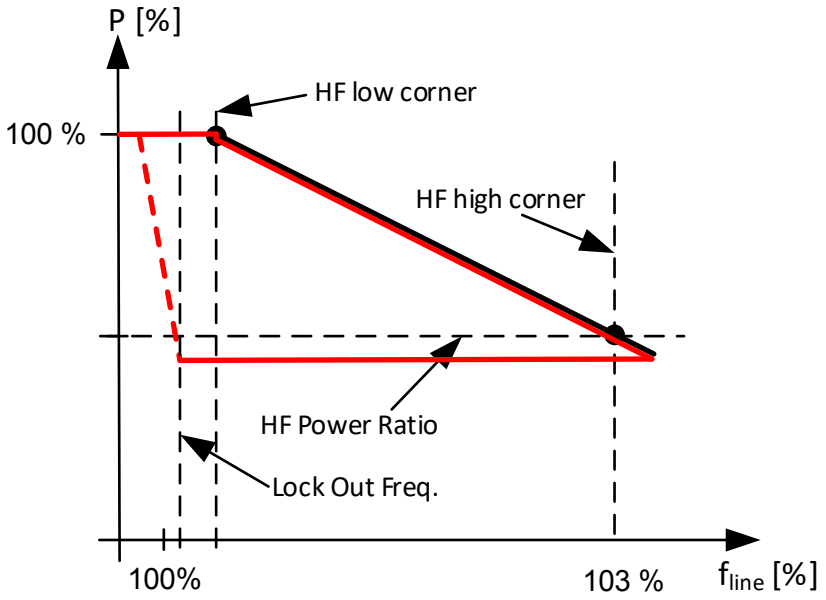
P2.17.11.4.6 Low Min Voltage ID3342

Under voltage level when maximum reactive power is injected to grid.

6.12.8 Power Limit

6.12.8.1 High Frequency Power Limit

Select power limit behavior on high line frequency.



P2.17.12.1.1 HighFreqModes ID 3307

Parameter select how minimum power limit is handled.

0 = High Limit

Power limit will fallow set scaled line.

1 = Minimum

Power limit is kept at minum level set by scaled line.

P2.17.12.1.2 HighFreqLowCornr % ID 3295

Corner where power limiting is started on high line frequency. There is a 100 ms delay before limiting is started.

P2.17.12.1.3 HighFreqPLim Slope %/Hz ID 3239

Slope for power limit. If set to zero, function will use P2.17.12.1.7 High Freq High Corner and P2.17.12.1.8 High Freq Power Ratio. Use this parameter when power is needed to reduced with certain slope. Use P2.17.12.1.7 High Freq High Corner and P2.17.12.1.8 High Freq Power Ratio when power limits needs to be in certain value at certain frequency.

P2.17.12.1.4 HighFreqLockOut % ID 3308

Below this limit power limitation is stopped. P2.17.12.1.6 can be used to define delay before power limit is released.

P2.17.12.1.5 HighFreqPLimRamp %/s ID 3298

Power limit increase ramp rate.

P2.17.12.1.6 HighFreqPReleDel ms ID 3299

Delay how long limit is kept after frequency is below ID3308.

P2.17.12.1.7 High Line Frequency Full Power Release delay ms ID3374

When this is activated power is limited for this time to level where power was when High Frequency Low corner was exceeded.

P2.17.12.1.8 HighFreqHigCornr % ID 3296

Frequency corner where minimum power limit is used. If power limitation is defiend with slope use P2.17.1.1.3 paramter to define slope.

P2.17.12.1.9 HighFreqPowRatio % ID 3309

Power level in relation to actual power when ID3295 was exceeded to be used at ID3296 corner.

6.12.8.2 *High Voltage Power Limit*

P2.17.12.2.1 Limit Mode ID3360

Parameter select how minimum power limit is handled.

0 = High Limit

Power limit will fallow set scaled line.

1 = Minimum

Power limit is kept at minim level set by scaled line.

P2.17.12.2.2 Log In Voltage [%] ID3325

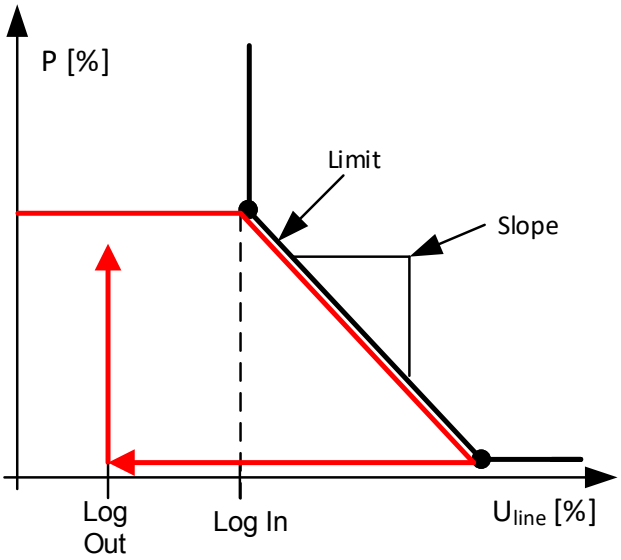
High voltage level when power will be started to limit by the defined slope. Power limit will not increase until voltage has gone below Log Out Voltage Level.

P2.17.12.2.3 Log Out Voltage [%] ID3326

Low Voltage Level where power limit is released if line voltage has increased above Log In Voltage Level

P2.17.12.2.4 Limit Slope [%/%] ID3327

Defines slope for the power limit when voltage goes above Log In Voltage. Function is disabled when this parameter is zero.



*6.12.8.3 **Low Freq Power***

Power increase function when frequency decreases. When activated and frequency goes low, drive will activate Power PI controller and start to increase power.

P2.17.12.5.1 Power Increase High Frequency ID3334

Frequency when power is started to increase.

P2.17.12.5.2 Power Increase Slope ID3335

Slope how steeply power is increased.

P2.17.12.5.3 Power Increase Max ID3336

Limit for increased power.

6.12.9 Cos Phii Control

P 2.17.13.1 CosPhiiMode ID3345

0 = Direct Reference

1 = Volt LogIn LogOut

2 = Act. Current

P 2.17.13.2 CosPhiiRef ID 3304

Direct Cos Phii reference. If Lock In and Out is used this function is not active.
1000=unity, 100=min, neg=capacitive

6.12.9.1 ***Lock in and out control***

Cos Phii control is used at over voltage situations. Controller is activated when voltage is above Lock In Voltage and Active Current is more than 50 %. 1,0 ref at 50 % power and 0,9 ref at 100 % power.

P 2.17.13.3.1 LockInVoltage % ID 3305

Voltage level when Cos Phii control is started.

P 2.17.13.3.2 LockOutVoltage % ID 3306

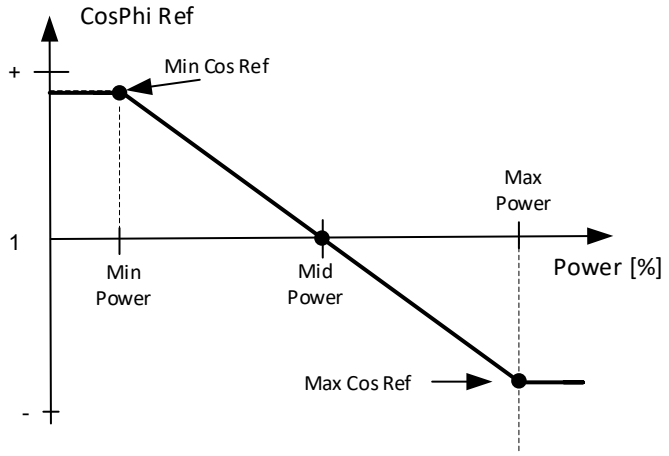
Voltage level when Cos Phii control is stopped.

P 2.17.13.3.3 Max Cos Ref ID3346

Cos Phii reference used when power is at 100 %.

6.12.9.2 Cos Phii Active Current Control

Cos Phii reference is started to adjust above 50 % power and reach value set by ID3346 at 100 % Power.



P2.17.13.4.1 Min Cos Ref Min Power ID3357
Minimum power where Min Cos Ref is used

P2.17.13.4.2 Min Cos Ref ID3356
Cos Phii Reference at Min Power point.

P2.17.13.4.3 Cos Ref Mid Power ID3358
Middle power point where Cos Phii Ref is 1,000

P2.17.13.4.4 Max Cos Ref Max Power ID3359
Maximum power where Max Cos Ref is used

P2.17.13.4.5 Max Cos Ref ID3346
Cos Phii Reference at maximum power point.

6.12.10 External Input

External input to make a trip and/or to activate separate frequency limits for tripping.

P 2.17.14.1 Ext GC Trip In ID 3310

Direct digital input to activate Grid Code trip function.

P 2.17.14.2 SeparateFLimMon ID 3311

Digital input to active more strict frequency trip limits.

P 2.17.14.3 SepFreqHighLim % ID 3313

Frequency high limit used to Grid Code trip when digital input defined by ID3311 is active.

P 2.17.14.4 SepFreqLowLim % ID 3313

Frequency low limit used to Grid Code trip when digital input defined by ID3311 is active.

6.12.11 Grid Code Options

P 2.17.15.1 Grid Code Options ID 3328

B00 = +1 = Activate this bit for Grid Code: GB/T 19964-2012.

B01 = +2 = For voltage level trips minimum of phase voltages is used.

P2.17.15.2 Voltage Filt. TC ms 3332

Filtering time constant for voltage that is used Grid Code monitoring.

P2.17.15.3 Frequency Filt. TC ms 3333

Filtering time constant for frequency that is used Grid Code monitoring.

P2.17.15.4 FRT Options 3400

P2.17.15.5 Vac Stop Offset % 3337

With this is possible to give offset for Grid Code voltage in stop state.

P2.17.15.6 Vac Run Offset % 3338

With this is possible to give offset for Grid Code voltage in run state.

P2.17.15.7 Power Follower Hysteresis ID1529

Power follower hysteresis.

P2.17.15.8 Line Voltage High Filt. TC ms 3373

Filtering time constant for voltage that is used Grid Code monitoring.

7. CONTROL

Unlike the parameters listed above, these parameters are located in the **M3** menu of the control panel. The reference parameters do not have an ID number.

Table 58.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 2=Systembus

Parameters and descriptions

P 3.1 Control Source ID 1403

0=Keypad Cntrl

1=External PLC
2=SystemBus

8. FIELDBUS INTERFACE

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 59. 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.
Day Energy Produced	kwh	High: 1866 Low: 1867	Day energy of inverter fed into the grid.
Last Day Energy Produced	kwh	High: 1868 Low: 1869	Last day energy of inverter fed into the grid.

8.1 Control Word

Table 60. Fieldbus interface Control data

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

Control Word

Table 61. Fieldbus Control word bits

Bit	Name	Value = 0	Value = 1	Description
0	Start Command		Start	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	Master		Master	
9	Reserved			
10	Reserved			
11	Reserved			
12	Reserved			
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			

8.2 Status Words

Table 62. Fieldbus interface status data

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

Status Word

Table 63. 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 9.1 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 9.1
6	Reserved			
7	Inverter Running Status	-	Inverter Running	See Chapter 9.1
8	Master		Master	
9	Heartbeat bit			The inverter toggles this bit on and off. 1s on, 1s off.
10	ChargeSwState		Charged	
11	Reserved			
12	Reserved			
13	Reserved			
14	Reserved			
15	Reserved			

8.3 Warning Status words

Statusword 1, ID1819

Table 64. 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	Safe Disable	No Fault	Fault	
15	Reserved			

Statusword 2, ID1820

Table 65. 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 66. Warnings status word 3

Bit	Name	Value = 0	Value = 1	Description
0	Processor Watchdog	No Fault	Fault	See Fault list 25
1	Reserved			
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 67. 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			

8.4 Monitoring values for Fieldbus use

Table 68. Monitoring values for Fieldbus use

Values	Min	Max	Unit	ID	Description
Energy yesterday (high word)				1640	
Energy yesterday (low word)				1641	
DC Start Level			V	1642	
Run Time Yesterday			h	1643	
Grid Connections (High Word)			-	1644	
Grid Connections (Low Word)			-	1645	
Unit temperature			°C	1646	
Runtime Today			h	1647	
Total Runtime (High Word)			h	1648	
Total Runtime (Low Word)			h	1649	
Calibrated 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	
Energy today (high word)			kWh	1658	
Energy today (low word)			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	

9. PROBLEM SOLVING

While proper information is needed form the problem, it is also recommended to try with latest application- and system software versions available. Software is continuously developed and default settings are improved.

Type	Signal Name	Actual	Unit
Value	Supply Frequency	0	Hz
Value	Supply Voltage	0	V
Value	DC-link Voltage	564	V
Value	Active Current	0	%
Value	Reactive Current	0	%
Value	Line State	32972	
Value	Status Word	1283	
Value	DINStatusWord 1	0	

Picture 19. The recommended signals for NCDrive

Use the fastest communication speed (Baudrate: 57 600) and a 50 ms update interval for signals for the RS232 communication.

For the CAN communication, use a 1 Mbit communication speed and a 10 ms update interval for signals.

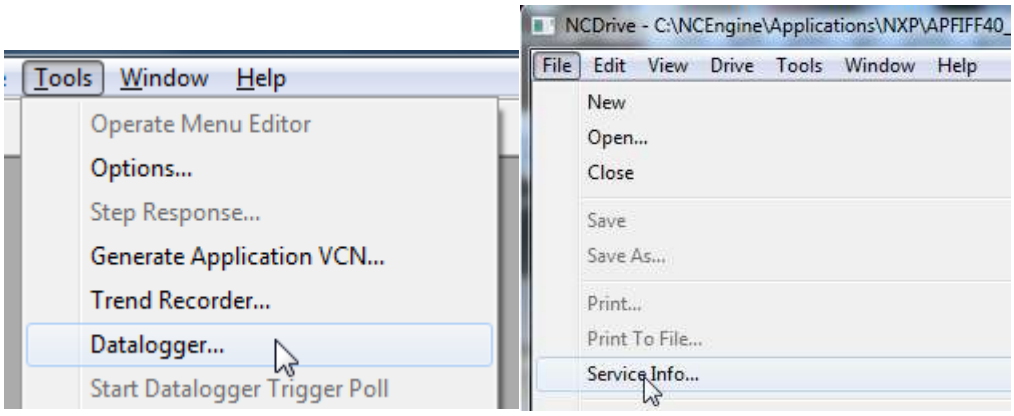
Use original vcn-file instead of generic vcn-file when uploading parameters. Then every application values will update correct to monitor window.

When you contact the support, send the *.trn, *.par and Service info (*.txt) files with a description of the situation. If the situation is caused by a fault, take also the Datalogger data from the drive.

Note that Datalogger settings can be changed to catch correct situation and it is also possible to make manual force trig for Datalogger.

Before storing the parameter file, upload the parameters from the drive and save when NCDrive is in the ON-LINE state. If it is possible, do this while the problem is active.

It is also helpful to have a single line diagram from the system where problem is faced.



Picture 20. Datalogger window opening and Service Info upload.

10. 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	Check supply voltage, fuses and cable.	X

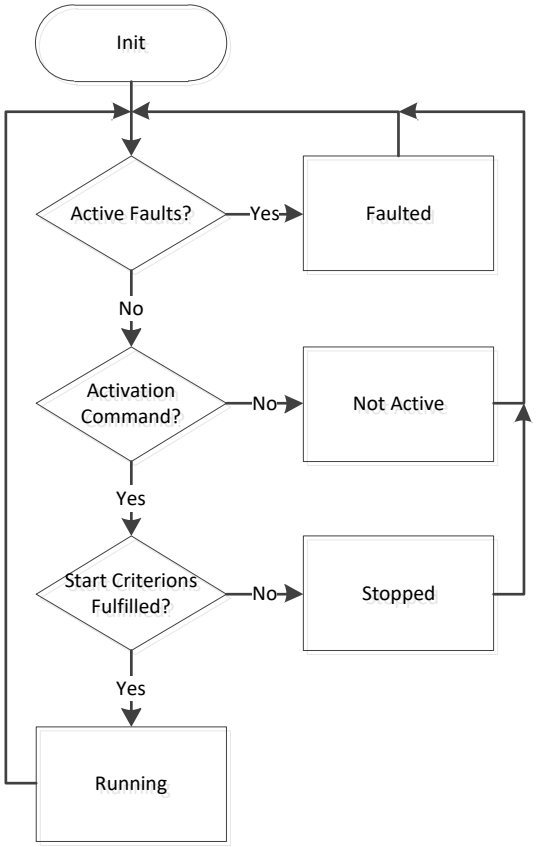
		S2 = Phase supervision active front end		
11	Output phase supervision	Output line phase is missing.	Check supply voltage, fuses and cable.	---
13	Inverter under-temperature	Heatsink temperature is under –10°C		---
14	Inverter over-temperature	Heatsink temperature is over 90°C Overtemperature warning 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.	---
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

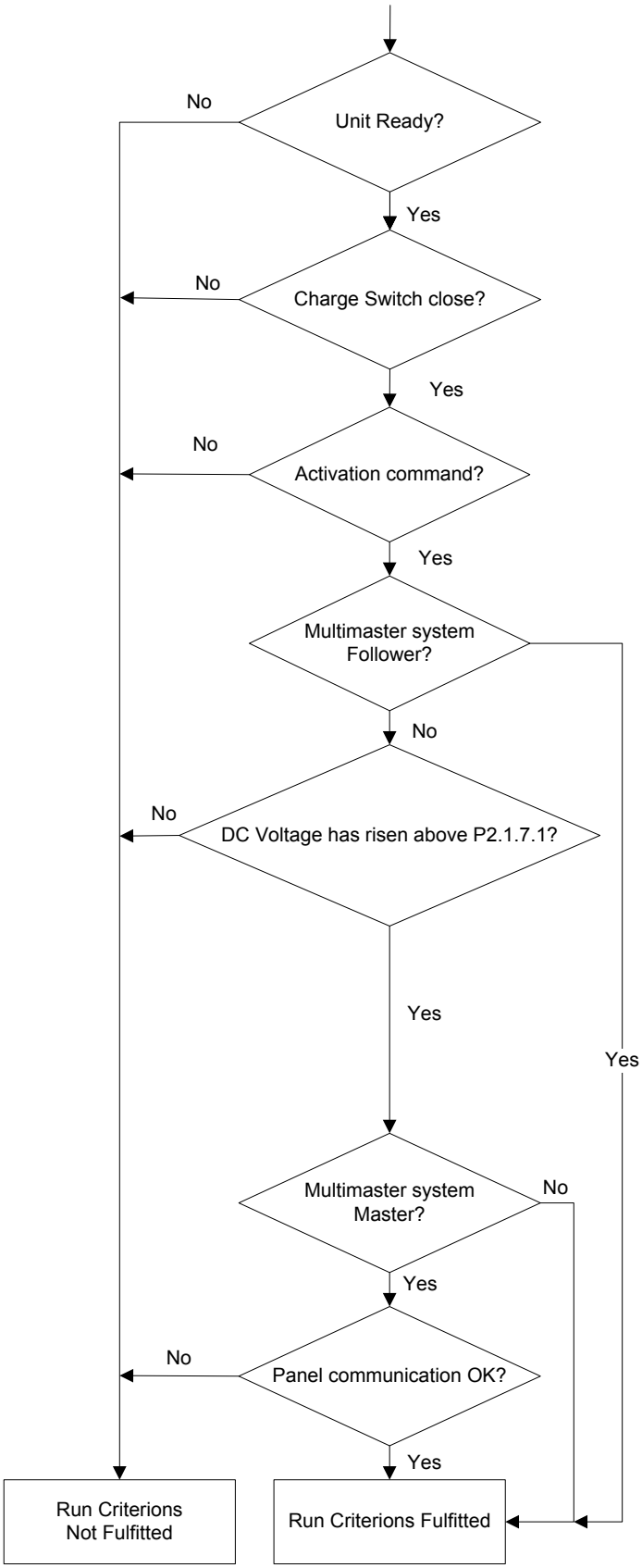
75	FreqUnderLimit	AC frequency on line side is below the min limit.	Check AC Frequency	Delayed
76	DC Ground Warning	DC Insulation measurement signal has gone above the warning limit.	Check DC Insulation	---
77	DC Ground Fault	DC Insulation measurement signal has gone above the fault limit.	Check DC Insulation	Delayed
78	DC Overvoltage (only warning)	DC voltage level is over overvoltage ref max		
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	Emergency Switching	Command for emergency stop received from digital input.	New run command is accepted after reset.	
95	Gridcode fault	Grid Code tripping limit has been reached. A1 :Invalid grid code license A2: Line Voltage High Level 1 A3: Line Voltage High Level 2 A4: Line Voltage Low Level 1 A5: Line Voltage Low Level 2 A6: Line Frequency High Level 1 A7: Line Frequency High Level 2 A8: Line Frequency Low Level 1 A9: Line Frequency Low Level 2 A10: LVRT Three Phase trip. A11: LVRT Bi-Phase trip A12: Separated limits or forced trip A13: Line Frequency change rate trip. A14: 10 min average trip A15: Line Voltage High Level 3 A16: Line Voltage Low Level 3 A17: Line Frequency High Level 3 A18: Line Frequency Low Level 3	Check grid code parameters A2: IDs 3256 and 3257 A3: IDs 3258 and 3259 A4: IDs 3260 and 3261 A5: IDs 3262 and 3263 A6: IDs 3264 and 3265 A7: IDs 3266 and 3267 A8: IDs 3268 and 3269 A9: IDs 3270 and 3271 A10: IDs 3272-3285 A11: IDs 3272-3285 A12: IDs 3310-3313 A13: ID 3322 A14: ID 3353 A15: IDs 3361 and 3362 A16: IDs 3365 and 3366 A17: IDs 3368 and 3369 A18: IDs 3370 and 3371	---
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 ID 1853	Check air circulation of the drive	---

11. STATE MACHINE:

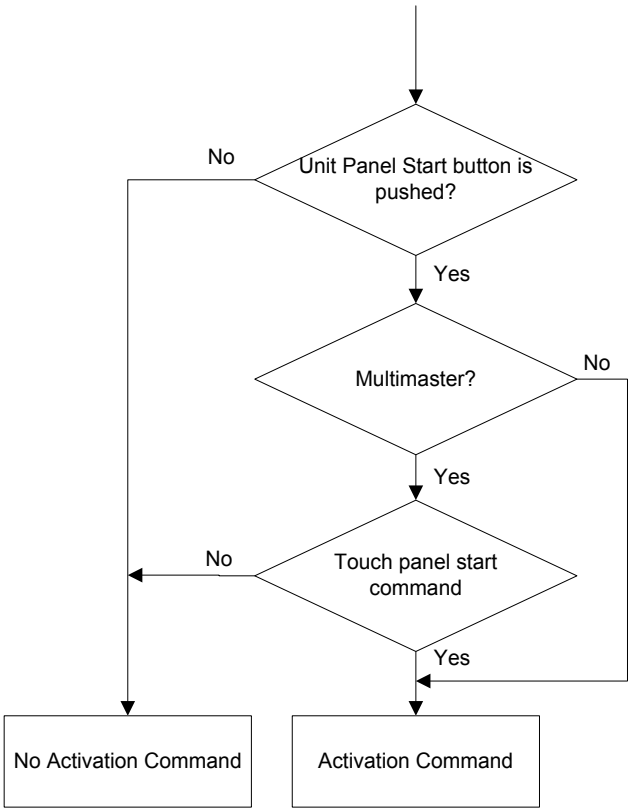
11.1 General state machine:



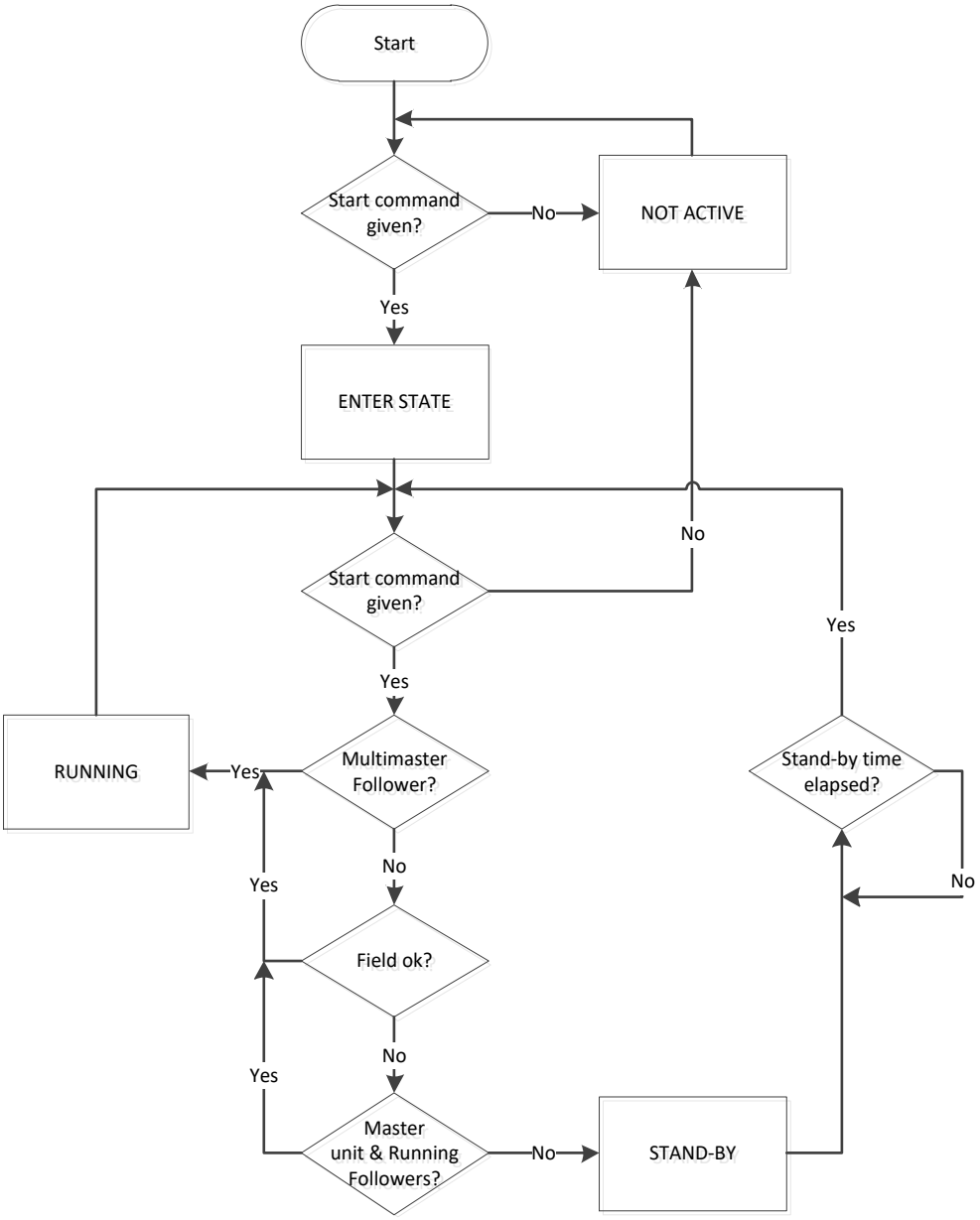
11.1.1 Start Criterions:



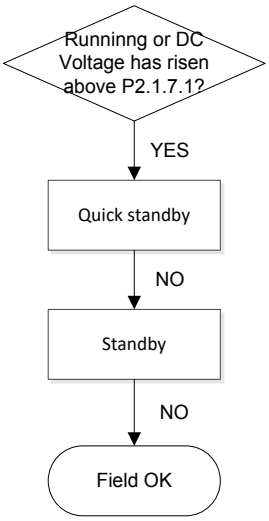
11.1.2 Activation command:



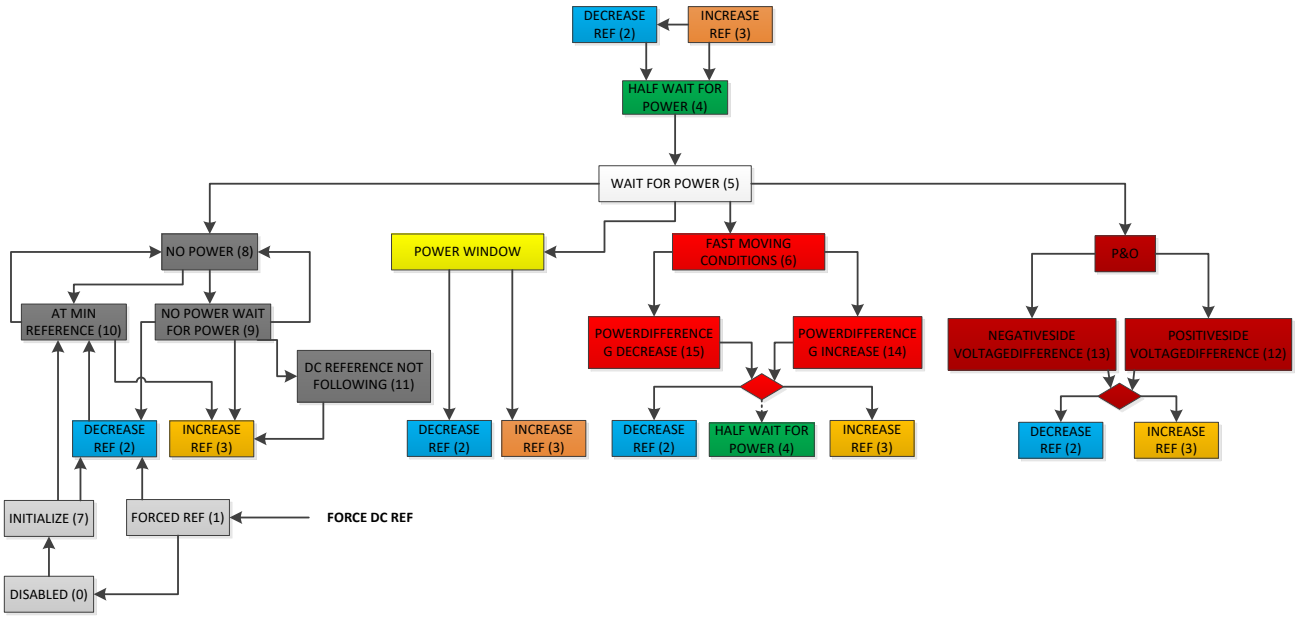
11.2 General Substate Machine



11.2.1 Field OK



11.3 MPPT State:

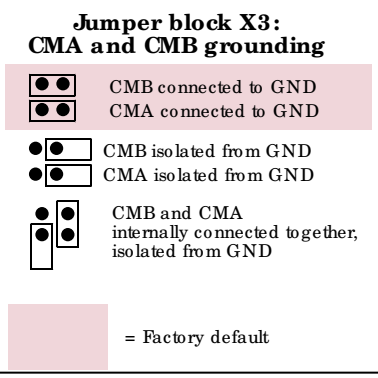


12. IO-CONNECTIONS

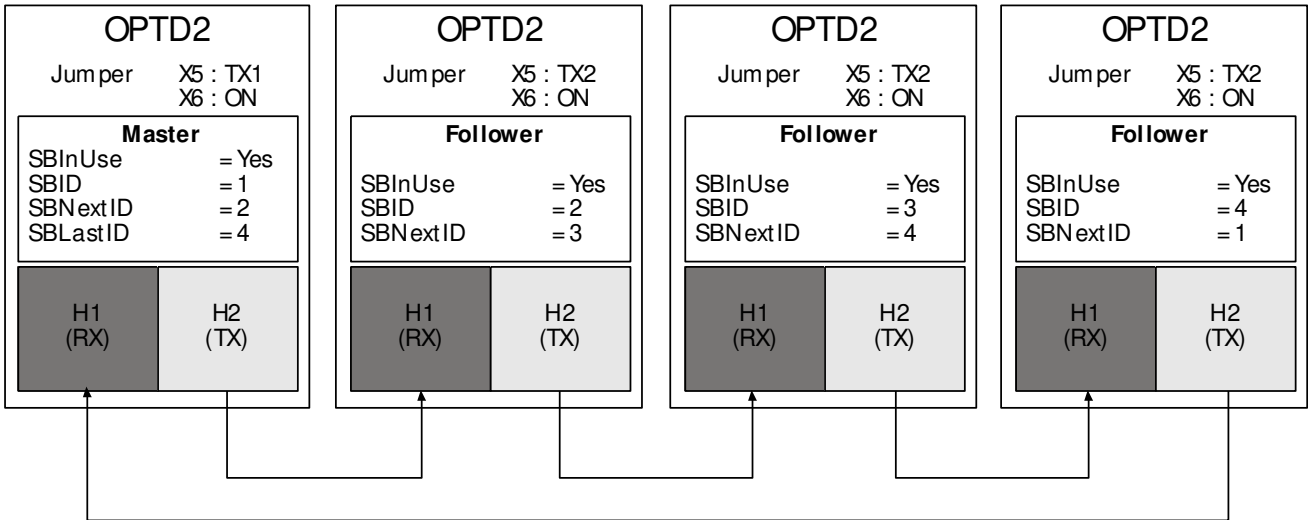
OPTA1			
Terminal		Signal	Description
1	$+10V_{ref}$	Reference output	Voltage for potentiometer, etc.
2	AI1+	DC Ground Analogue input, voltage range 0—10V DC	Voltage input DC Ground
3	AI1-	I/O Ground	Ground for reference and controls
4	AI2+	AC Measurement range 0—10V DC	Current input AC Measurement
5	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		

12.1 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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