Application Guide

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iC7 Series Cooling Module

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iC7 Series Cooling Module Application Guide

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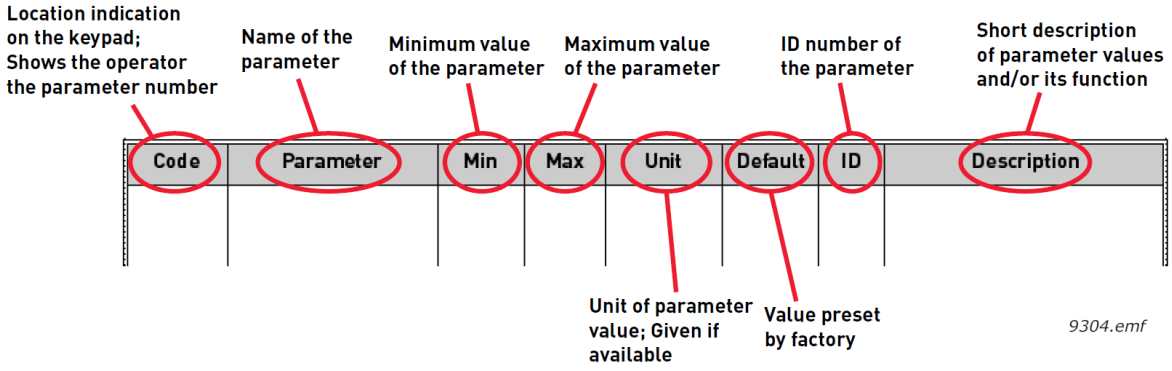
ABOUT THIS GUIDE

This guide describes the features and use of the AMFI1256 – iC7 Series Cooling Module application software. The guide has been compiled in accordance with the menu structure of the control unit.

Note! This guide includes a large number of parameter tables. The following image shows the column names and their explanations:



1. IC7 SERIES COOLING MODULE APPLICATION

Software AMFI1256, iC7 Series Cooling Module Application

This application software is designed for VACON® 100 control unit, which is used inside iC7 Series Cooling Module cabinet. This software is designed for both 1 and 2 pump cooling module systems (see the following figure).

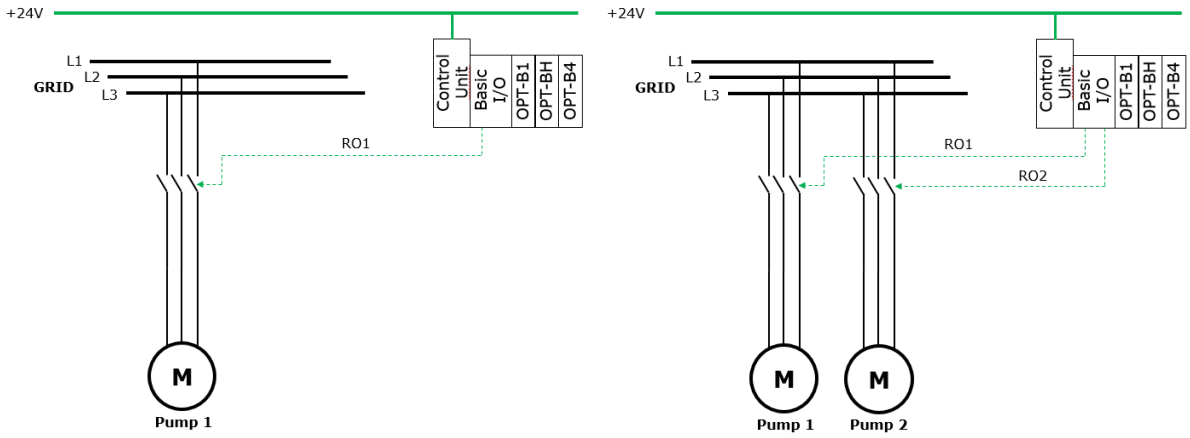


Figure 1. Cooling unit configurations (1 and 2 pump systems)

The iC7 Series Cooling Module application is responsible for:

- controlling the actuators of the cooling units (pumps, valves, and so on)
- monitoring and supervising the signals and measurements related to the cooling unit (temperature, pressure, flow, and so on)
- handling of the control signals (start/stop commands, control over fieldbus, and so on)

In the iC7 Series Cooling Module, pumps are operated at a fixed speed. The coolant flow is not adjustable.

Coolant temperature is controlled by regulating a 3-way valve based on the measured coolant temperature. The control unit is regulating the 3-way valve automatically to keep the coolant temperature at the setpoint value.

The standard delivery includes I/O boards OPT-B1 (placed in slot C) and OPT-BH (placed in slot D). The last free option slot (slot E) is reserved for a fieldbus option board (PROFIBUS DP, for example), which enables the controlling, monitoring, and programming of the drive from the host system.

1.1 Redundancy in the dual pump Cooling Module

The following functions are available for redundant and fault tolerant operation:

1.1.1 Service mode

Service mode allows the operation of the cooling module manually, without most of the protection functionalities. When service mode is activated, pumps can be manually started/stopped and the position of the 3-way valve can be adjusted manually with the parameter ***P2.7.3 Valve Manual Reference***.

1.1.2 Autochange

Autochange function can be used to equalize the pump running hours by switching between the two pumps after an adjustable time delay. If needed, the autochange function can also be parameterized so that pump running times are not equal.

1.1.3 Motor thermal protection

The Cooling Module supervises the state of the motor thermal relay by a feedback signal. In a dual pump system, if motor overtemperature is detected on one of the pumps, the secondary pump is taken into use and the cooling module continues operation.

1.1.4 Auto Trial function

Pump Auto Trial feature is designed to keep the system running in case any alarm or fault occurs in the dual-pump cooling module. If an alarm or a fault occurs, the feature forces the system to perform the autochange (switch to the secondary pump), and tries to reset active faults automatically (only once) and continue operation.

1.2 Auto-recovery functions in Cooling Module

1.2.1 Automatic Reset

Automatic reset function can be used to reset some of the most common faults in the cooling module automatically.

1.2.1.1 Automatic reset in single pump configuration

Short-term power outage might be the most typical use case for the automatic reset function in the single pump configuration. When the power is cut from the pump, the cooling module typically generates either a “Coolant Flow (High)” fault or “PT12 Pump Outlet Pressure (Low)” fault. These two faults can be included in the automatic reset function, so that the cooling module resets these faults automatically and continues operation when the supply power for the pump is available again (after the short term power outage).

1.2.1.2 Automatic reset in dual pump configuration

In dual pump configuration, “*Auto Trial Function*” can be used for resetting and restarting the cooling module automatically after any fault. For that reason, it is recommended to parameterize the timing of “*Auto Trial*” and “*Automatic reset*” so that “*Auto Trial*” function tries to reset the fault first, and “*Automatic Reset*” tries the reset later, if the problem was not solved by the “*Auto Trial*” function.

2. CONTROL I/O

This application software has been designed for the following option board setup:

- Slot C: OPT-B1
- Slot D: OPT-BH
- Slot E: OPT-B4

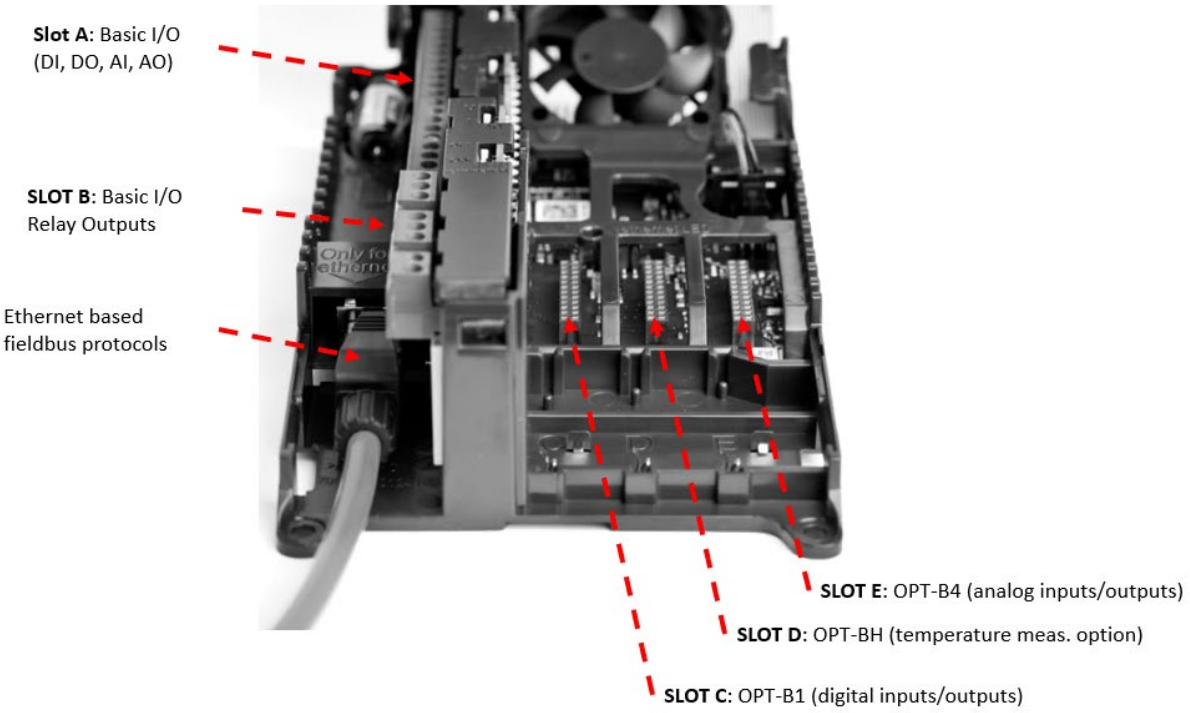


Figure 2. Control unit and option boards

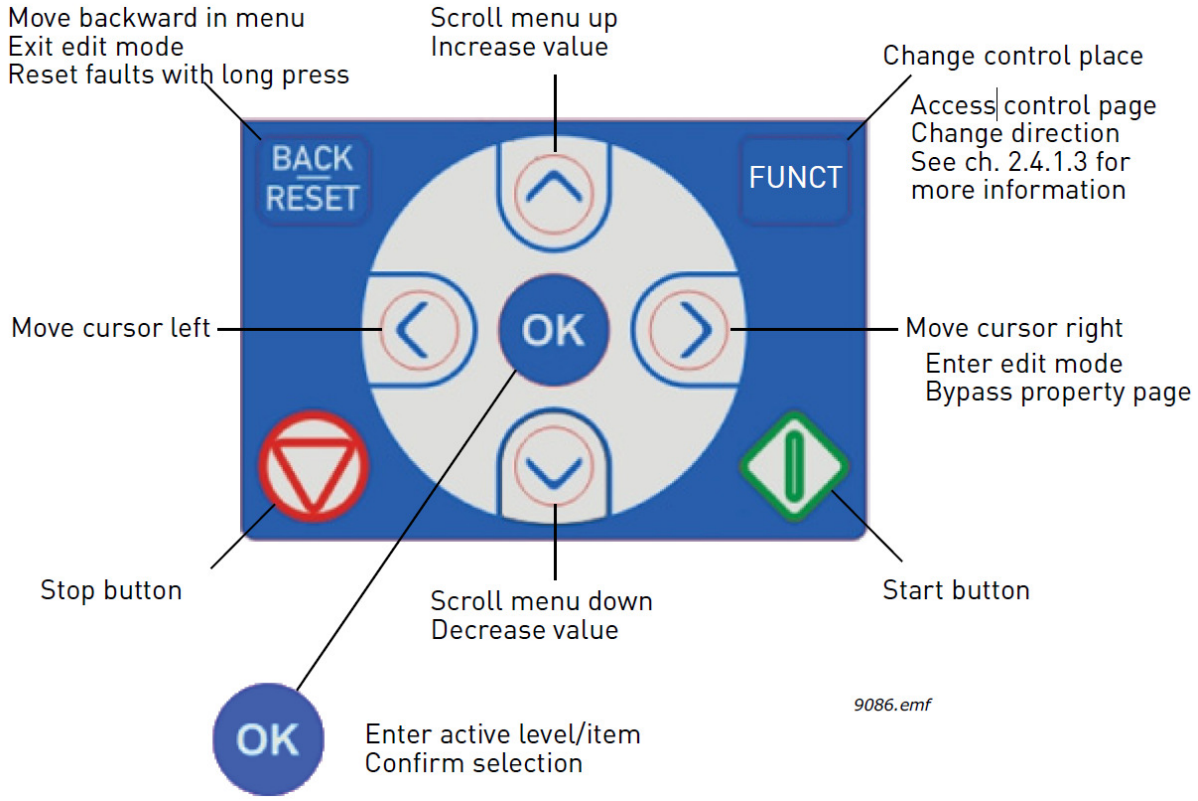
3. USER INTERFACES ON VACON® 100 CONTROL UNIT

This chapter presents the different user interfaces on the VACON® 100 control unit:

- Graphical LCP
- VACON® Live

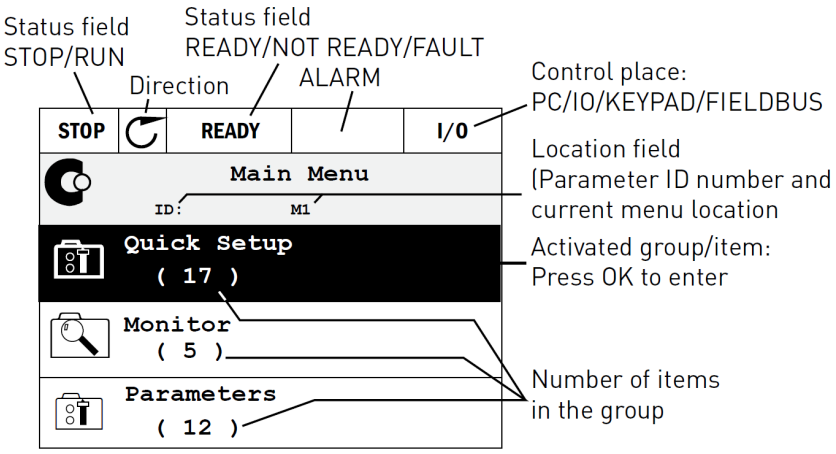
3.1 Graphical LCP

The button section of the keypad:



The data on the control panel are arranged in menus and submenus. Use the Up and Down arrows to move between the menus. Enter the group/item by pressing the OK-button and return to the former level by pressing the BACK/RESET-button.

The keypad display indicates the status of the motor and the drive and any irregularities in motor or drive functions. On the display, there is information about the drive, the current location in the menu structure, and the item shown.



3.1.1 Using the graphical LCP

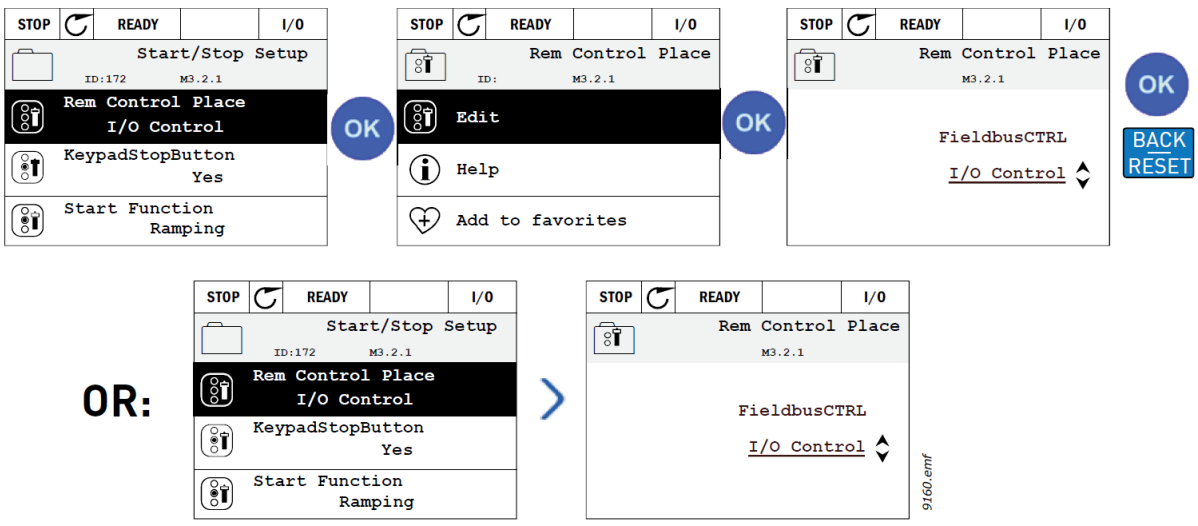
3.1.1.1 Editing values

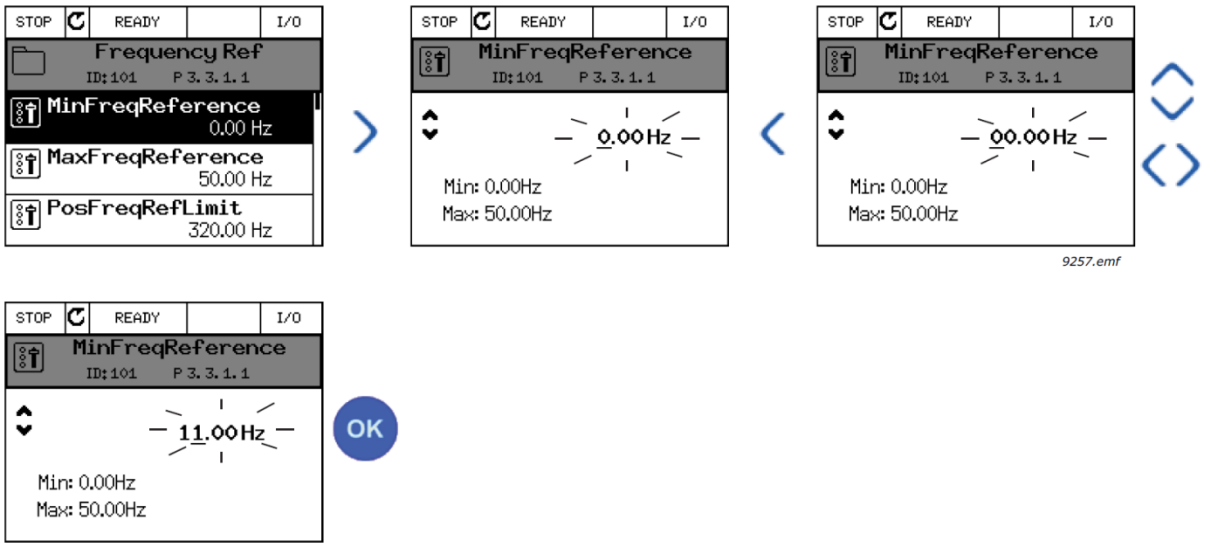
The selectable values can be accessed and edited in two different ways on the graphical LCP.

Parameters with one valid value
Typically, one parameter is set to one value. The value is selected either from a list of values (see the following example) or the parameter is given a numerical value from a defined range (for example, 0.00…50.00 Hz).

Change the value of a parameter following the following procedure:

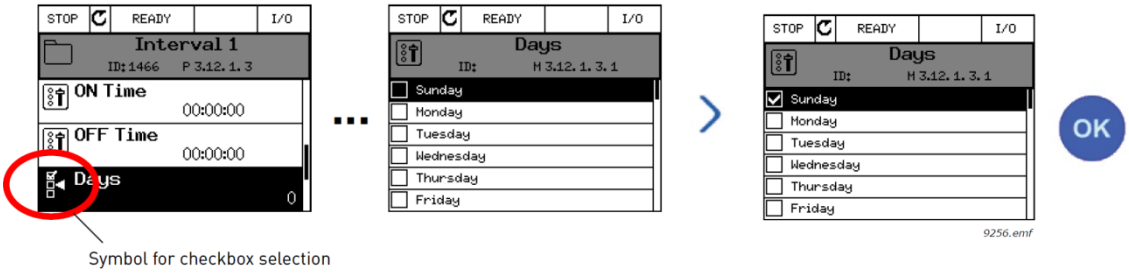
1. Locate the parameter.
2. Enter the Edit mode.
3. Set the new value with the arrow buttons up/down. Move from digit to digit with the arrow buttons left/right if the value is numerical and then change the value with the arrow buttons up/down.
4. Confirm the change with the OK button, or ignore the change by returning to the previous level with the Back/Reset button.





Parameters with checkbox selection

Some parameters allow selecting several values. Make a checkbox selection at each value that is to be activated as instructed in the following image.



3.1.1.2 Resetting faults

Active faults and alarms can be reset by a long press of RESET –button on the keypad (2 s.).

3.1.1.3 Function button

The FUNCT-button is used for four functions:

1. To quickly access the Control page
2. To easily change drive control places
3. To change the rotation direction
4. To quickly edit a parameter value

Control places

The control place is the source of control where the drive can be started and stopped. Control place is selected with parameter ***P2.1.1 Control Place***, which has the following options:

- I/O Control (default)
- Keypad Control
- Fieldbus Control

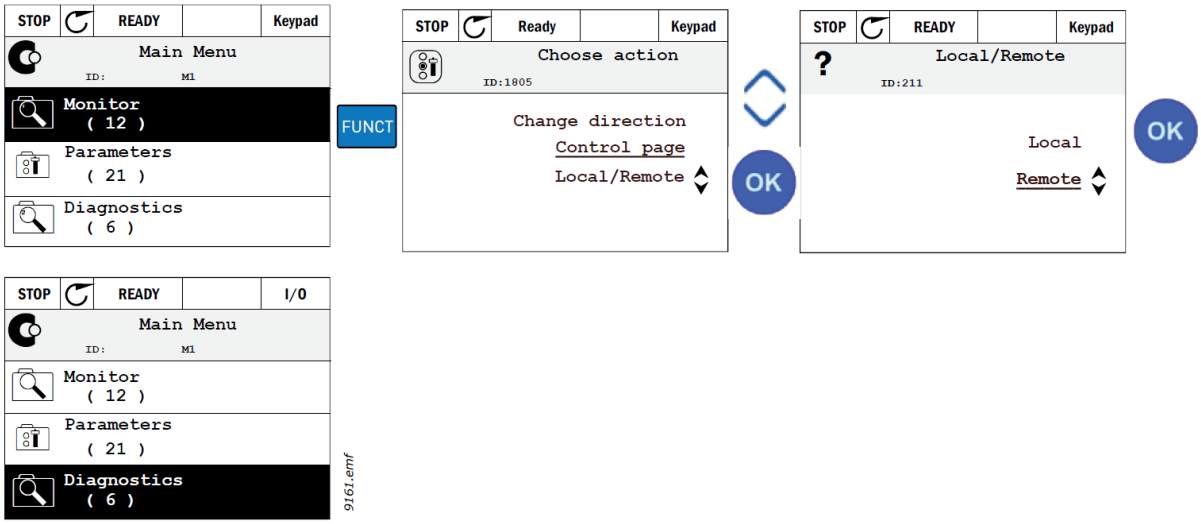
The selected control place can be seen on the status bar of the keypad.

Drive frequency reference is taken from parameter P2.2.2 Freq. Reference. This reference is common for all control places (excluding PC control).

Motor rotation direction (forward/backward) is defined with parameter ***P2.2.1 Direction***. This selection is common for all control places.

Changing control places

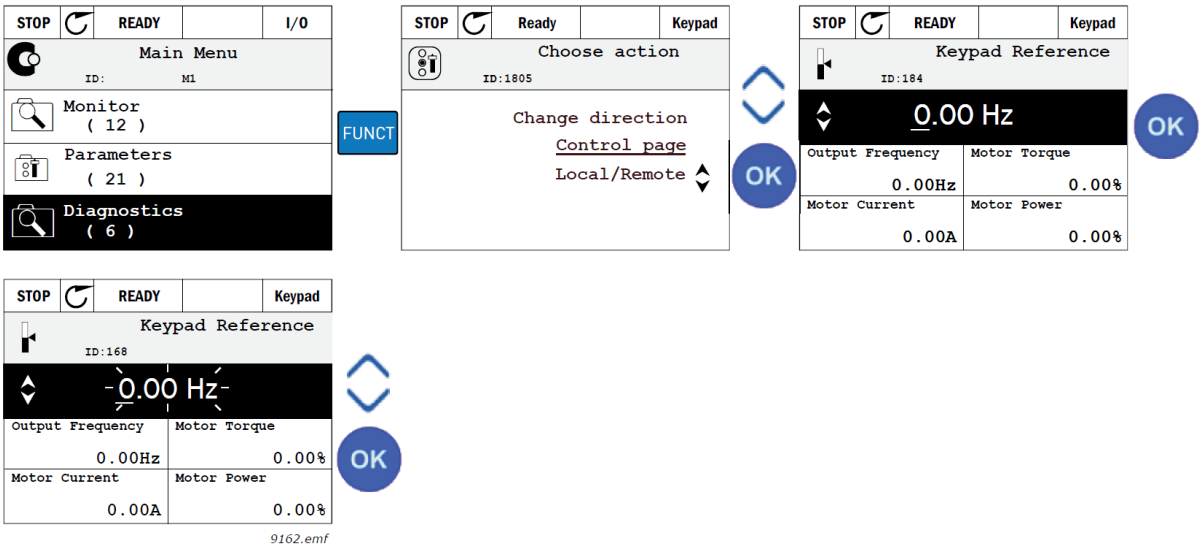
1. Anywhere in the menu structure, push the FUNCT button.
2. Push the Arrow up or the Arrow down button to select Control Place and confirm with the OK button.
3. On the next display, select either I/O, Keypad or FB and again confirm with the OK button.
4. The display returns to the same location as it was when the FUNCT button was pushed. However, if the Keypad control place was selected, the display asks for keypad reference.



Accessing the control page

The Control page is meant for easy operation and monitoring of the most essential values.

1. Anywhere in the menu structure, push the FUNCT button.
2. Push the Arrow up or the Arrow down button to select Control page and confirm with the OK button.
3. The control page appears if keypad control place and keypad reference are selected to be used. The Keypad reference can be set after pressing the OK button. If other control places or reference values are used, the display shows Frequency reference, which is not editable. The other values on the page are Multimonitoring values. The values that appear for monitoring can be selected.



Quick edit

Through the Quick edit functionality, the desired parameter can be accessed quickly by entering the parameter's ID number.

1. Anywhere in the menu structure, push the FUNCT button.
2. Push the Arrow up or the Arrow down buttons to select Quick Edit and confirm with the OK button.
3. Enter the ID number of the parameter or monitoring value that you wish to access. Press the OK button to confirm.
4. The requested Parameter/Monitoring value appears on the display (in editing/monitoring mode.)

3.1.1.4 Copying parameters

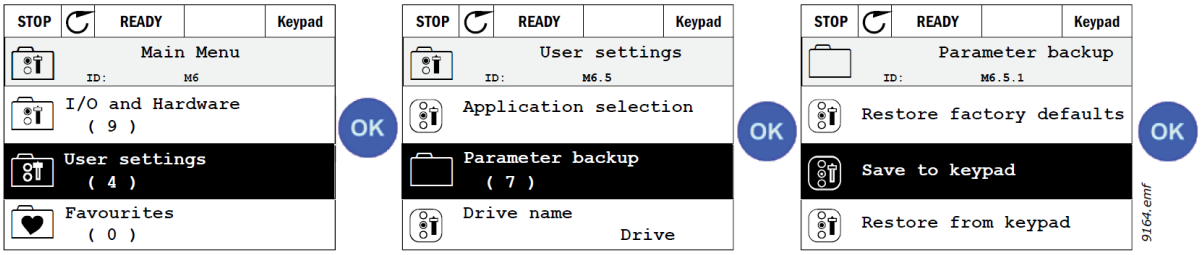
Note! This feature is available in the graphical LCP only.

The parameter copy function can be used to copy parameters from one drive to another.

The parameters are first saved to the keypad, then the keypad is detached and connected to another drive. Finally the parameters are downloaded to the new drive restoring them from the keypad.

Before any parameters can successfully be copied from the keypad to the drive, the drive has to be stopped before the parameters are uploaded.

- First go into the User settings menu and locate the Parameter backup submenu.
- In the Parameter backup submenu, there are three possible functions to be selected:
- *Restore factory defaults* re-establishes the parameter settings originally made at the factory.
- *Save to keypad* copies all parameters to the keypad.
- *Restore from keypad* copies all parameters from the keypad to a drive.



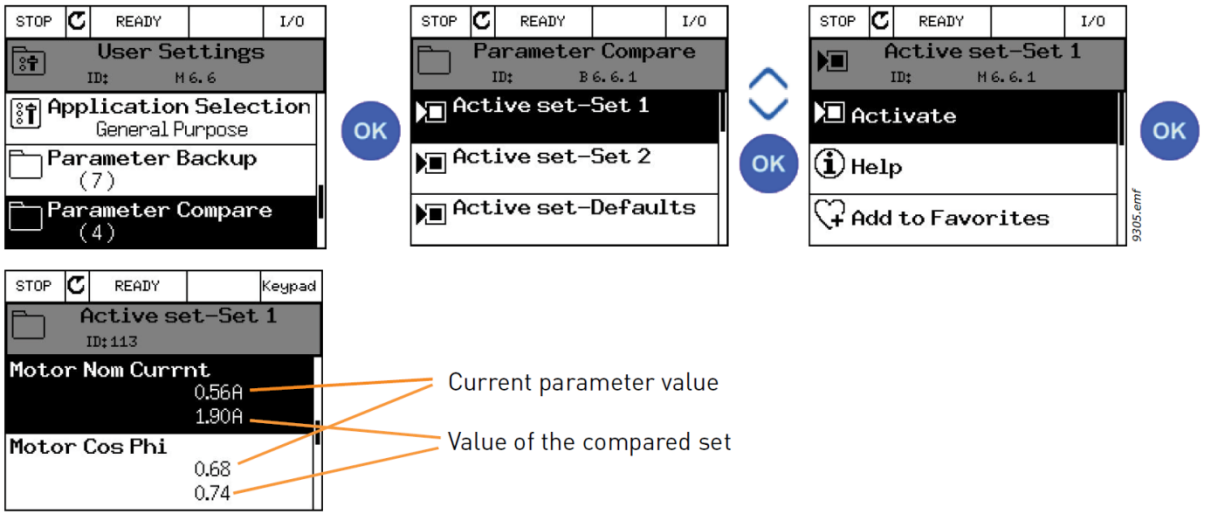
3.1.1.5 Comparing parameters

With this function, the active parameter set can be compared with one of these four sets:

- Set 1 (B5.5.4: Save to Set 1)
- Set 2 (B5.5.6: Save to Set 2)
- Defaults (Factory defaults)
- Keypad set (B5.5.2: Save to Keypad)

See the following figure.

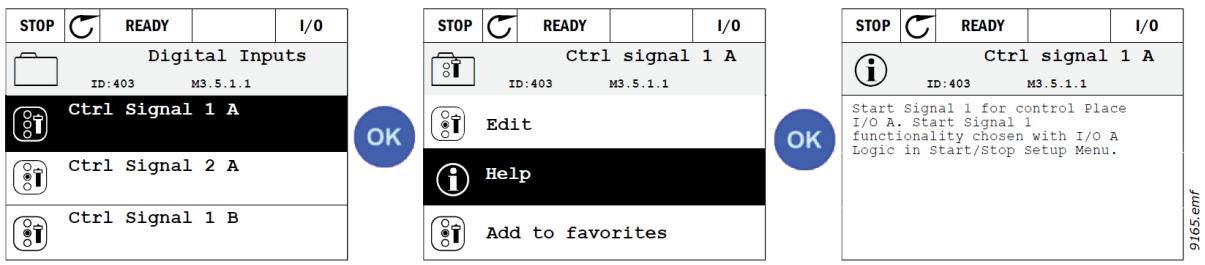
Note! If the parameter set to be compared with has not been saved, the display shows: “Comparing failed”



3.1.1.6 Help texts

The graphical LCP features instant help and information displays for various items. All parameters offer an instant help display. Select Help and press the OK button.

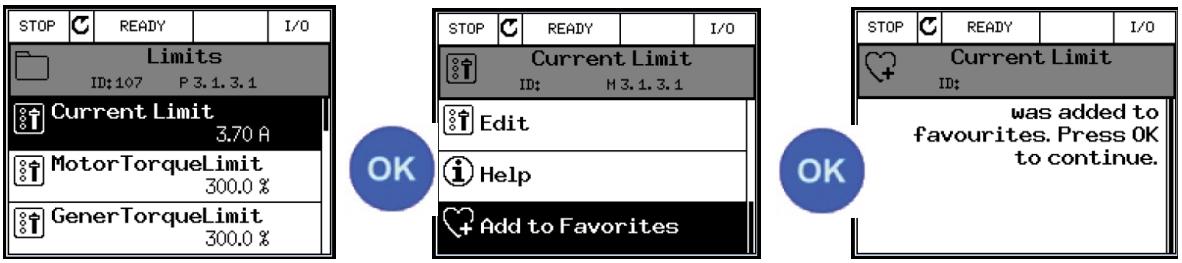
Text information is also available for faults, alarms, and the start-up wizard.



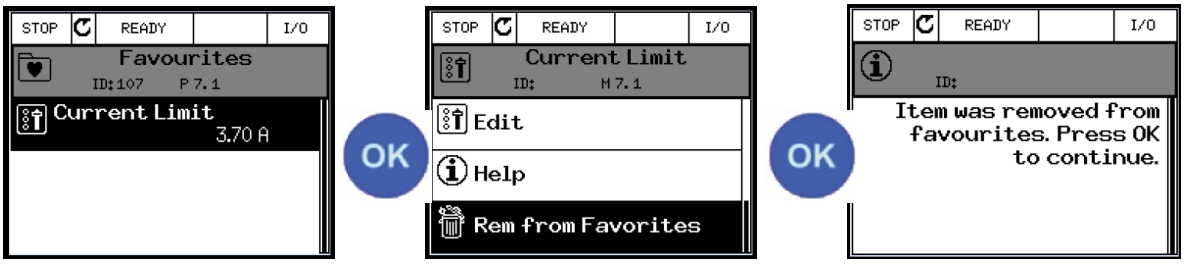
3.1.1.7 Favorites

You might need to refer to certain parameter values or other items often. Instead of locating them one by one in the menu structure, add them to a folder called Favorites where they can easily be reached.

On the keypad, you can add items or parameters to the Favorites menu, as follows:



To remove an item or a parameter from the Favorites folder, do the following:

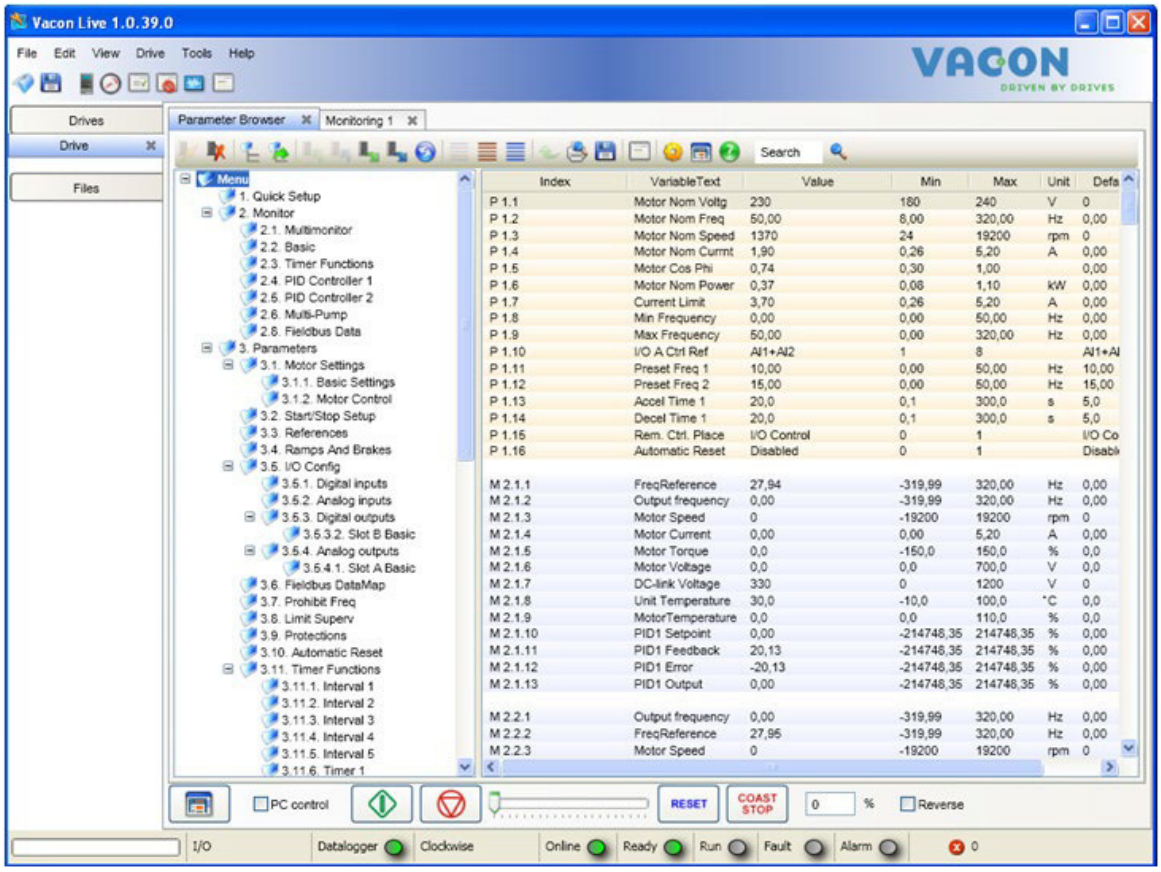


3.2 VACON® Live

VACON® Live is a PC-tool for commissioning and maintenance of VACON® 100-based products. VACON® Live tool can be downloaded from www.danfoss.com.

VACON® Live includes the following features:

- Parameterization, monitoring, drive info, datalogger, and so on.
- Software download tool VACON® Loader is integrated.
- Support for RS485 and Ethernet
- Windows 7 support
- Languages supported: English, German, Spanish, Finnish, French, Italian, Russian, Swedish, Chinese, Czech, Danish, Dutch, Polish, Portuguese, Romanian, Slovak and Turkish.
- Connection can be made by using a USB/RS485 cable or Ethernet cable (VACON® 100)
- RS485 drivers are installed automatically during the VACON® Live installation.
- When the connection is made, VACON® Live finds the connected drive automatically

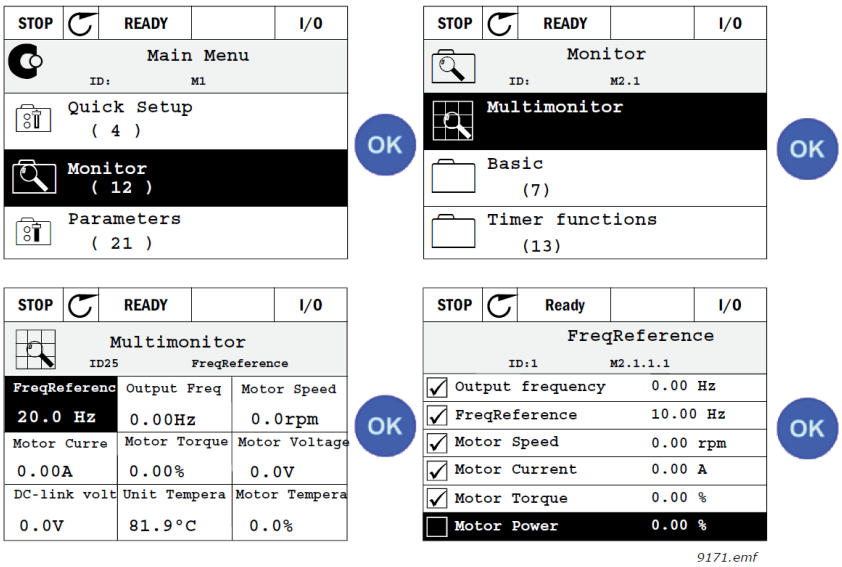


4. MONITOR MENU

The AC drive provides a possibility to monitor the actual values of parameters and signals as well as statuses and measurements. Some of the values to be monitored are customizable.

4.1 Multimonitor

On the keypad multi-monitor page, you can collect four to nine values that you wish to monitor. The number of the monitored items can be selected with parameter P2.1.13.5.



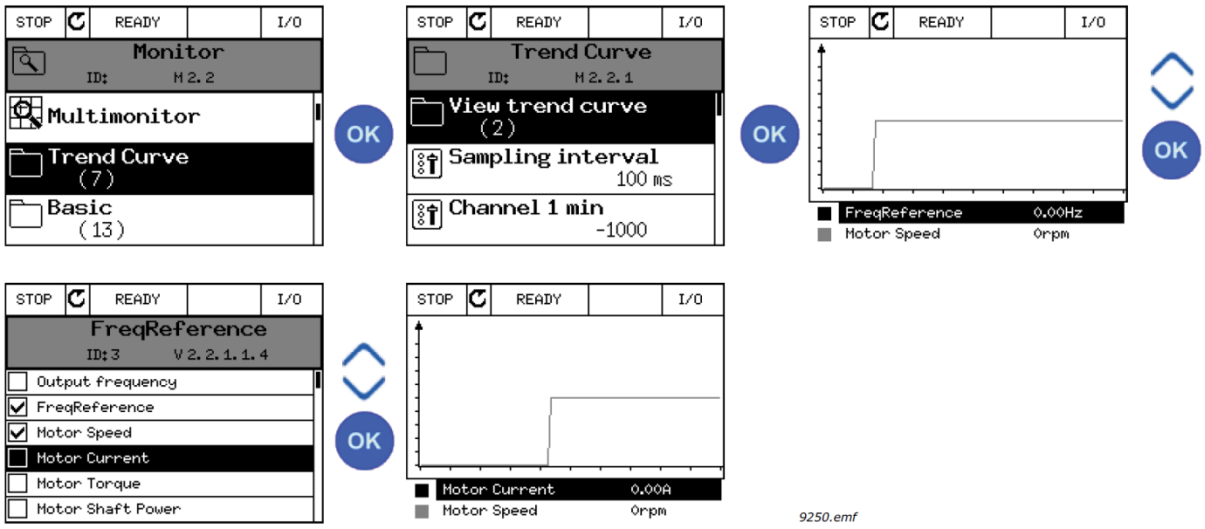
4.2 Trend Curve

The Trend Curve feature is a graphical presentation of two monitor values at a time.

Selecting values to monitor starts logging the values. In the Trend curve submenu, you can view the trend curve, make the signal selections, give the minimum and maximum settings, Sampling interval and select whether to use Autoscaling or not.

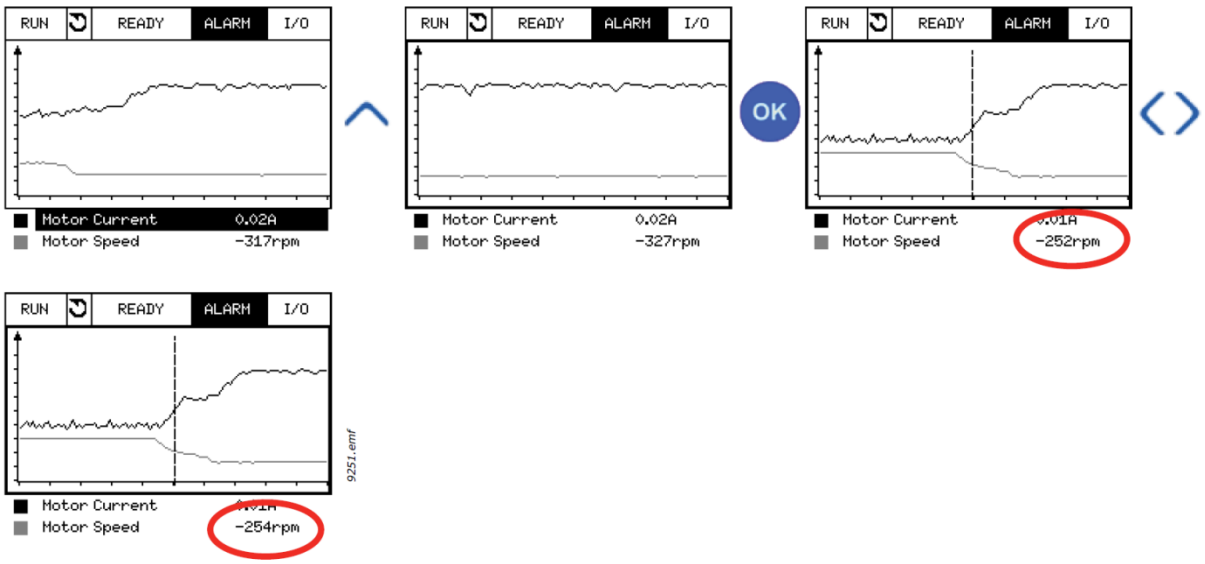
Change values to monitor following the following procedure:

1. Locate the Trend curve menu in the Monitor menu and press OK.
2. Further enter the menu View trend curve by pressing OK again.
3. The current selections to monitor are FreqReference and Motor speed visible at the bottom of the display.
4. Only two values can be monitored as trend curves simultaneously. Select the one of the current values that you wish to change with the arrow buttons and press OK.
5. Browse the list of given monitoring values with the arrow buttons, select the one you wish and press OK.
6. The trend curve of the changed value can be seen on the display.



The Trend Curve feature also allows you to halt the progression of the curve and read the exact individual values.

1. In the Trend curve view, select the display with the arrow button up (the frame of the display turns bold) and press OK at the desired point of the progressing curve. A vertical hairline appears on the display.
2. The display freezes and the values at the bottom of the display correspond to the location of the hairline.
3. Use the arrow buttons left and right to move the hairline to see the exact values of some other location.



4.3 Multimonitor

Code	Parameter	Unit	Scale	ID	Description
V1.1.1	Temperature Error (PID)	°C / °F	0.01	22	
V1.1.2	TE11 Coolant Temperature (to drives)	°C / °F	0.01	1952	
V1.1.3	Coolant Flow (filtered)	l/min / gpm	1	1967	
V1.1.4	PT11 Pressure, Inlet	bar / PSI	0.01	1951	
V1.1.5	PT12 Pressure, Outlet	bar / PSI	0.01	1950	
V1.1.6	Heater		1	1956	0 = Off 1 = On

4.4 I/O

Code	Parameter	Unit	Scale	ID	Description
V1.3.1	PT11 Pressure, Inlet	bar / PSI	0.01	1950	
V1.3.2	PT12 Pressure, Outlet	bar / PSI	0.01	1951	
V1.3.3	TE11 Coolant Temperature (to drives)	°C / °F	0.01	1952	
V1.3.5	TE21 Temperature (ambient)	°C / °F	0.01	1954	
V1.3.6	ME21 Humidity	% rh	0.01	1963	
V1.3.7	DIN Status Word 1		1	56	16 bit word where each bit is the status of one digital input. 6 digital inputs from every slot are read. Word 1 starts from input 1 in slot A (bit0) and goes to input 4 in slot C (bit15).
V1.3.8	DIN Status Word 2		1	57	16 bit word where each bit is the status of one digital input. 6 digital inputs from every slot are read. Word 2 starts from input 5 in slot C(bit0) and goes to input 6 in slot E (bit13).
V1.3.9	RO Status Word 1		1	17	16 bit word where each bit is the status of one RO function. B0=Run B1=Ready B2=Fault B3=Alarm B4=Pump 1 Control (contactor) B5=Pump 2 Control (contactor) B6=Cooling OK B7=Coolant Heater Active B8=Run LED B9=Cabinet Heater Active
V1.3.10	Coolant Flow (calculated)	l/min / gpm	1	1955	Estimated coolant flow
V1.3.11	Dew Point Temperature (calculated)	°C / °F	0.01	1964	Calculated dew point temperature. -1 =Dew point calculation disabled
V1.3.12	PT11 Pressure (filtered)	bar / PSI	0.01	1965	Filtered value
V1.3.13	PT12 Pressure (filtered)	bar / PSI	0.01	1966	Filtered value
V1.3.14	Coolant Flow (filtered)	l/min / gpm	1	1967	Estimated coolant flow (filtered value)

4.5 Extras/Advanced

Code	Parameter	Unit	Scale	ID	Description
V1.4.1	Drive Status Word		1	43	Bit coded status of drive. B1=Ready, B2=Run, B3=Fault, B6=RunEnable, B7=AlarmActive, B12=RunRequest,
V1.4.2	Last Active Fault Code		1	37	
V1.4.3	Last Active Fault ID		1	95	

V1.4.4	Last Active Alarm Code		1	74	
V1.4.5	Last Active Alarm ID		1	94	

4.6 FV11 Temperature Control

Code	Parameter	Unit	Scale	ID	Description
V1.5.1	Temperature Reference (PID)	°C / °F	0.01	20	Setpoint value for PID controller
V1.5.2	Temperature Actual (PID)	°C / °F	0.01	21	Actual value for PID controller (TE11 Temperature (coolant to AC drives))
V1.5.3	Temperature Error (PID)	°C / °F	0.01	22	
V1.5.4	Valve Control (PID Output)	%	0.01	23	Output of the PID controller (used for controlling 3-way valve position)

4.7 Pump Status

Code	Parameter	Unit	Scale	ID	Description
V1.6.1	Pump 1 Running Time	h	0.1	1957	
V1.6.2	Pump 2 Running Time	h	0.1	1958	
V1.6.3	Time to Next Autochange	h	0.1	1959	

4.8 Fieldbus Data

Code	Parameter	Unit	Scale	ID	Description
V1.7.1	FB Control Word		1	874	Fieldbus control word used by the application in bypass mode/format. Depending on the fieldbus type or profile, the data might be modified before sent to the application.
V1.7.3	FB Status Word		1	864	Fieldbus status word sent by application in bypass mode/format. Depending on the fieldbus type or profile, the data might be modified before sent to the fieldbus.
V1.7.5	FB Process Data Out 1		1	866	Raw value of process data out 32 bit signed format
V1.7.6	FB Process Data Out 2		1	867	Raw value of process data out 32 bit signed format
V1.7.7	FB Process Data Out 3		1	868	Raw value of process data out 32 bit signed format
V1.7.8	FB Process Data Out 4		1	869	Raw value of process data out 32 bit signed format
V1.7.9	FB Process Data Out 5		1	870	Raw value of process data out 32 bit signed format
V1.7.10	FB Process Data Out 6		1	871	Raw value of process data out 32 bit signed format
V1.7.11	FB Process Data Out 7		1	872	Raw value of process data out 32 bit signed format
V1.7.12	FB Process Data Out 8		1	873	Raw value of process data out 32 bit signed format
V1.7.13	FB Process Data In 1		1	876	Raw value of process data in 32 bit signed format

V1.7.14	FB Process Data In 2		1	877	Raw value of process data in 32 bit signed format
V1.7.15	FB Process Data In 3		1	878	Raw value of process data in 32 bit signed format
V1.7.16	FB Process Data In 4		1	879	Raw value of process data in 32 bit signed format
V1.7.17	FB Process Data In 5		1	880	Raw value of process data in 32 bit signed format
V1.7.18	FB Process Data In 6		1	881	Raw value of process data in 32 bit signed format
V1.7.19	FB Process Data In 7		1	882	Raw value of process data in 32 bit signed format
V1.7.20	FB Process Data In 8		1	883	Raw value of process data in 32 bit signed format

5. PAREMETERS MENU

5.1 Basic Parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.1	Control Place	1	3		1	2000	1 = I/O 2 = Keypad 3 = Fieldbus
P2.1.2	Cooling Module Type	2	5		4	1524	2 = 76kW (1-Pump) 3 = 76kW (2-Pump) 4 = 152kW (1-Pump) 5 = 152kW (2-Pump)
P2.1.3	Coolant Type	0	8		0	1607	0 = 100% Water 1 = 30% Propylene Glycol 2 = 40% Propylene Glycol 3 = 50% Propylene Glycol 4 = 60% Propylene Glycol 5 = 30% Ethylene Glycol 6 = 40% Ethylene Glycol 7 = 50% Ethylene Glycol 8 = 60% Ethylene Glycol
P2.1.4	Pump Type	0	1		0	1617	0 = 50 Hz Pump 1 = 60 Hz Pump

5.1.1 Options

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.1.5.1	°C / °F unit selection	0	1		0	1197	0 = Celsius (°C) 1 = Fahrenheit (°F)
P2.1.5.2	bar / PSI unit selection	0	1		0	1200	0 = bar 1 = PSI
P2.1.5.3	l/min / gpm unit selection	0	1		0	1199	0 = l/min 1 = gal/min
P2.1.5.4	kW / hp unit selection	0	1		0	1198	0 = kW 1 = hp
P2.1.5.5	Multimonitor view	0	2		1	1196	0 = 2x2 sections 1 = 3x2 sections 2 = 3x3 sections
P2.1.5.6	Parameter Password	0	9999		0	1806	Administrator password. Reserved for future features.

5.2 Input Signals

5.2.1 Digital Inputs

Code	Parameter	Default	ID	Description
P2.2.1.1	Start Cooling System	DigIN SlotA.x	1840	
P2.2.1.2	Service Mode Activation	DigIN SlotA.x	1841	OPEN = AUTO –mode active CLOSED = SERVICE –mode active
P2.2.1.3	LS22 Leakage Switch	DigIN SlotA.x	1844	
P2.2.1.4	LLS 11 Low Level (Fault)	DigIN SlotA.x	1842	
P2.2.1.5	LLS 11 Low Level (Alarm)	DigIN SlotA.x	1843	
P2.2.1.6	Heater Over Heat Switch	DigIN SlotC.x	1845	OPEN = Over heat CLOSED = OK
P2.2.1.7	Pump P11 Start	DigIN SlotC.x	1846	**Note!** In Auto mode, combined with “Start Cooling System” signal.
P2.2.1.8	Pump P12 Start	DigIN SlotC.x	1846	**Note!** In Auto mode, combined with “Start Cooling System” signal.
P2.2.1.9	External fault close	DigIN Slot0.x	405	OPEN = OK CLOSED = External fault
P2.2.1.10	External fault open	DigIN Slot0.x	406	OPEN = External fault CLOSED = OK
P2.2.1.11	Fault reset close	DigIN SlotA.x	414	CLOSED = Resets all active faults
P2.2.1.12	Fault reset open	DigIN Slot0.x	213	OPEN = Resets all active faults
P2.2.1.13	Run enable	DigIN Slot0.x	407	OPEN = Run disabled CLOSED = Run enabled
P2.2.1.14	Motor Overheat	DigIN Slot0.x	1848	OPEN = OK CLOSED = Over heat

5.2.2 Analog inputs

5.2.2.1 PT12 Pressure, Outlet

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.1.1	PT12 signal selection				AnIN SlotA.1	1820	
P2.2.2.1.2	PT12 signal range	0	1		0	1821	0 = 0..10V / 0..20mA 1 = 2..10V / 4..20mA
P2.2.2.1.3	PT12 signal filter time	0.00	300.00	s	0.1	1822	
P2.2.2.1.4	PT12 scale min	0.0	100.0	bar / PSI	0.0	1823	Sensor measurement range. For example, 4..20mA corresponds to 0…6 bar.
P2.2.2.1.5	PT12 scale max	0.0	100.0	bar / PSI	6.0	1824	Sensor measurement range. For example, 4..20mA corresponds to 0…6 bar.

5.2.2.2 PT11 Pressure, Inlet

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.2.1	PT11 signal selection				AnIN SlotA.2	1825	
P2.2.2.2.2	PT11 signal range	0	1		0	1827	0 = 0..10V / 0..20mA 1 = 2..10V / 4..20mA
P2.2.2.2.3	PT11 signal filter time	0.00	300.00	s	0.1	1826	
P2.2.2.2.4	PT11 scale min	0.0	100.0	bar / PSI	0.0	1828	Sensor measurement range. For example, 4..20mA corresponds to 0…6 bar.
P2.2.2.2.5	PT11 scale max	0.0	100.0	bar / PSI	6.0	1829	Sensor measurement range. For example, 4..20mA corresponds to 0…6 bar.

5.2.2.3 TE11 Temperature (coolant to AC drives)

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.3.1	TE11 signal selection				AnIN SlotD.2	1830	
P2.2.2.3.2	TE11 signal filter time	0.00	300.00	s	2.0	1832	
P2.2.2.3.3	TE11 Offset	-30.0	30.0	°C / °F	0.0	1836	

5.2.2.4 TE21 Temperature (ambient)

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.5.1	TE21 signal selection				AnIN SlotD.3	1831	
P2.2.2.5.2	TE21 signal filter time	0.00	300.00	s	2.0	1833	
P2.2.2.5.3	TE21 Offset	-30.0	30.0	°C / °F	0.0	1838	

5.2.2.5 ME21 Humidity

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.6.1	ME21 signal selection				AnIN SlotE.1	1532	
P2.2.2.6.2	ME21 signal range	0	1		1	1533	0 = 0..10V / 0..20mA 1 = 2..10V / 4..20mA
P2.2.2.6.3	ME21 signal filter time	0.00	300.00	s	2.0	1534	
P2.2.2.6.4	ME21 scale min	0.0	100.0	%rh	0.0	1535	Sensor measurement range. For example, 4..20mA corresponds to 0...100 %rh.
P2.2.2.6.5	ME21 scale max	0.0	100.0	%rh	6.0	1536	Sensor measurement range. For example, 4..20mA corresponds to 0...100 %rh.

5.2.3 Input Options

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.3.1	Digital input signal inversion (Word)	0	65535		60	1586	Digital input signal inversion. Select digital input signals which you want to invert. Checked = NO (normally open) Un Checked = NC (normally closed) B0 = Start Cooling System B1 = Service Mode Activ. B2 = LS1 Low Level B3 = LS2 Middle Level B4 = Leakage Switch B5 = Heater Over Heat Switch B6 = Pump 1 Start B7 = Pump 2 Start

5.3 Output Signals

5.3.1 Digital Outputs

Code	Parameter	Default	ID	Description
P2.3.1.1	Run	DigOUT Slot0.1	1550	
P2.3.1.2	Ready	DigOUT Slot0.1	1551	
P2.3.1.3	Fault	DigOUT SlotC.5	1552	
P2.3.1.4	Alarm	DigOUT Slot0.1	1553	
P2.3.1.5	Pump 1 contactor control	DigOUT SlotB.1	1554	
P2.3.1.6	Pump 2 contactor control	DigOUT SlotB.2	1555	
P2.3.1.7	Cooling OK	DigOUT SlotC.4	1556	
P2.3.1.8	Heater control	DigOUT SlotB.3	1557	
P2.3.1.9	Run LED	DigOut SlotC.3	1558	
P2.3.1.10	Cabinet heater	DigOut Slot0.1	1615	
P2.3.1.11	Alarm (Toggle)	DigOUT SlotC.6	1864	

5.3.2 Analog Outputs

Code	Parameter	Default	ID	Description
P2.3.2.1	FV11 Valve control value (PID output)	AnOUT SlotA.1	1501	
P2.3.2.2	PT12 Pressure, Outlet	AnOUT Slot0.1	1502	
P2.3.2.3	PT11 Pressure, Inlet	AnOUT Slot0.1	1503	
P2.3.2.4	TE11 Temperature (to Inverters)	AnOUT Slot0.1	1504	
P2.3.2.6	TE21 Temperature (ambient)	AnOUT Slot0.1	1507	
P2.3.2.7	Coolant Flow (calculated)	AnOUT Slot0.1	1506	

5.3.3 Output Options

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.3.3.1	Analog output signal range selection (2V / 4mA)	0	65535		2	1510	Analog output signal range selection. Select AO signals which must have range 4…20mA. Checked = 4…20mA, Unchecked = 0…20mA B0=Output Frequency B1=FV11 Valve Ctrl (PID Out) B2=PT12 Pressure, Outlet B3=PT11 Pressure, Inlet B4=TE11 Temp. (to Inverters) B6=TE21 Temp. (ambient) B7=Coolant Flow
P2.3.3.2	Digital output signal inversion (Word)	0	65535		1028	1587	Digital output signal inversion. Select digital output signals which you want to invert. Checked = NO (normally open) Unchecked = NC (normally closed) B0 = Run B1 = Ready B2 = Fault B3 = Alarm B4 = Pump 1 Ctrl B5 = Pump 2 Ctrl B6 = Cooling OK B7 = Heater Control B8 = Run LED B9 = Cabinet Heater B10 = Alarm (Toggling)
P2.3.3.3	Signal Light Test	0	1		0	1616	This parameter is meant to be used during commissioning. When the signal light test is activated, the following outputs (signal lights) are activated:

							Fault Alarm, Alarm (toggle) Cooling OK Run 0 = Inactive 1 = Active
P2.3.3.4	Analog output range inversion selection (Word)	0	63		2	1511	Analog output signal inversion. Select analog output signals which you want to invert. Checked = Inverted range (100..0%) Unchecked = Normal range (0..100%) B0=Output Frequency B1=FV11 Valve Ctrl (PID Out) B2=PT12 Pressure, Outlet B3=PT11 Pressure, Inlet B4=TE11 Temp. (to Inverters) B6=TE21 Temp. (ambient) B7=Coolant Flow

5.4 Protections

5.4.1 General

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.1.1	Response to external fault	0	2		2	701	0 = No action 1 = Alarm 2 = Fault
P2.4.1.2	Response to fieldbus communication fault	0	3		3	733	0 = No action 1 = Alarm 3 = Fault
P2.4.1.3	Response to slot communication fault	0	2		2	734	See P2.4.1.1
P2.4.1.4	Response to thermistor fault	0	2		0	732	See P2.4.1.1
M2.4.1.5	Fieldbus Watchdog						

5.4.1.1 Fieldbus Watchdog

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.1.5.1	Watchdog Response	0	2		2	1860	0 = No action (disabled) 1 = Alarm 2 = Fault
P2.4.1.5.2	Watchdog Delay	0	20.0	s	3.0	1863	
P2.4.1.5.3	Watchdog delay at power up	0	70.0	s	30.0	1862	

5.4.2 Cooling Module

5.4.2.1 Alarm Limits

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.2.1.1	PT12 Low (Alarm)	P2.4.2.2.1	4.0 (bar)	bar / PSI	1.4	1573	
P2.4.2.1.2	PT11 Low (Alarm)	P2.4.2.2.2	P2.4.2.1.3	bar / PSI	0.4	1574	
P2.4.2.1.3	PT11 High (Alarm)	P2.4.2.1.2	6.0 (bar)	bar / PSI	2.0	1575	
P2.4.2.1.4	TE11 Low (Alarm)	P2.4.2.2.3	P2.4.2.1.5	°C / °F	5.0	1563	
P2.4.2.1.5	TE11 High (Alarm)	P2.4.2.1.4	P2.4.2.2.4	°C / °F	50.0	1576	
P2.4.2.1.8	TE21 Low (Alarm)	-35 (°C)	P2.4.2.1.9	°C / °F	-15.0	1566	
P2.4.2.1.9	TE21 High (Alarm)	P2.4.2.1.8	65 (°C)	°C / °F	60.0	1565	
P2.4.2.1.11	Flow Low (Alarm)	P2.4.2.2.7	P2.4.2.1.12	l/min / gpm	*	1603	
P2.4.2.1.12	Flow High (Alarm)	P2.4.2.1.11	P2.4.2.2.8	l/min / gpm	*	1604	
P2.4.2.1.13	Delta Pressure Low (Alarm)	0.0	P2.4.2.2.2	bar / PSI	0.3	1618	

5.4.2.2 Fault Limits

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.2.2.1	PT12 Low (Fault)	1 (bar)	P2.4.2.1.1	bar / PSI	1.2	1579	
P2.4.2.2.2	PT11 Low (Fault)	0 (bar)	P2.4.2.1.2	bar / PSI	0.2	1580	
P2.4.2.2.3	TE11 Low (Fault)	-40 (°C)	P2.4.2.1.4	°C / °F	0.0	1582	
P2.4.2.2.4	TE11 High (Fault)	P2.4.2.1.5	65 (°C)	°C / °F	60.0	1589	
P2.4.2.2.7	Flow Low (Fault)	0.2 x NomFlow	P2.4.2.2.8	l/min / gpm	*	1605	

P2.4.2.2.8	Flow High (Fault)	P2.4.2.2.7	0.9 x Nominal Flow	l/min / gpm	*	1606	

5.4.3 Protection Options

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.4.3.1	Fault test word 1	0	65535		0	1570	Word for activating faults for test purposes (cooling module specific faults). B0=LLS11 Low (Fault) B1=LLS11 Low (Alarm) B4=PT12 Failure (Alarm) B5=PT12 Low (Fault) B6=PT12 Low (Alarm) B7=PT11 Failure (Alarm) B8=PT11 Low (Fault) B9=PT11 Low (Alarm) B10=PT11 High (Alarm)
P2.4.3.2	Fault test word 2	0	65535		0	1588	Word for activating faults for test purposes (cooling module specific faults). B0=TE11 Failure (Alarm) B1= TE11 High (Alarm) B5=TE21 Auto Adjust (Alarm) B6=LS22 Leakage Switch B7=Motor Overheat B8=TE11 High (Fault) B9=TE11 Low (Alarm) B10=TE11 Low (Fault)
P2.4.3.4	Fault test word 4	0	65535		0	1595	Word for activating faults for test purposes (cooling module specific faults). B0= Flow Low (Alarm) B1= Flow High (Alarm) B2= Flow Low (Fault) B3= Flow High (Fault) B4= Delta Pressure (Alarm)
P2.4.3.5	Fault disable word 1	0	65535		0	1571	Word for disabling cooling module related protections temporarily. B0=LLS11 Low (Fault) B1=LLS11 Low (Alarm) B4=PT12 Failure (Alarm) B5=PT12 Low (Fault) B6=PT12 Low (Alarm) B7=PT11 Failure (Alarm) B8=PT11 Low (Fault) B9=PT11 Low (Alarm) B10=PT11 High (Alarm)
P2.4.3.6	Fault disable word 2	0	65535		0	1582	Word for disabling cooling module related protections temporarily. B0=TE11 Failure (Alarm) B1= TE11 High (Alarm) B5=TE21 Auto Adjust (Alarm) B6=LS22 Leakage Switch B7=Motor Overheat B8=TE11 High (Fault) B9=TE11 Low (Alarm) B10=TE11 Low (Fault)
P2.4.3.7	Fault disable word 4	0	65535		0	1594	Word for disabling cooling module related protections temporarily. B0= Flow Low (Alarm) B1= Flow High (Alarm) B2= Flow Low (Fault)

							B3= Flow High (Fault) B4= Delta Pressure (Alarm)

5.5 Automatic Reset

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.5.1	Automatic Reset	0	1		0	731	0 = Disabled 1 = Enabled
P2.5.3	Wait Time	0.1	10000.0	s	0.5	717	
P2.5.4	Trial Time	0.0	10000.0	s	60.0	718	
P2.5.5	Number Of Trials	1	10	x	4	759	
P2.5.6	External Fault	0	1		0	726	Include fault in the automatic reset function? 0 = No 1 = Yes
P2.5.7	Coolant Flow (High) Fault	0	1		1	1810	Include fault in the automatic reset function? 0 = No 1 = Yes
P2.5.8	PT12 Pressure (Low) Fault	0	1		1	1811	Include fault in the automatic reset function? 0 = No 1 = Yes

5.6 Fieldbus Data Mapping

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.6.1	Fieldbus process data out 1 selection	0	35000		1952	852	Select monitored data with parameter ID. Data is scaled to an unsigned 16-bit value according to the format on the keypad. For example, 255.5 on the keypad equals 255. (Default: TE11 Coolant Temperature)
P2.6.2	Fieldbus process data out 2 selection	0	35000		22	853	See above. (Default: Temp. Error (PID))
P2.6.3	Fieldbus process data out 3 selection	0	35000		1955	854	See above. (Default: Coolant Flow (calc.))
P2.6.4	Fieldbus process data out 4 selection	0	35000		1951	855	See above. (Default: PT11 Pressure, Inlet)
P2.6.5	Fieldbus process data out 5 selection	0	35000		1950	856	See above. (Default: PT12 Pressure, Outlet)
P2.6.6	Fieldbus process data out 6 selection	0	35000		1954	857	See above. (Default: TE21 Temperature (ambient))
P2.6.7	Fieldbus process data out 7 selection	0	35000		74	858	See above. (Default: Last Active Alarm Code)
P2.6.8	Fieldbus process data out 8 selection	0	35000		37	859	See above. (Default: Last Active Fault Code)
P2.6.9	Fieldbus process data in 1 selection	0	35000		0	890	Select controlled data with parameter ID. (Default: Not Used)
P2.6.10	Fieldbus process data in 2 selection	0	35000		0	891	See above.
P2.6.11	Fieldbus process data in 3 selection	0	35000		0	892	See above.
P2.6.12	Fieldbus process data in 4 selection	0	35000		0	893	See above.
P2.6.13	Fieldbus process data in 5 selection	0	35000		0	894	See above.
P2.6.14	Fieldbus process data in 6 selection	0	35000		0	895	See above.

P2.6.15	Fieldbus process data in 7 selection	0	35000		0	896	See above.
P2.6.16	Fieldbus process data in 8 selection	0	35000		0	897	See above.

5.7 FV11 Temperature Control

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.1	Temperature reference	10.0	55.00	°C / °F	45.0 °C	167	
P2.7.2	Temperature reference automatic adjust	0	1		0	1525	0 = Disabled 1 = Enabled
P2.7.3	Valve manual reference	0	100	%	0	1590	Valve manual control when SERVICE-mode is activated.

5.7.1 PID Settings

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.7.4.1	PID Gain	0.00	1000.00	%	100.00	118	
P2.7.4.2	PID Integration Time	0.00	600.00	s	1.00	119	
P2.7.4.3	PID Derivation Time	0.00	100.00	s	0.00	132	
P2.7.4.4	Dead Band	Varies	Varies	Varies	0.0	1056	
P2.7.4.5	Dead Band Delay	0.00	320.00	s	0.00	1057	

5.8 Autochange

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.8.1	Pump 1 Autochange interval	-1	336	h	0	1521	-1 = 40 s (test mode) 0 = Autochange not used >0 = Autochange used
P2.8.2	Pump 2 Autochange interval	-1	336	h	0	1526	-1 = 40 s (test mode) 0 = Autochange not used >0 = Autochange used
P2.8.3	Pump restart delay after autochange	0.1	30	s	0.1	1567	
B2.8.4	Reset pump 1 running time counter	0	1		0	1522	0 = No action 1 = Reset (to zero)
B2.8.5	Reset pump 2 running time counter	0	1		0	1523	0 = No action 1 = Reset (to zero)

5.9 Coolant Heater Control

Code	Parameter	Min	Max	Unit	Default	ID	Description
B2.9.1	Heater ON (Service)	0	1		0	1172	Heater manual control (activation) in SERVICE mode: 0 = No 1 = Yes
B2.9.2	Heater OFF (Service)	0	1		0	1173	Heater manual control (deactivation) in SERVICE mode: 0 = No 1 = Yes
P2.9.3	Heater Control (Auto)	0	1		0	1600	Enable heater automatic control in AUTO mode: 0 = Disabled 1 = Enabled (in normal operation)
P2.9.4	Heater ON (Auto)	0.0	100.0	°C / °F	5.0	1601	Heater activation temperature, if heater automatic control is enabled.
P2.9.5	Heater OFF (Auto)	0.0	100.0	°C / °F	15.0	1602	Heater deactivation temperature, if heater automatic control is enabled.

5.10 Cabinet Heater Control

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.10.1	Cabinet Heater Enable	0	1		0	1612	Cabinet heater control: 0 = Disabled 1 = Enabled
P2.10.2	Cabinet Heater ON	-30.0	65.0		-2.0	1613	Cabinet heater is activated when the measured ambient temperature goes below this limit.
P2.10.3	Cabinet Heater OFF	-30.0	65.0		0.0	1614	Cabinet heater is deactivated when the measured ambient temperature goes above this limit.

5.11 Pump Auto-trial

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.12.1	Auto-trial	0	1		0	1855	Automatic fault reset: 0 = Disabled 1 = Enabled
P2.12.2	Auto-Trial Wait Time	0.0	10.0	s	0.0	1856	Wait time before the auto-trial function tries to reset the fault.

5.12 Pump Deairing

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.13.1	Automatic deairing	0	1		0	1857	Automatic deairing cycle (30s): 0 = Disabled 1 = Enabled **Note!** This function is meant to be used only temporarily during the commissioning.

6. SYSTEM MENUS

6.1 Diagnostics

Code	Parameter	Min	Max	Unit	Default	ID	Description
M3.1	Active Faults						
P3.2	Reset Faults	0	1		0		0=No Action 1=Reset all active faults (edge)
M3.3	Fault History						
M3.4	Total Counters						
M3.5	Trip Counters						
M3.6	Software Info						

6.1.1 Active Faults

See chapter 9.34 for a detailed description.

6.1.2 Fault History

See chapter 9.34 for a detailed description.

6.1.3 Total Counters

Code	Parameter	Min	Max	Unit	Default	ID	Description
V3.4.1	Energy Counter			Varies		2291	
V3.4.3	Operating Time			a d hh:min			
V3.4.7	Run Time			a d hh:min			
V3.4.11	Power On Time			a d hh:min			
V3.4.15	Start Command Counter					2295	

6.1.4 Trip Counters

Code	Parameter	Min	Max	Unit	Default	ID	Description
V3.5.1	Energy Counter			Varies		2296	**To reset the counter** (with graphical LCP): Push the OK button once. Reset counter page appears. Push the OK button once again.
V3.5.3	Operating Time			a d hh:min			**To reset the counter** (with graphical LCP): Push the OK button once. Reset counter page appears. Push the OK button once again.

6.1.5 Software Info

Code	Parameter	Min	Max	Unit	Default	ID	Description
V3.6.1	Software Package					2524	
V3.6.4	System Load	0	100	%		2300	
V3.6.5	Application Name					2525	
V3.6.6	Application ID					837	
V3.6.7	Application Version					838	

6.2 I/O and Hardware

Code	Parameter	Min	Max	Unit	Default	ID	Description
M4.1	Basic IO						
M4.2	Slot C						
M4.3	Slot D						
M4.4	Slot E						
M4.5	Real Time Clock						
M4.6	Power Unit Settings						
M4.7	Keypad						
M4.8	RS-485						
M4.9	Ethernet						

6.2.1 Basic IO

Code	Parameter	Min	Max	Unit	Default	ID	Description
V4.1.1	Digital Input 1	0	1			2502	
V4.1.2	Digital Input 2	0	1			2503	
V4.1.3	Digital Input 3	0	1			2504	
V4.1.4	Digital Input 4	0	1			2505	
V4.1.5	Digital Input 5	0	1			2506	
V4.1.6	Digital Input 6	0	1			2507	
V4.1.7	Analog Input 1 Mode	1	3			2508	1=0...20mA 3=0...10V
V4.1.8	Analog Input 1	0	100	%		2509	
V4.1.9	Analog Input 2 Mode	1	3			2510	1=0...20mA 3=0...10V
V4.1.10	Analog Input 2	0	100	%		2511	
V4.1.11	Analog Output 1 Mode	1	3			2512	
V4.1.12	Analog Output 1	0	100	%		2513	
V4.1.13	Relay Output 1	0	1			2514	
V4.1.14	Relay Output 2	0	1			2515	
V4.1.15	Relay Output 3	0	1			2516	

6.2.2 Real Time Clock

Code	Parameter	Min	Max	Unit	Default	ID	Description
V4.5.1	Battery State	1	3			2205	1=Battery Not Installed 2=Battery Installed 3=Change battery
P4.5.2	Time			hh:mm.ss		2201	
P4.5.3	Date			dd.mm		2202	
P4.5.4	Year			yyyy		2203	
P4.5.5	Daylight Saving	1	4		1	2204	1=Not Used 2=EU 3=US 4=Russia

6.2.3 Power Unit Settings

Code	Parameter	Min	Max	Unit	Default	ID	Description
M4.6.1	Fan						
M4.6.2	Brake Chopper						
M4.6.4	Sine Filter						

6.2.3.1 Fan

Code	Parameter	Min	Max	Unit	Default	ID	Description
P4.6.1.1	Fan Control Mode	0	1		1	2377	0=Always On

							1=Optimized
V4.6.1.5	Fan Lifetime			h		849	
P4.6.1.6	Fan Lifetime Alarm Limit	0	200000	h	50000	824	
B4.6.1.7	Fan Lifetime Reset	0	1		0	823	0=No action 1=Reset Fan Lifetime (edge)

6.2.3.2 *Brake Chopper*

Code	Parameter	Min	Max	Unit	Default	ID	Description
P4.6.2.1	Brake Chopper Mode	0	3		0	2526	0=Disabled 1=Enabled (Run) 2=Enabled (Run&Stop) 3=Enabled (Run, No testing)

6.2.3.3 *Sine Filter*

Code	Parameter	Min	Max	Unit	Default	ID	Description
P4.6.4.1	Sine Filter	0	1		0	2527	0=Disabled 1=Enabled

6.2.4 *Keypad*

Code	Parameter	Min	Max	Unit	Default	ID	Description
P4.7.1	Timeout Time	0	60	min	0	804	
P4.7.2	Default Page	0	4		0	2318	0=None 1=Enter the desired menu index to parameter P5.7.3 2=Main Menu 3=Control Page 4=Multimonitor
P4.7.3	Menu Index					2499	
P4.7.4	Contrast	30	70	%	50	830	
P4.7.5	Backlight Time	0	60	min	5	818	

6.3 User Settings

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.1	Language Selection	Varies	varies		Varies	802	Depends on the selected language package
M5.5	Parameter Backup						
M5.6	Parameter Compare						
P5.7	Drive Name					2528	

6.3.1 Parameter Backup

Code	Parameter	Min	Max	Unit	Default	ID	Description
B5.5.1	Restore Factory Defaults					831	
P5.5.2	Save to Keypad					2497	
P5.5.3	Restore from Keypad					2488	
B5.5.4	Save to Set 1					2489	
B5.5.5	Restore from Set 1					2490	
B5.5.7	Save to Set 2					2491	
B5.5.8	Restore from Set 2					2492	

6.3.2 Parameter Compare

Code	Parameter	Min	Max	Unit	Default	ID	Description
B5.6.1	Active Set – Set 1					2493	
B5.6.2	Active Set – Set 2					2494	
B5.6.3	Active Set – Defaults					2495	
B5.6.4	Active Set – Keypad Set					2496	

6.4 Favorites

See chapter 9.38 for a detailed description.

6.5 User Levels

Code	Parameter	Min	Max	Unit	Default	ID	Description
P7.1	User Level	0	2		0	1194	0=Normal 1=Monitoring 2=Favourites
P7.2	Access Code	0	99999		00000	2362	

7. DESCRIPTION OF MONITORING VALUES

7.1 Multimonitor

See chapter 5.1 for a detailed description.

7.2 Trend Curve

See chapter 5.2 for a detailed description.

7.3 I/O Monitoring

V1.3.1 PT11 – Pressure, Inlet ID 1950 "PT11 Pressure, Inlet"

State of PT11 -signal (Pump inlet pressure). Presented in selected process units (bar or PSI). Signal scaled according to signal range and scale min/max settings selected in M2.2.2 Analog inputs –menu.
[#.## bar] or [#.## PSI]

V1.3.2 PT12 – Pressure, Outlet ID 1951 "PT12 Pressure, Outlet"

State of PT12 -signal (Pump outlet pressure). Presented in selected process units (bar or PSI). Signal scaled according to signal range and scale min/max settings selected in M2.2.2 Analog inputs –menu.
[#.## bar] or [#.## PSI]

V1.3.3 TE11 – Temperature (coolant to drives) ID 1952 "TE11 Temp. (to Inv.)"

State of TE11 -signal (Coolant temperature to AC drives). Presented in selected process units (°C or °F).
[#.## °C] or [#.## °F]

V1.3.5 TE21 – Temperature (ambient) ID 1954 "TE21 Temp. (ambient)"

State of TE21 -signal (Ambient temperature). Presented in selected process units (°C or °F).
[#.## °C] or [#.## °F]

V1.3.6 ME21 – Humidity ID 1963 "ME21 Humidity"

Measured relative humidity.
[#.## % rh]

V1.3.7 Digital input status word 1 ID 56 "DIN StatusWord1"

A 16 bit status word where each bit indicates the status of one digital input.
6 digital inputs are read from each option board slot.
DIN StatusWord1 starts from digital input 1 in slotA (bit 0) and goes to digital input 4 in SlotC (bit 15)
[#]

b0 = Digital input 1 (in Slot A)
b1 = Digital input 2 (in Slot A)
b2 = Digital input 3 (in Slot A)
b3 = Digital input 4 (in Slot A)
b4 = Digital input 5 (in Slot A)
b5 = Digital input 6 (in Slot A)
b6 = Digital input 1 (in Slot B)
b7 = Digital input 2 (in Slot B)
b8 = Digital input 3 (in Slot B)
b9 = Digital input 4 (in Slot B)
b10 = Digital input 5 (in Slot B)
b11 = Digital input 6 (in Slot B)
b12 = Digital input 1 (in Slot C)
b13 = Digital input 2 (in Slot C)
b14 = Digital input 3 (in Slot C)
b15 = Digital input 4 (in Slot C)

V1.3.8 Digital input status word 2 ID 57 "DIN StatusWord2"

A 16 bit status word where each bit indicates the status of one digital input.
6 digital inputs are read from each option board slot.
DIN StatusWord1 starts from digital input 5 in slotC (bit 0) and goes to digital input 6 in SlotE (bit 13)
[#]

b0 = Digital input 5 (in Slot C)
b1 = Digital input 6 (in Slot C)
b2 = Digital input 1 (in Slot D)
b3 = Digital input 2 (in Slot D)
b4 = Digital input 3 (in Slot D)
b5 = Digital input 4 (in Slot D)
b6 = Digital input 5 (in Slot D)
b7 = Digital input 6 (in Slot D)
b8 = Digital input 1 (in Slot E)
b9 = Digital input 2 (in Slot E)
b10 = Digital input 3 (in Slot E)
b11 = Digital input 4 (in Slot E)
b12 = Digital input 5 (in Slot E)
b13 = Digital input 6 (in Slot E)

V1.3.9 Digital output status word 1 ID 17 "RO StatusWord1"

A 16 bit status word where each bit indicates the status of one digital output function.
[#]

b0 = Run
b1 = Ready
b2 = Fault
b3 = Alarm
b4 = Pump 1 (contactor) control
b5 = Pump 2 (contactor) control
b6 = Cooling OK
b7 = Coolant Heater Active
b8 = Run LED
b9 = Cabinet Heater Active

V1.3.10 Coolant Flow (internally calculated) ID 1955 "Coolant Flow"

Calculated Coolant flow. This monitoring value is internally calculated, based on pressure measurements (PT11 and PT12) and pump frequency. Presented in selected process units (l/min or gal/min).
[# l/min] or [# gpm]

V1.3.11 Dew Point Temperature (calculated) ID 1964 "Dew Point Temperature"

Calculated dew point temperature.

Note! Can be used only when ambient temperature measurement (TE21) and humidity measurement (ME21) sensors are connected and configured into use.

-1 = Dew point calculation is disabled (ambient temperature measurement or humidity measurement is missing)

[#.## °C] or [#.## °F]

V1.3.12 PT11 – Pressure, Inlet (filtered) ID 1965 "PT11 Pressure (filtered)"

State of PT11 -signal (Pump inlet pressure). Presented in selected process units (bar or PSI). Signal scaled according to signal range and scale min/max settings selected in M2.2.2 Analog inputs –menu. Filtered with 3 s time constant.
[#.## bar] or [#.## PSI]

V1.3.13 PT12 – Pressure, Outlet (filtered) ID 1966 "PT12 Pressure (filtered)"

State of PT12 -signal (Pump outlet pressure). Presented in selected process units (bar or PSI). Signal scaled according to signal range and scale min/max settings selected in M2.2.2 Analog inputs –menu. Filtered with 3 s time constant.
[#.## bar] or [#.## PSI]

V1.3.14 Coolant Flow (filtered) ***ID 1967 "Coolant Flow (filtered)"***

Calculated Coolant flow. This monitoring value is internally calculated, based on pressure measurements (PT11 and PT12) and pump frequency. Presented in selected process units (l/min or gal/min). Filtered with 3 s time constant.
[# l/min] or [# gpm]

7.4 Extras/Advanced

V1.4.1 ***Drive status word*** ***ID 43*** ***"DriveStatusWord"***

Bit-coded status of the drive.
[#]

b1 = Ready
b2 = Run
b3 = Fault
b6 = Run enable
b7 = Alarm active
b10 = DC brake (in stop) active
b11 = DC brake active
b12 = Run request active
b13 = Motor regulator active

V1.4.2 ***Last active fault code*** ***ID 37*** ***"LastActiveFaultCode"***

Fault code of the latest activated fault that has not been reset
[#]

V1.4.3 ***Last active fault ID*** ***ID 95*** ***"LastActiveFault ID"***

Fault ID of the latest activated fault that has not been reset
[#]

V1.4.4 ***Last active alarm Code*** ***ID 74*** ***"LastActiveAlarmCode"***

Alarm code of the latest activated alarm that has not been reset
[#]

V2.4.5 ***Last active alarm ID*** ***ID 94*** ***"LastActiveAlarm ID"***

Alarm ID of the latest activated alarm that has not been reset
[#]

7.5 FV11 Temperature Control

V1.5.1 Temperature reference (PID setpoint) ID 20 "Temp. Reference (PID)"

Coolant fluid temperature reference. Setpoint value of the PID controller, which controls the position of the 3-way valve. Presented in selected process units (°C or °F).
[#.## °C] or [#.## °F]

V1.5.2 Temperature actual (PID feedback) ID 21 "Temp. Actual (PID)"

Coolant fluid temperature reference. Feedback value of the PID controller, which controls the position of the 3-way valve. Presented in selected process units (°C or °F).
[#.## °C] or [#.## °F]

V1.5.3 Temperature error value ID 22 "Temp.Error (PID)"

Error value of the PID controller (deviation of actual temperature from reference temperature). Presented in selected process units (°C or °F).
[#.## °C] or [#.## °F]

V1.5.4 Valve control value (PID output) ID 23 "Valve Ctrl (PID Output)"

Control value of 3-way valve (position). Output of the PID controller in the range of 0..100.0 %.
[#.## %]

7.6 Pump Status

V1.6.1 Pump 1 running time ID 1957 "Pump 1 Running Time"

V1.6.2 Pump 2 running time ID 1958 "Pump 1 Running Time"

Pump 1 and Pump 2 running times. Presented in 0.1 h resolution.
[#.# h]

V1.6.3 Time to next autochange ID 1959 "Tome to Autochange"

Time remaining to the next autochange. Presented in 0.1 h resolution.
[#.# h]

7.7 Fieldbus Data

V1.7.1 Fieldbus control word ID 874 "FB Control Word"

Fieldbus control word (in bypass mode).
[#]

Bit	Descriptions	
	Value = 0 (FALSE)	**Value = 1 (TRUE)**
Bit 0	Stop-request from Fieldbus	Start-request from Fieldbus
Bit 1	Reserved	Reserved
Bit 2	No action	Reset active faults and alarms (on rising edge 0=>1)
Bit 3	No action	Force stop mode to Coasting
Bit 4	No action	Force stop mode to Ramping
Bit 5	Reserved	Reserved
Bit 6	Reserved	Reserved
Bit 7	Reserved	Reserved
Bit 8	Reserved	Reserved
Bit 9	Reserved	Reserved
Bit 10	Reserved	Reserved
Bit 11	Reserved	Reserved
Bit 12	Reserved	Reserved
Bit 13	Reserved	Reserved
Bit 14	Reserved	Reserved
Bit 15	Reserved	Reserved

V1.7.3 Fieldbus status word ID 864 "FB Status Word"

Fieldbus status word (in bypass mode). Generated in application level.
[#]

Note! Depending on the Fieldbus type or profile, the data might be modified before sent to the Fieldbus.

Bit	Descriptions	
	Value = 0 (FALSE)	Value = 1 (TRUE)
Bit 0	Not ready to operate	Ready to operate
Bit 1	Not running	Running
Bit 2	Cooling not OK	Cooling is OK
Bit 3	No fault	Fault is active
Bit 4	No alarm	Alarm is active
Bit 5	Reserved	Reserved
Bit 6	Reserved	Reserved
Bit 7	Reserved	Reserved
Bit 8	Reserved	Reserved
Bit 9	Reserved	Reserved
Bit 10	Reserved	Reserved
Bit 11	Normal operating mode is active	Service mode is active
Bit 12	Pump 1 is off	Pump 1 is active
Bit 13	Pump 2 is off	Pump 2 is active
Bit 14	Liquid heater is off	Liquid heater is active
Bit 15	Cabinet heater is off	Cabinet heater is active

V1.7.5	***Fieldbus process data out 1***	***ID 866***	***"FB Data Out 1"***
V1.7.6	***Fieldbus process data out 2***	***ID 867***	***"FB Data Out 2"***
V1.7.7	***Fieldbus process data out 3***	***ID 868***	***"FB Data Out 3"***
V1.7.8	***Fieldbus process data out 4***	***ID 869***	***"FB Data Out 4"***
V1.7.9	***Fieldbus process data out 5***	***ID 870***	***"FB Data Out 5"***
V1.7.10	***Fieldbus process data out 6***	***ID 871***	***"FB Data Out 6"***
V1.7.11	***Fieldbus process data out 7***	***ID 872***	***"FB Data Out 7"***
V1.7.12	***Fieldbus process data out 8***	***ID 873***	***"FB Data Out 8"***

Raw values of process data sent to Fieldbus. (32-bit values)
[#]

V1.7.13	***Fieldbus process data in 1***	***ID 876***	***"FB Data In 1"***
V1.7.14	***Fieldbus process data in 2***	***ID 877***	***"FB Data In 2"***
V1.7.15	***Fieldbus process data in 3***	***ID 878***	***"FB Data In 3"***
V1.7.16	***Fieldbus process data in 4***	***ID 879***	***"FB Data In 4"***
V1.7.17	***Fieldbus process data in 5***	***ID 880***	***"FB Data In 5"***
V1.7.18	***Fieldbus process data in 6***	***ID 881***	***"FB Data In 6"***
V1.7.19	***Fieldbus process data in 7***	***ID 882***	***"FB Data In 7"***
V1.7.20	***Fieldbus process data in 8***	***ID 883***	***"FB Data In 8"***

Raw values of process data received from Fieldbus. (32-bit values)
[#]

8. DESCRIPTION OF PARAMETERS

8.1 Basic Parameters

P2.1.1 Control place ID2000 "Control Place"

The active control place of the drive can be changed by this parameter.

0 = PC Control (activated from PC-tool (VACON® LIVE))
1 = I/O terminal
2 = Keypad
3 = Fieldbus

P2.1.2 Cooling Module Type ID1524 "Cooling Module Type"

This parameter defines the type and the configuration of the cooling module.
This parameter must be set according to the cooling module type during the commissioning.

Supported configurations are:

2 = 76kW (single pump) – Nominal flow 190 l/min
3 = 76kW (dual pump) – Nominal flow 190 l/min
4 = 152kW (single pump) – Nominal flow 370 l/min
5 = 152kW (dual pump) – Nominal flow 370 l/min

There are single and dual pump configurations available:

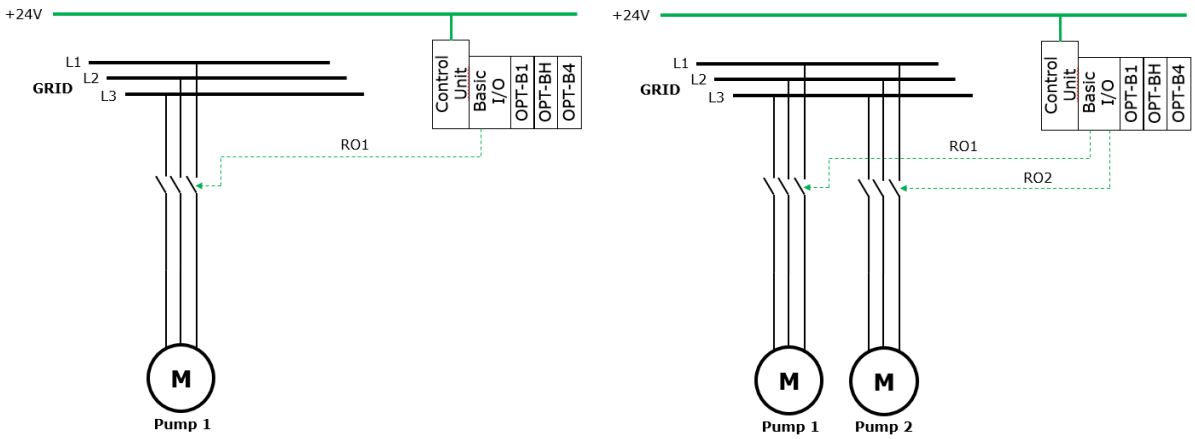


Figure 3. Different configurations of iC7 Series Cooling Module

P2.1.3 Coolant Type ID1607 "Coolant Type"

Use this parameter to select the mixture of the coolant used in the system

0 = 100% Water
1 = 30% Propylene Glycol
2 = 40% Propylene Glycol
3 = 50% Propylene Glycol
4 = 60% Propylene Glycol
5 = 30% Ethylene Glycol
6 = 40% Ethylene Glycol
7 = 50% Ethylene Glycol
8 = 60% Ethylene Glycol

Note! This parameter must be set correctly in order to get the required accuracy in inbuilt flow estimation.

P2.1.4 Pump Type ID1617 "Pump Type"

Use this parameter to select the nominal frequency of the pump (and the AC grid)

0 = 50 Hz Pump (Xylem)
1 = 60 Hz Pump (Xylem)

Note! This parameter must be set correctly in order to get the required accuracy in inbuilt flow estimation.

P2.1.5.1 Temperature unit (°C/°F) selection ID1197 "°C/°F selection"

All temperature-related parameters and monitoring values are presented in the selected unit.

0 = Celsius degrees (°C)
1 = Fahrenheit degrees (°F)

Note! When the value of this parameter is changed, all temperature-related parameter values are converted to correspond to the selected unit.

P2.1.5.2 Pressure unit (bar/PSI) selection ID1200 "bar/PSI selection"

All pressure-related parameters and monitoring values are presented in the selected unit.

0 = bar
1 = PSI

Note! When the value of this parameter is changed, all pressure-related parameter values are converted to correspond to the selected unit.

P2.1.5.3 Flow unit (l/min / gpm) selection ID1199 "l/min / gpm selection"

All flow-related parameters and monitoring values are presented in the selected unit.

0 = l/min
1 = gpm

Note! When the value of this parameter is changed, all flow-related parameter values are converted to correspond to the selected unit.

P2.1.5.4 Power unit (kW/hp) selection ID1198 "kW/hp selection"

All power-related parameters and monitoring values are presented in the selected unit.

0 = kW (kilowatt)
1 = hp (horse power)

Note! When the value of this parameter is changed, all power-related parameter values are converted to correspond to the selected unit.

P2.1.5.5 Multimonitor view ID1196 "MultimonitorView"

This parameter defines how many sections are shown on keypad display in Multimonitor view.

0 = 2x2 sections
1 = 3x2 sections
2 = 3x3 sections

Note! Multimonitoring view can be opened by keypad by navigating to the monitoring menu M1.1 Multimonitor.

Note! Multimonitor view can also be set to a default page by parameter P5.7.2. The selected default page is shown on the keypad display automatically if no operations are done by keypad during the defined timeout time (P5.7.1).

8.2 I/O programming

The programming of inputs in the iC7 Series Cooling Module Application is very flexible. The available inputs and outputs on the standard and optional I/O can be used for various functions selected by the operator.

The available I/O can be expanded with optional boards to be inserted in option slots C, D, and E. More information about the installation of optional boards you find in the installation guide.

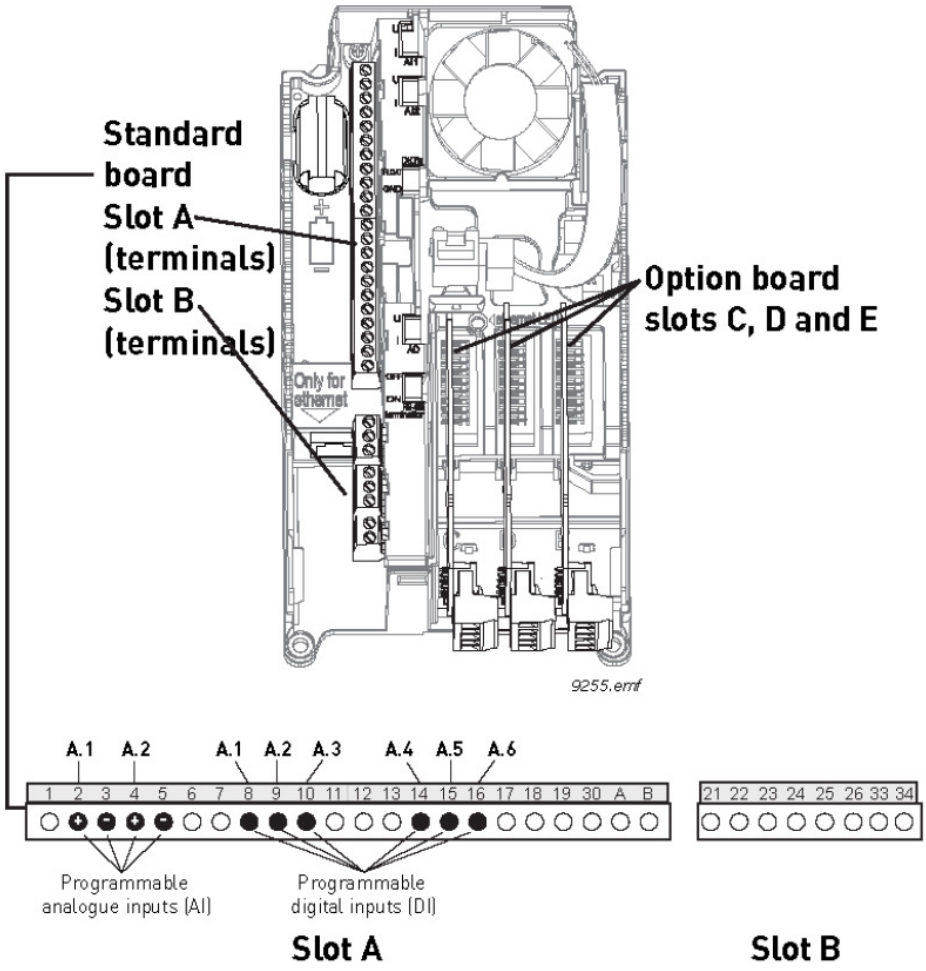


Figure-4. Option slots and programmable inputs

8.2.1 Digital input programming

The applicable functions for digital inputs are arranged as parameters in parameter group M2.2.1. The value given to the parameter is a reference to the digital input that you select to use for the function. The list of functions that you can assign to the available digital inputs is presented in parameter menu M2.2.1.

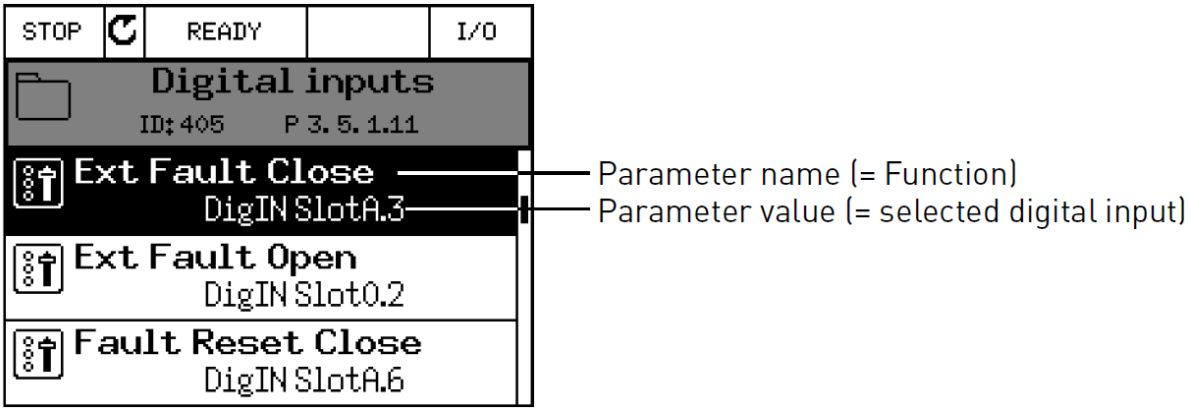


Figure 5. Digital input selection parameter

Given the standard I/O board compilation on the VACON® 100 control unit, there are 6 digital inputs available (Slot A terminals 8, 9, 10, 14, 15 and 16). In the programming view, these inputs are referred to as follows:

Input Type (graphical LCP)	Slot	Input #	Explanation
DigIN	A.	1	Digital input #1 (terminal 8) on board in Slot A (Standard I/O board)
DigIN	A.	2	Digital input #2 (terminal 9) on board in Slot A (Standard I/O board)
DigIN	A.	3	Digital input #3 (terminal 10) on board in Slot A (Standard I/O board)
DigIN	A.	4	Digital input #4 (terminal 14) on board in Slot A (Standard I/O board)
DigIN	A.	5	Digital input #5 (terminal 15) on board in Slot A (Standard I/O board)
DigIN	A.	6	Digital input #6 (terminal 16) on board in Slot A (Standard I/O board)

In the following example (mentioned after this), the function '*External Fault Close*' located in menu M2.2.1 as parameter P2.2.1.9, is given the value DigIN SlotA.3 (graphical LCP).

This means that the function External fault close is now controlled with a digital signal to digital input DI3 (terminal 10). This is what is shown in the parameter list:

Code	Parameter	Default	ID	Description
P2.2.1.9	External fault close	DigIN SlotA.3	405	OPEN = OK CLOSED = External fault

Assume that the selected input must be changed. DI6 (terminal 16) on the standard I/O should be used instead of DI3. Do as instructed here:

1. Select the parameter and push the Arrow right button.

2. You are now in the Edit mode as the slot value DigIN SlotA. is blinking and underlined. (Should you have more digital inputs available in your I/O, for example, through inserted option boards in slots C, D or E, they can also be selected here.).

3. Push the Arrow right button again to activate the terminal value 3.

4. Push the Arrow up button three times to change the terminal value to 6. Confirm with the OK button.

5. **Note!** If the digital input DI6 was already used for some other function, a notification is shown. You might then want to change either of these selections.

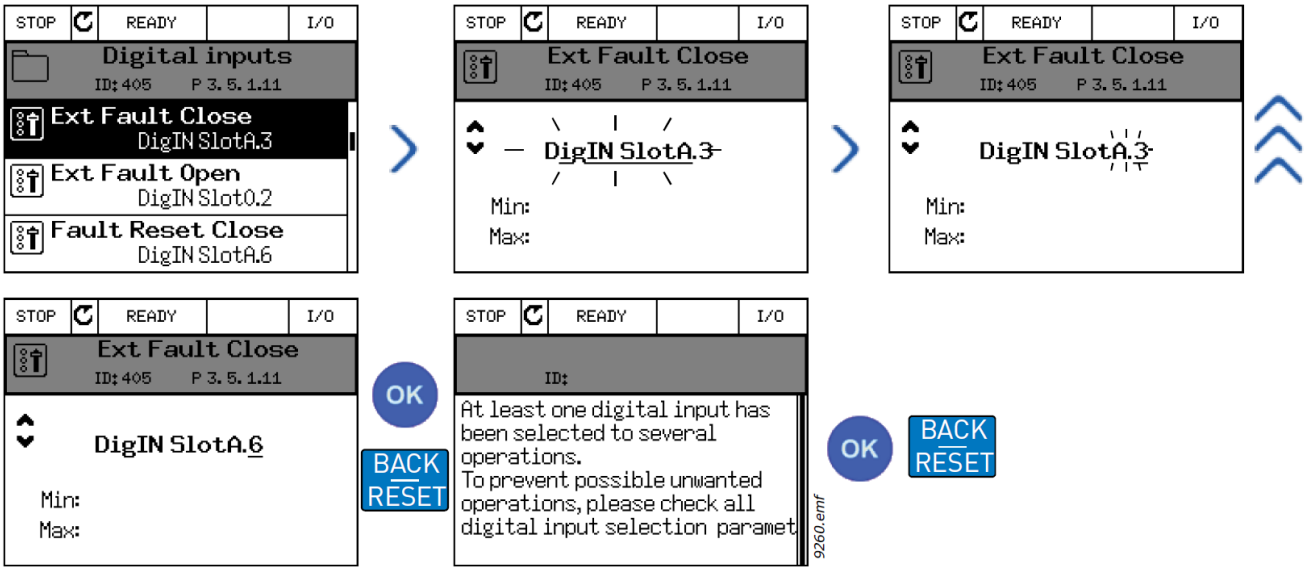


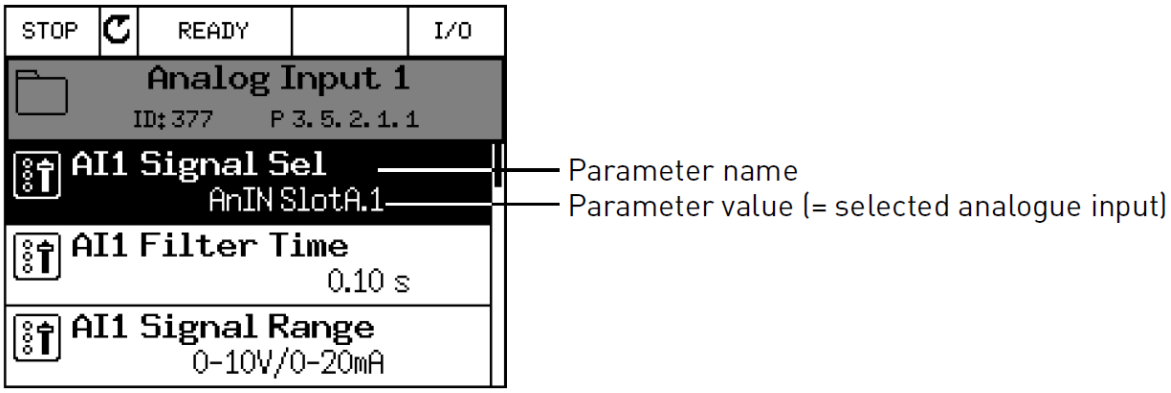
*Figure **Error! No text of specified style in document.**6. Programming digital inputs with keypad*

Now, the function External fault close is controlled with a digital signal to digital input DI6 (terminal 16).

Note!	The function is not assigned to any terminal, or the input is set to be always FALSE, if its value is DigIN Slot0.1. This is the default value of most parameters in menu M2.2.1. On the other hand, some inputs have been by default set to always be TRUE. Their value shows DigIN Slot0.2.

8.2.2 Analog input programming

The target input for the analog frequency reference signal can also be selected from the available analog inputs.



Given the standard I/O board compilation on the VACON® 100 control unit, there are 2 analog inputs available (Slot A terminals 2/3 and 4/5). In the programming view, these inputs are referred to as follows:

Input Type (graphical LCP)	Slot	Input #	Explanation
AnIN	A.	1	Analog input #1 (terminal 2/3) on board in Slot A (Standard I/O board)
AnIN	A.	2	Analog input #2 (terminal 4/5) on board in Slot A (Standard I/O board)

In the following example (mentioned after this), the parameter PT1 signal selection located in menu M2.2.2.1 with parameter code P2.2.2.1.1, is by default given the value AnIN SlotA.1 (graphical LCP). This means that the target input for the pressure measurement signal PT1 is now the analog input in terminals 2/3. Whether the signal is voltage or current must be determined with the DIP switches. See the installation guide for more information. This is what is shown in the parameter list:

Code	Parameter	Min	Max	Unit	Default	ID	Description
P2.2.2.1.1	PT12 signal selection				AnIN SlotA.1	1820	

Assume you must change the selected input. Instead of AI1 you wish to use the analog input on your option board in slot C. Do as instructed here:

1. Select the parameter and push the Arrow right button.

2. You are now in the Edit mode as the slot value AnIN SlotA. is blinking and underlined.

3. Push the Arrow up button once to change the slot value to AnIN SlotC. Confirm with the OK button.

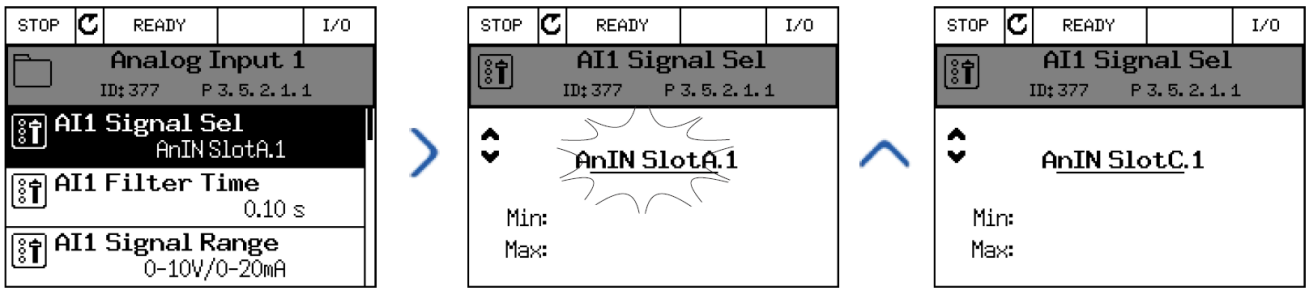


Figure 7. Programming analog input signal with graphical LCP

8.2.3 Description of signal sources

Source	Function
Slot0.#	**Digital inputs:** A digital signal can be forced to a constant FALSE or TRUE state using this functionality. For example, some signals have been set to be always in TRUE state by manufacturer, e.g parameter P2.2.1.13 (Run enable). Unless changed, the Run enable signal is always on. # = 1: Always FALSE # = 2–10: Always TRUE **Analog inputs** (used for testing purposes): # = 1: Analog input = 0% signal strength # = 2: Analog input = 20% signal strength # = 3: Analog input = 30% signal strength ... # = 10: Analog input = 100% signal strength
SlotA.#	Number (#) corresponds to digital input in slot A.
SlotB.#	Number (#) corresponds to digital input in slot B.
SlotC.#	Number (#) corresponds to digital input in slot C.
SlotD.#	Number (#) corresponds to digital input in slot D.
SlotE.#	Number (#) corresponds to digital input in slot E.

8.3 Digital Inputs

P2.2.1.1 Start cooling system ID1840 "Start Cooling System"

Digital input selection parameter for start cooling system signal.

This digital input signal is used to start/stop the cooling module when AUTO mode is active and at least one of the "Pump 1 Start" and "Pump 2 Start" signals (digital input signals) are active.

P2.2.1.2 SERVICE –mode activation ID1841 "Service Mode Activ."

Digital input selection parameter for Service mode activation signal.

This digital input signal is used to force the drive to SERVICE mode.
In SERVICE mode, pumps can be controlled manually by "Pump 1 Start" and "Pump 2 Start" signals (P2.2.1.7 and P2.2.1.8). Also 3-way valve can be manually controlled to the desired position by a parameter (P2.7.3).

SERVICE mode is typically used, for example, when commissioning the cooling module system.

Note! In SERVICE mode, all cooling module–related protections are disabled.

P2.2.1.3 LS22 Leakage switch ID1844 "LS22 Leakage Switch"

Digital input selection parameter for supervision signal from Leakage Switch.

P2.2.1.4 Tank level low switch (LLS11) ID1842 "LLS11 Low Level (Fault)"

Digital input selection parameter for low coolant tank level switch signal (LLS11).
This signal generates a fault indication, if missing.

Note! The drive cannot be started if the coolant tank level is below "low level" (the LLS11 level switch signal is FALSE or missing).

P2.2.1.5 Tank level low switch (LLS11) ID1842 "LLS11 Low Level (Alarm)"

Digital input selection parameter for middle coolant tank level switch –signal (LLS11).
This signal generates an alarm indication, if missing.

P2.2.1.7 Pump 1 start ID1846 "Pump P11 Start"

P2.2.1.8 Pump 2 start ID1847 "Pump P12 Start"

Digital input signal selection parameters for starting/stopping the pumps.

Each pump typically has its own hand switches on the operation panel door to start and stop the pumps.

In AUTO mode, pump start commands are combined with "Cooling System Start" signal (P2.2.1.1). If pump autochanging is needed, both "Pump 1 Start" and "Pump 2 Start" signals have to be activated.

In SERVICE mode, the pump whose start signal is recently activated is started. Only one pump can be driven at a time.

P2.2.1.9 External fault activation (CLOSE) ID405 "Ext Fault Close"

Selection of digital input signal for activating external fault (fault code 51, fault ID1051).

Contact closed = External fault activated
Contact open = No action

P2.2.1.10 External fault activation (OPEN) ID406 "Ext Fault Open"

Selection of digital input signal for activating external fault (fault code 51, fault ID1051).

Contact closed = No action
Contact open = External fault activated

P2.2.1.11 Fault reset (CLOSE) ID414 "Fault Reset Close"

Selection of digital input signal for resetting all active faults.

Contact closed = Faults are reset (on rising edge)
Contact open = No action

P2.2.1.12 Fault reset (OPEN) ID213 "Fault Reset Open"

Selection of digital input signal for resetting all active faults.

Contact closed = No action
Contact open = Faults are reset (on falling edge

P2.2.1.13 Run enable ID407 "Run Enable"

Selection of digital input signal for enabling/disabling the start of the motor.

If run enable is removed from during the operation, the motor stops.

Contact closed = Start of motor is enabled
Contact open = Start of motor is disabled

P2.2.1.14 Motor Overheat ID1848 "Motor Overheat"

Selection of digital input signal for feedback signal from the motor thermal switch.

In a single pump system, if the motor thermal switch has tripped:

- The pump is stopped and "Motor Overtemperature" fault is generated.

In a dual pump system, if the motor thermal switch has tripped:

- The primary pump is stopped and "Motor Overtemperature" warning is generated. The secondary pump is started, and the cooling module continues operation normally. If motor overheat is detected also when operating with the secondary pump, "Motor Overtemperature" fault is generated and operation is stopped.

8.4 Analog inputs

P2.2.2.1.1 Pressure sensor PT12 signal selection ID1820 "PT12 Signal Sel"

Connect the PT12 signal to the analog input of your choice with this parameter.
(PT12 = Pump Outlet Pressure)

P2.2.2.1.2 Pressure sensor PT12 signal range ID1821 "PT12 Signal Range"

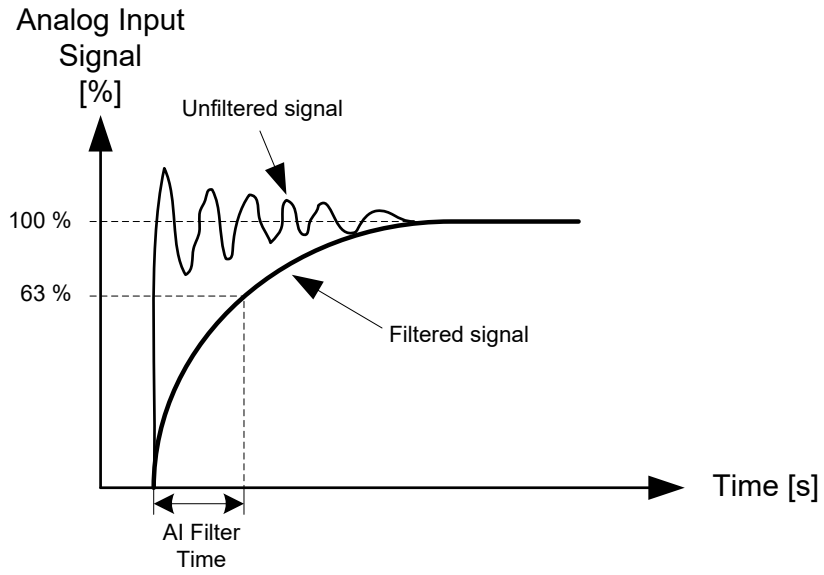
This parameter defines the range of PT12 (analog input) signal.

0 = 0…10 V or 0…20 mA
1 = 2…10 V or 4…20 mA

Note! The type of the analog input signal (current or voltage) is selected by the DIP switches on the control board.

P2.2.2.1.3 Pressure sensor PT12 filtering time ID1822 "PT12 Filter Time"

This parameter defines the filtering time for PT12 signal. When this parameter is given a value greater than 0 the function that filters out disturbances from the incoming analog signal is activated.



P2.2.2.1.4 Pressure sensor PT12 scale minimum ID1823 "PT12 Scale Min"

P2.2.2.1.5 Pressure sensor PT12 scale maximum ID1824 "PT12 Scale Max"

These parameters are used for defining the pressure sensor measurement range (in real process units).

For example, if the pressure sensor signal 4...20mA corresponds to 0...10 bar, then these parameters should be set as follows:

P2.2.2.1.4 PT12 Scale Min = 0.0 bar
P2.2.2.1.5 PT12 Scale Max = 10.0 bar

P2.2.2.2.1 Pressure sensor PT11 signal selection ID1825 "PT11 Signal Sel"

P2.2.2.2.2 Pressure sensor PT11 signal range ID1826 "PT11 Signal Range"

P2.2.2.2.3 Pressure sensor PT11 filtering time ID1827 "PT11 Filter Time"

P2.2.2.2.4 Pressure sensor PT11 scale minimum ID1828 "PT11 Scale Min"

P2.2.2.2.5 Pressure sensor PT11 scale maximum ID1829 "PT11 Scale Max"

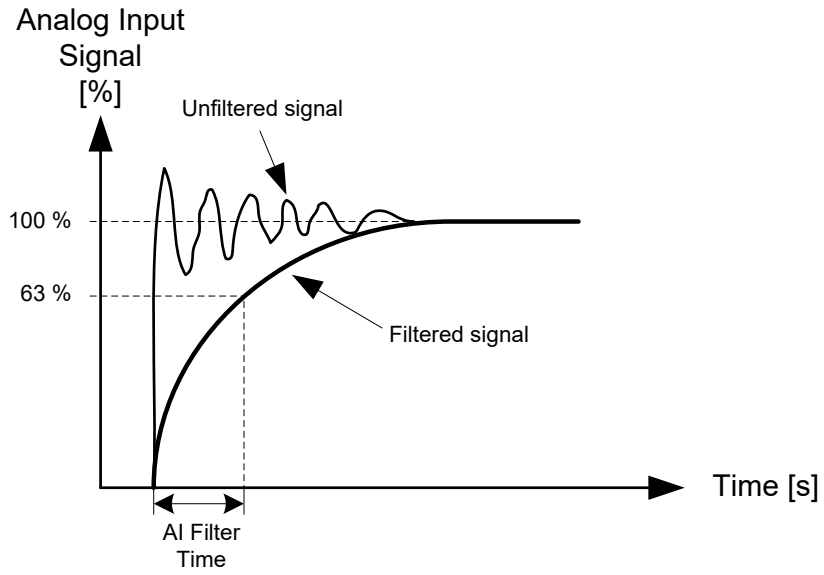
See descriptions of parameters P2.2.2.1.1 – P2.2.2.1.5
(PT11 = Pump Inlet Pressure)

P2.2.2.3.1 Temperature sensor TE11 signal selection ID1830 "TE11 Signal Sel"

Connect the temperature measurement signal (TE11) to the analog input of your choice with this parameter.
(TE11 = Temperature, coolant to AC drives)

P2.2.2.3.2 Temperature sensor TE11 filtering time ID1832 "TE11 Filter Time"

This parameter defines the filtering time for TE11 signal. When this parameter is given a value greater than 0 the function that filters out disturbances from the incoming temperature signal is activated.



P2.2.2.3.3 Temperature sensor TE11 offset ID1836 "TE11 Filter Offset"

This parameter gives the offset value that is added to the measured temperature.

This offset is typically used to compensate the minor measurement error that might occur due to the cable resistance when, for example, PT100 sensors are connected to the drive by using 2-wire wiring.

P2.2.2.5.1 Temperature sensor TE21 signal selection ID1834 "TE21 Signal Sel"

P2.2.2.5.2 Temperature sensor TE21 filtering time ID1835 "TE21 Filter Time"

P2.2.2.5.3 Temperature sensor TE21 offset ID1838 "TE21 Offset"

This signal is used to measure cooling module ambient temperature.

Cooling module ambient temperature measurement can be used to avoid the condensation problems in the AC drives. Ambient temperature is used to supervise that the temperature of the coolant to the AC drives will not fall below the ambient temperature.

See descriptions of parameters P2.2.2.3.1 – P2.2.2.3.3
(TE21 = Cooling Module ambient temperature)

P2.2.2.6.1 Humidity sensor ME21 signal selection ID1532 "ME21 Signal Sel"

P2.2.2.6.2 Humidity sensor ME21 signal range ID1533 "ME21 Signal Range"

P2.2.2.6.3 Humidity sensor ME21 filtering time ID153 "ME21 Filter Time"

P2.2.2.6.4 Humidity sensor ME21 scale minimum ID1535 "ME21 Scale Min"

P2.2.2.6.5 Humidity sensor ME21 scale maximum ID1536 "ME21 Scale Max"

See descriptions of parameters P2.2.2.1.1 – P2.2.2.1.5
(PT11 = Pump Inlet Pressure)

P2.2.3.1 Digital input inversion word ID1586 "DI Inversion Word"

This parameter is used for inverting the operation of cooling module specific digital input signals.

Not Checked	(☐)	= Normal operation	(NO = normally open)
Checked	(☒)	= Inverted operation	(NC = normally closed)

B0 = +1 = Start Cooling System
B1 = +2 = Service Mode Activ.
B2 = +4 = LLS11 Low Level (Fault)
B3 = +8 = LLS11 Low Level (Alarm)
B4 = +16 = LS22 Leakage Switch
B6 = +64 = Pump 1 Start
B7 = +128= Pump 2 Start
B8 = +256= Cooling Standby
B9= +512= Motor Overheat

8.5 Digital Outputs

P2.3.1.1 Digital output: Run ID1550 "DO Run"

Digital output selection parameter for Run signal.

This digital output signal is activated when the cooling module is run –state.

P2.3.1.2 Digital output: Ready ID1551 "DO Ready"

Digital output selection parameter for Ready signal.

This digital output signal is activated when the cooling module is ready to start.

P2.3.1.3 Digital output: Fault ID1552 "DO Fault"

Digital output selection parameter for Fault signal.

This digital output signal is activated when any fault is activated in the cooling module.

P2.3.1.4 Digital output: Alarm ID1553 "DO Alarm"

Digital output selection parameter for Alarm signal.

This digital output signal is activated when any alarm is activated in the cooling module.

P2.3.1.5 Digital output: Pump 1 (contactor) control ID1554 "DO Pump 1 Ctrl"

Digital output selection parameter for pump 1 (contactor) control signal.

This digital output signal is used to control pump 1 contactor (in a single pump configuration). Digital output is activated when the cooling module is started and pump 1 is selected.

P2.3.1.6 Digital output: Pump 2 (contactor) control ID1555 "DO Pump 2 Ctrl"

Digital output selection parameter for pump 2 (contactor) control signal.

This digital output signal is used to control pump 2 contactor (in a dual pump configuration). Digital output is activated when the cooling module is started and pump 2 is selected.

P2.3.1.7 Digital output: Cooling OK ID1556 "DO Cooling OK"

Digital output selection parameter for Cooling OK signal.

Typically, this signal is wired to AC drives to indicate that the cooling module is operating. The signal is activated when the following conditions are fulfilled:

- No faults active
- AUTO –mode is active
- Pump is running (Pump 1 or Pump 2)

P2.3.1.8 Digital output: Coolant heater control ID1557 "DO Heater Ctrl"

Digital output selection parameter for coolant heater control signal.

This digital output signal is used to control an external (electrical) heater (if installed into cooling module expansion tank). See heater control parameters in parameter menu M2.9.

P2.3.1.9 Digital output: Run signal for indication LED ID1557 "DO Run LED"

Digital output selection parameter for Run (LED) signal.

This digital output signal is used to control RUN indication light on the cooling module cabinet door.

This signal has a special behavior, depending on the operating mode of the cooling module:

AUTO mode:

- Activated, when the cooling module is operating (Running)
- Deactivated, when cooling module is stopped

SERVICE mode:

- Blinking at 1 Hz frequency, when service mode is active

P2.3.1.10 Digital output: Cabinet heater ID1615 "DO Cabinet Heater"

Digital output selection parameter for cabinet heater control signal.

This digital output signal is used to control an external (electrical) heater inside the cabinet of the cooling module. See heater control parameters in parameter menu M2.10.

P2.3.1.11 Digital output: Alarm (toggle) ID1864 "DO Alarm (Toggle)"

Digital output selection parameter for Alarm signal.

This digital output signal is activated when any alarm is activated in the cooling module. If multiple alarms are activated simultaneously, this output is deactivated (toggle) for 1 s every time a new alarm is activated.

8.6 Analog Outputs

P2.3.2.1 Analog output: FV11 3-Way valve control (PID output) ID1501 "AO FV11 Valve Ctrl (PID Out)"

Analog output selection parameter for 3-way valve control signal.

This (PID controlled) signal is used to control the 3-way valve in the system. When the coolant temperature rises and more cooling is needed, the electrical actuator opens the 3-way valve and the line to the cooling module opens. When the coolant temperature lowers and cooling is not needed so much, the actuator closes the line to the cooling module and opens the inline at the same time. The signal is scaled linearly between 0...100%.

See also tuning parameters in parameter menu M2.11.

P2.3.2.2 Analog output: Pressure, Outlet (PT12) ID1502 "AO PT12 Press. Outlet"

Analog output selection parameter for measured PT12 signal.
Signal is scaled linearly between defined pressure sensor scale: scale min...scale max (P2.2.2.1.4 and P2.2.2.1.5).

P2.3.2.3 Analog output: Pressure, Inlet (PT11) ID1503 "AO PT11 Press. Inlet"

Analog output selection parameter for measured PT11 signal.
Signal is scaled linearly between defined pressure sensor scale: scale min...scale max (P2.2.2.2.4 and P2.2.2.2.5).

P2.3.2.4 Analog output: Temperature (TE11) (to Inv.) ID1504 "AO TE11 Temp.(to Inv.)"

Analog output selection parameter for measured TE11 signal.
The signal is scaled linearly between -30...200 °C degrees.

P2.3.2.6 Analog output: Temperature (TE21) (ambient) ID1507 "AO TE21 Temp.(ambient)"

Analog output selection parameter for measured TT2 signal.
The signal is scaled linearly between -30...200 °C degrees.

P2.3.2.7 Analog output: Coolant Flow (calculated) ID1506 "AO Coolant Flow (calc.)"

Analog output selection parameter for calculated flow signal.
The signal is scaled linearly between 0...30 l/min.

P2.3.3.1 Analog output signal range selection ID1510 "AO Range Sel. (2V/4mA)"

This parameter is used for selecting analog output signal range.

When current signal (mA) is used:
This parameter can be used to select the range to be either 0...20mA or 4...20mA

When voltage signal (V) is used:
This parameter can be used to select the range to be either 0...10V or 2...10V

This parameter is a 16-bit word where each analog output signal has an own bit which is used to select analog output signal range (either 0...20mA or 4...20mA).

Not Checked	(☐)	= 0...20mA or 0...10V (depending on the signal type: mA or V)
Checked	(☒)	= 4...20mA or 2...10V (depending on the signal type: mA or V)

B0 = +1 = AO Output Frequency
B1 = +2 = AO FV11 Valve Ctrl (PID Out)
B2 = +4 = AO PT12 Pressure, Outlet
B3 = +8 = AO PT11 Pressure, Inlet
B4 = +16 = AO TE11 Temperat. (to inverters)
B6 = +64 = AO TE21 Temperat. (ambient)
B7 = +128= AO Coolant Flow (calc.)

P2.3.3.2 Digital output inversion word ID1587 "DO Inversion Word"

This parameter is used for inverting the operation of cooling module specific digital output signals.

Not Checked	(☐)	= Normal operation	(NO = normally open)
Checked	(☒)	= Inverted operation	(NC = normally closed)

B0 = +1 = DO Run
B1 = +2 = DO Ready
B2 = +4 = DO Fault
B3 = +8 = DO Alarm
B4 = +16 = DO Pump 1 Ctrl
B5 = +32 = DO Pump 2 Ctrl
B6 = +64 = DO Cooling OK
B7 = +128 = DO Heater Ctrl
B8 = +256 = DO Run LED
B9 = +1024= DO Alarm (toggle)

P2.3.3.3 Signal light test ID1616 "Signal Light Test"

This parameter meant to be used during the commission, to ensure that signal light wirings are connected correctly.

When a signal light test is activated, the following digital outputs (signal lights on the cabinet door) are activated constantly:

- Fault
- Alarm
- Alarm (toggle)
- Run
- Cooling OK

0 = Test Inactive
1 = Test Active

Note! Parameter must be returned to “Inactive” mode after the test!

P2.3.3.4 Analog output signal range inversion selection ID1511 “AO Range Inversion Sel.”

This parameter is used for inverting range of the analog output signal.

In normal mode, the analog output signal range is:

- Analog output signal 0..100 % => 0…20mA (or 4..20mA or 0..10V or 2..10V)

When the range is inverted:

- Analog output signal 0..100 % => 20…0mA (or 20..4mA or 10..0V or 10..2V)

This parameter is a 16-bit word where each analog output signal has an own bit which is used to activate the inversion of the analog output signal range.

Not Checked (☐) = Normal signal range (for example, 0..100% ⇔ 0..20mA)
Checked (☒) = Inverted signal range (for example, 0..100% ⇔ 20..0mA)

B0 = +1 = AO Output Frequency
B1 = +2 = AO FV11 Valve Ctrl (PID Out)
B2 = +4 = AO PT12 Pressure, Outlet
B3 = +8 = AO PT11 Pressure, Inlet
B4 = +16 = AO TE11 Temperat. (to inverters)
B6 = +64 = AO TE21 Temperat. (ambient)
B7 = +128= AO Coolant Flow (calc.)

8.7 Protections General

P2.4.1.1 Response to External fault ID701 “External Fault”

This parameter defines the response for an external fault.
[*F51 – External Fault (Fault ID: 1051)*]

0 = No action
1 = Alarm
2 = Fault

External fault can be activated by a digital input signal (P2.2.1.9 or P2.2.1.10). It can be used to inform about an external condition where the drive must react to.

P2.4.1.2 Fieldbus communication fault ID733 "FieldbusComm Flt"

This parameter defines the response for fieldbus timeout fault.
[*F53 – Fieldbus Timeout Fault (Fault ID: 1053)*]

Fieldbus Communication fault or alarm is generated if the communication between the Fieldbus master and Cooling module is timed out or broken.

0 = No Action
1 = Alarm
3 = Fault

P2.4.1.3 Slot communication fault ID734 "SlotComm Flt"

This parameter defines the response for slot communication fault.
[*F54 – Slot Fault (Fault ID: 1354, 1454, 1554, 1654, 1754)*]

Slot communication fault is generated if the drive detects defective option boards (or slots).

0 = No action
1 = Alarm
2 = Fault

P2.4.1.4 Thermistor fault ID732 "Thermistor Fault"

This parameter defines the response for a thermistor fault.
[*F66 –Thermistor Input Fault (Fault ID: 1366, 1466, 1566)*]

0 = No action
1 = Alarm
2 = Fault

Note! Parameter value 0 "No action" deactivates the protection

8.7.1 Fieldbus Watchdog

Fieldbus Watchdog function can be used to supervise that the communication to the fieldbus master device is alive. This function is monitoring the watchdog bit in Fieldbus Control Word bit 11 and echoes it back to the Fieldbus Status Word bit 10. If the watchdog bit remains at the same state for too long, the Fieldbus Watchdog alarm or fault is activated.

P2.4.1.5.1 Response to watchdog timeout ID1860 "Watchdog Response"

This parameter defines the response to the fieldbus watchdog fault.
[*F53 – FB Watchdog (Fault ID: 1897)*]

0 = No action (supervision disabled)
1 = Alarm
2 = Fault

Note! Parameter value 0 "No action" deactivates the supervision. Watchdog supervision is enabled only when fieldbus has been selected as active control place.

P2.4.1.5.2 Watchdog timeout delay ID1863 "Watchdog Delay"

This parameter defines the maximum duration of the watchdog bit at the same state.
If the watchdog bit (Control Word bit 11) remains at the same state for longer than the delay set by this parameter, an alarm/fault "F53 - FB Watchdog" is activated.

P2.4.1.5.3 Watchdog delay at power-up ID1862 "WatchdogPowerUpDelay"

This parameter defines the delay (after power-up) after which the watchdog supervision function is enabled. At the power up of the system, it might take a bit longer before the communication to the fieldbus master is established. For that reason, also the watchdog supervision might need to be delayed until the communication is established.

8.8 Cooling Module Protections

P2.4.2.1.1 PT12 Pressure outlet: low limit (alarm) ID1573 "PT12 Low (Alarm)"

Low limit (alarm) for (measured) outlet pressure.

P2.4.2.1.2 PT11 Pressure inlet: low limit (alarm) ID1574 "PT11 Low (Alarm)"

Low limit (alarm) for (measured) inlet pressure.

P2.4.2.1.3 PT11 Pressure inlet: high limit (alarm) ID1575 "PT11 High (Alarm)"

High limit (alarm) for (measured) inlet pressure.

P2.4.2.1.4 TE11 Temperature (coolant): low limit (alarm) ID1563 "TE11 Low (Alarm)"

Low limit (alarm) for (measured) coolant temperature.

P2.4.2.1.5 TE11 Temperature (coolant): high limit (alarm) ID1576 "TE11 High (Alarm)"

High limit (alarm) for (measured) coolant temperature.

P2.4.2.1.8 TE21 Temperature (ambient): low limit (alarm) ID1566 "TE21 Low (Alarm)"

Low limit (alarm) for (measured) coolant temperature.

P2.4.2.1.9 TE21 Temperature (ambient): high limit (alarm) ID1565 "TE21 High (Alarm)"

High limit (alarm) for (measured) coolant temperature.

P2.4.2.1.11 Coolant Flow: low limit (alarm) ID1603 "Flow Low (Alarm)"

Low limit (alarm) for (calculated) coolant flow.

P2.4.2.1.12 Coolant Flow: high limit (alarm) ID1604 "Flow High (Alarm)"

High limit (alarm) for (calculated) coolant flow.

P2.4.2.1.13 Delta pressure: low limit (alarm) ID1618 "DeltaPress.Low (Alarm)"

Low limit (alarm) for pressure difference between pump outlet and inlet pressure (PT12 – PT11).

Pressure difference is supervised only when the pump is controlled on. Too low pressure difference between pump inlet and outlet (in run mode) typically indicates that the pump is not rotating for some reason. Alarm "Delta Pressure (PT12)" is activated if too low pressure difference is detected for 2 s (in run mode).

P2.4.2.2.1 PT12 Pressure Outlet: low limit (fault) ID1579 "PT12 Low (Fault)"

Low limit (fault) for (measured) outlet pressure.

P2.4.2.2.2 PT11 Pressure Inlet: low limit (fault) ID1580 "PT11 Low (Fault)"

Low limit (fault) for (measured) inlet pressure.

P2.4.2.2.3 TE11 Temperature (coolant): low limit (fault) ID1562 "TE11 Low (Fault)"

Low limit (fault) for (measured) coolant temperature.

P2.4.2.2.4 TE11 Temperature (coolant): low limit (fault) ID1589 "TE11 High (Fault)"

High limit (fault) for (measured) coolant temperature.

P2.4.2.2.7 Coolant Flow: low limit (fault) ID1605 "Flow Low (Fault)"

Low limit (fault) for (calculated) coolant flow.

P2.4.2.2.8 Coolant Flow: high limit (fault) ID1606 "Flow High (Fault)"

High limit (fault) for (calculated) coolant flow.

8.9 Protection Options

P2.4.3.1	***Fault/alarm test word 1***	***ID1570***	***"Fault Test Word 1"***
P2.4.3.2	***Fault/alarm test word 2***	***ID1588***	***"Fault Test Word 2"***
P2.4.3.4	***Fault/alarm test word 4***	***ID1595***	***"Fault Test Word 4"***

Sometimes (for example, during the Factory Acceptance Test (FAT)) there is a need to simulate certain faults or warnings in order to demonstrate how the system reacts.

These parameters can be used to activate different cooling module specific faults and alarms manually, for test purposes, without starting the unit or changing any wirings. These parameters are 16-bit words where each bit activates an individual alarm or fault.

On the user interface (Keypad and VACON® Live) these parameters are presented in "checkbox" view, meaning that:

Not Checked	(☐)	= Fault/Alarm activated according to normal conditions
Checked	(☒)	= Fault/Alarm forced to active manually

Fault/alarm test word 1:

B0	=	+1	= LS1 Low	(Fault)
B1	=	+2	= LS2 Low	(Alarm)
B4	=	+16	= PT12 Sensor Failure	(Alarm)
B5	=	+32	= PT12 Low	(Fault)
B6	=	+64	= PT12 Low	(Alarm)
B7	=	+128	= PT11 Sensor Failure	(Alarm)
B8	=	+256	= PT11 Low	(Fault)
B9	=	+512	= PT11 Low	(Alarm)
B10	=	+1024	= PT11 High	(Alarm)

Fault/alarm test word 2:

B0	=	+1	= TE11 Sensor Failure	(Alarm)
B1	=	+2	= TE11 High	(Alarm)
B5	=	+32	= TE21 High	(Alarm)
B6	=	+64	= Leakage Switch	(Fault)
B8	=	+256	= Motor Overheat	(Fault)
B9	=	+512	= TE11 High	(Fault)
B10	=	+1024	= TE11 Low	(Alarm)
B11	=	+2048	= TE11 Low	(Fault)

Fault/alarm test word 4:

B0	=	+1	= Flow Low	(Alarm)
B1	=	+2	= Flow High	(Alarm)
B2	=	+4	= Flow Low	(Fault)
B3	=	+8	= Flow High	(Fault)

Note! When not testing, these parameters must be set to zero!

Note! These faults/alarms have fixed fault response. It cannot be changed.

P2.4.3.5	***Fault/alarm disable word 1***	***ID1571 "Fault Disable Word 1"***
P2.4.3.6	***Fault/alarm disable word 2***	***ID1582 "Fault Disable Word 2"***
P2.4.3.7	***Fault/alarm disable word 4***	***ID1594 "Fault Disable Word 4"***

Sometimes (for example, in Factory Acceptance Test (FAT)) there is a need to temporarily disable the generation of some faults or alarms (for example, to be able to test the system).

These parameters can be used to disable different cooling module specific faults and alarms temporarily, for test purposes. These parameters are 16-bit words where each bit disables an individual alarm or fault.

On the user interface (Keypad and VACON® Live) these parameters are presented in "checkbox" view, meaning that:

Not Checked	(☐)	= Fault/Alarm enabled and activated according to normal fault/alarm conditions.
Checked	(☒)	= Fault/Alarm disabled. Fault/alarm does not present.

Fault/alarm test word 1:

B0	=	+1	= LS1 Low	(Fault)
B1	=	+2	= LS2 Low	(Alarm)
B4	=	+16	= PT12 Sensor Failure	(Alarm)
B5	=	+32	= PT12 Low	(Fault)
B6	=	+64	= PT12 Low	(Alarm)
B7	=	+128	= PT11 Sensor Failure	(Alarm)
B8	=	+256	= PT11 Low	(Fault)
B9	=	+512	= PT11 Low	(Alarm)
B10	=	+1024	= PT11 High	(Alarm)

Fault/alarm test word 2:

B0	=	+1	= TE11 Sensor Failure	(Alarm)
B1	=	+2	= TE11 High	(Alarm)
B5	=	+32	= TE21 High	(Alarm)
B6	=	+64	= Leakage Switch	(Fault)
B8	=	+256	= Motor Overheat	(Fault)
B9	=	+512	= TE11 High	(Fault)
B10	=	+1024	= TE11 Low	(Alarm)
B11	=	+2048	= TE11 Low	(Fault)

Fault/alarm test word 4:

B0	=	+1	= Flow Low	(Alarm)
B1	=	+2	= Flow High	(Alarm)
B2	=	+4	= Flow Low	(Fault)
B3	=	+8	= Flow High	(Fault)

Note! When not testing, these parameters must be set to zero!

8.10 Automatic Reset

The Auto reset function tries to reset the fault automatically during the trial time. Number of automatic reset tries can be set by a parameter. Faults that are included to automatic reset can also be selected by parameter. The function operates as the Automatic Restart function if the start command is received as a static signal.

P2.5.1 Automatic reset ID731 "Automatic reset"

This parameter defines if the automatic reset function is used or not.

0 = Automatic fault reset disabled
1 = Automatic fault reset enabled

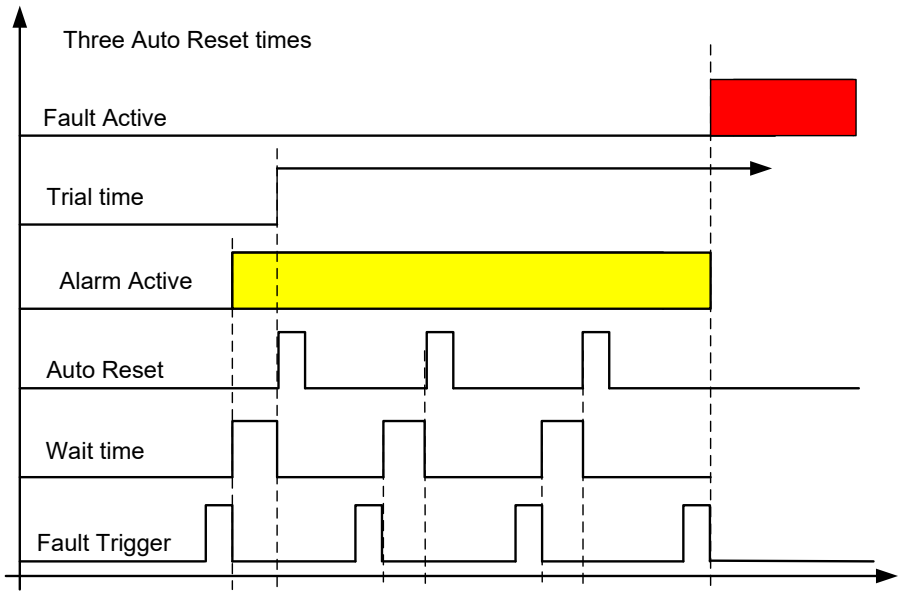
P2.5.3 Automatic reset: Wait time ID717 "Wait Time"

Defines the wait time (after removing the fault trigger) before the automatic fault reset takes place.

Note! If there is an external fault, remove the cause of fault on the external device. The wait time count starts only when the cause of fault has been removed.

P2.5.4 Automatic reset: Trial time ID718 "Trial Time"

The Automatic reset function keeps trying to reset the faults appearing during the time set with this parameter. When the trial time has elapsed and the fault is still active, the cooling module trips to a permanent fault.



P2.5.5 Automatic reset: Number of trials ID759 "Number of Trials"

Total number of trials (irrespective of fault type). If the drive is not able to be reset within this number of trials and the set trial time, a fault is generated.

The following parameters define which of the faults are included in the automatic reset:

P2.5.6 ***External fault*** ***ID726*** ***"External Fault"***

This parameter defines which faults are included in the automatic reset function.

0 = No (not included to automatic reset)
1 = Yes (included to automatic reset)

P2.5.7 ***Coolant Flow (High) Fault*** ***ID1810*** ***"Coolant Flow (High)"***

This parameter defines which faults are included in the automatic reset function.

0 = No (not included to automatic reset)
1 = Yes (included to automatic reset)

P2.5.8 ***PT12 Pressure (Low) Fault*** ***ID1811*** ***"PT12 Pressure (Low)"***

This parameter defines which faults are included in the automatic reset function.

0 = No (not included to automatic reset)
1 = Yes (included to automatic reset)

8.11 Fieldbus Data Mapping

P2.6.1	***Fieldbus data out selection 1***	***ID852***	***"FB DataOut 1 Sel"***
P2.6.2	***Fieldbus data out selection 2***	***ID853***	***"FB DataOut 2 Sel"***
P2.6.3	***Fieldbus data out selection 3***	***ID854***	***"FB DataOut 3 Sel"***
P2.6.4	***Fieldbus data out selection 4***	***ID855***	***"FB DataOut 4 Sel"***
P2.6.5	***Fieldbus data out selection 5***	***ID856***	***"FB DataOut 5 Sel"***
P2.6.6	***Fieldbus data out selection 6***	***ID857***	***"FB DataOut 6 Sel"***
P2.6.7	***Fieldbus data out selection 7***	***ID858***	***"FB DataOut 7 Sel"***
P2.6.8	***Fieldbus data out selection 8***	***ID859***	***"FB DataOut 8 Sel"***

Using these parameters, you can monitor any monitoring or parameter value from the fieldbus (Process Data Out 1–8). Enter the ID number of the item that you wish to monitor for the value of these parameters. See monitoring signals for full details of ID numbers.

The data is scaled to unsigned 16-bit format, according to the format on the keypad.

Default settings:

Data	Value	Unit	Scale	ID
Status Word	Status Word (low 16-bit)			
Reserved	Status Word (high 16-bit)	--	--	
Process data OUT 1	TE11 Temperature (Coolant)	°C / °F	0.01 °C	1952
Process data OUT 2	Temperature Error (PID Error)	°C / °F	0.01 °C	22
Process data OUT 3	Coolant Flow (calculated)	lpm / gpm	1 lpm	1955
Process data OUT 4	PT11 Pressure, Inlet	bar / PSI	0.01 bar	1951
Process data OUT 5	PT12 Pressure, Outlet	bar / PSI	0.01 bar	1950
Process data OUT 6	TE21 Temperature (ambient)	°C / °F	0.01 °C	1954
Process data OUT 7	Last Active Alarm Code	-	-	74
Process data OUT 8	Last Active Fault Code	-	-	37

Example:
The value '2500' for Output Frequency corresponds to '25.00 Hz' (scaling value is 0.01)

P2.6.9	***Fieldbus data in selection 1***	***ID891***	***"FB Data In 1 Sel"***
P2.6.10	***Fieldbus data in selection 2***	***ID892***	***"FB Data In 2 Sel"***
P2.6.11	***Fieldbus data in selection 3***	***ID893***	***"FB Data In 3 Sel"***
P2.6.12	***Fieldbus data in selection 4***	***ID894***	***"FB Data In 4 Sel"***
P2.6.13	***Fieldbus data in selection 5***	***ID895***	***"FB Data In 5 Sel"***
P2.6.14	***Fieldbus data in selection 6***	***ID896***	***"FB Data In 6 Sel"***
P2.6.15	***Fieldbus data in selection 7***	***ID897***	***"FB Data In 7 Sel"***
P2.6.16	***Fieldbus data in selection 8***	***ID898***	***"FB Data In 8 Sel"***

Using these parameters, you can control any parameter value from the fieldbus (Process Data In 1–8). Enter the ID number of the item that you wish to control for the value of these parameters.

8.12 FV11 Temperature Control

When the coolant temperature rises and more cooling is needed, the electrical actuator opens the 3-way valve and the line to the cooling module opens. When the coolant temperature lowers and cooling is not needed so much, the actuator closes the line to the cooling module and opens the inline at the same time.

In AUTO mode, the 3-way valve is controlled automatically. The operator gives a setpoint for the coolant temperature by a parameter. The automatic control system keeps the temperature at set temperature by moving the 3-way valve with PID control.

In SERVICE mode, the 3-way valve can be controlled to the desired position manually by the operator. Valve position can be adjusted by a parameter.

P2.7.1 Temperature reference ID167 "Temp. Reference"

This parameter defines the setpoint temperature for the coolant (from AC drives).

In AUTO mode, based on the measured TT2 –temperature (temperature of coolant from AC drives), the drive controls the 3-way valve position automatically (with PID controller), in order to keep the coolant temperature (TT2) at the value set by this parameter.

See parameter menu M2.7.4 for fine-tuning the PID controller.

Note! To avoid condensation problems in the AC drives, the coolant temperature should always be kept higher than the ambient temperature.

P2.7.2 Temperature reference automatic adjust ID1525 "Temp.Ref.AutoAdjust"

To avoid condensation problems in the AC drive system, coolant temperature should be kept slightly higher than the dew point temperature.

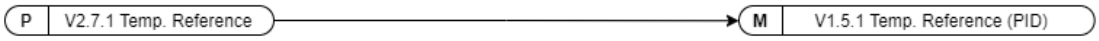
This parameter defines if the coolant temperature reference is allowed to be increased automatically, if the calculated dew point temperature raises higher that coolant temperature.

Note! Temperature reference automatic adjustment requires ambient temperature measurement sensor (TE21) and humidity sensor (ME21) to be installed and taken into use (M2.2.2.5 and M2.2.2.6).

Note! Automatic temperature reference adjustment can also be done based on the ambient temperature measurement only if no humidity measurement is available.

0 = "Disabled"

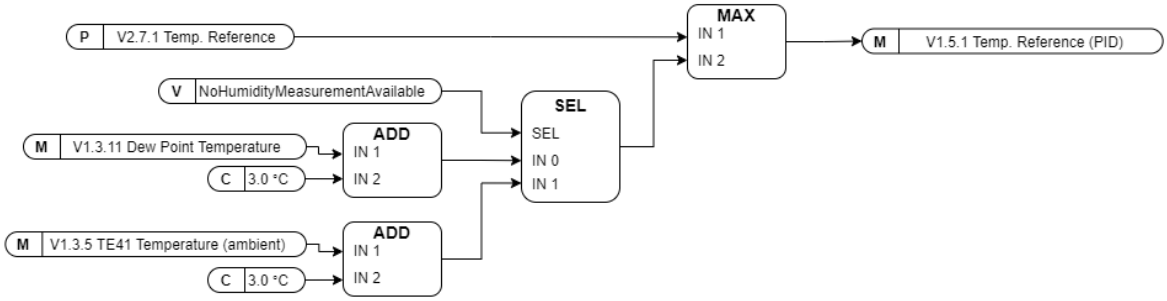
Coolant temperature reference is always taken from parameter P2.7.1 Temp. Reference, regardless from the ambient temperature.



1 = "Enabled"

Reference for coolant temperature is taken either from parameter P2.7.1 or calculated dew point temperature, depending which one is higher. (The highest value is used as temperature reference).

If humidity measurement is not available, ambient temperature is used instead of calculated dew point temperature.



P2.7.3 3-Way valve manual reference ID1590 "Valve Manual Ref."

In SERVICE mode, the 3-way valve can be controlled to the desired position manually by the operator. Valve position can be adjusted by this parameter.

P2.7.4.1 PID controller gain ID118 "Gain"

This parameter defines the gain of the PID controller (proportional term). If the value of the parameter is set to 100% a change of 10% in the error value causes the controller output to change by 10%. If the parameter value is set to 0 the PID controller operates as ID-controller.

A high proportional gain results in a large change in the output for a given change in the error. If the proportional gain is too high, the system can become unstable. In contrast, a small gain results in a small output response to a large input error, and a less responsive or less sensitive controller. If the proportional gain is too low, the control action may be too small when responding to system disturbances.

P2.7.4.2 PID controller integration time ID119 "Integration Time"

The parameter defines the integration time of the PID controller (integral term). If this parameter is set to 1.00 s, a change of 10% in the error value causes the controller output to change by Gain x 10.00%/s. If the parameter value is set to 0.00 s, the PID controller operates as a PD controller.

The integral term accelerates the movement of the process towards the setpoint and eliminates the residual steady state error that occurs with a pure proportional controller.

P2.7.4.3 PID controller derivation time ID132 "Derivation Time"

The parameter defines the derivation time of the PID controller (derivative term). If this parameter is set to 1.00 s, a change of 10% in the error value during 1.00 s causes the controller output to change by 10.00%. If the parameter value is set to 0.00 s, the PID controller operates as a PI controller.

The derivative term slows the rate of change of the controller output. Derivative control is used to reduce the magnitude of the overshoot produced by the integral component and improve the combined controller-process stability. However, the derivative term slows the transient response of the controller.

P2.7.4.4 PID controller dead band ID1056 "Dead Band"

P2.7.4.5 PID controller dead band delay ID1057 "Dead Band Delay"

This parameter defines the hysteresis (dead band) area around the PID controller setpoint value (P2.7.1 Temp Reference).

PID controller output value is locked, if the feedback signal stays on the defined dead band area (P2.7.4.4) for longer than the defined dead band delay (P2.7.4.5).

The size of the dead band area around the setpoint (P2.7.1) is defined in temperature units (°C or °F).

8.13 Autochange

P2.8.1	***Pump 11 autochange interval***	***ID1521***	***"P11 Autochange Interval"***
P2.8.2	***Pump 12 autochange interval***	***ID1526***	***"P12 Autochange Interval"***

In dual-pump cooling module configurations, the running pump can be changed after adjustable interval time, in order to prevent the pump of getting blocked when the pump remains at standstill for a long time.

If needed, it is possible to set a different autochange interval individually for both two pumps, to avoid a situation where both two pumps need maintenance service at the same time.

Autochange (pump change) is done when pump running time has exceeded the set autochange interval (P2.8.1 and P2.8.2). The cooling module monitors pump running time internally and makes the autochange automatically when needed.

Note! Autochange is enabled only in the AUTO –mode.

Note! Autochange is not used if P2.8.1 or P2.8.2 is set to zero.

These parameters enables/disables autochange and defines the autochange interval.

-1 = Autochange enabled. Interval set internally to 40 s (for test purposes)
0 = Autochange not used. The primary pump (Pump 11) is always used.
>0 = Autochange enabled. Interval defined by this parameter.

If autochange is done during the normal operation (when the system is running), the currently running pump will be stopped and the next pump will be started immediately. The two pumps are not operated simultaneously.

Note! Cooling OK digital output signal is kept high during the pump autochange (meaning that autochange does not stop the AC drives although the cooling pump is momentarily stopped).

P2.8.3	***Autochange restart delay***	***ID1567***	***"Autoch. Restart Delay"***

This parameter defines the start delay for the next pump, when the autochange procedure takes place. This delay can be used to adjust the possible pressure spikes in the system.

During the autochange procedure (pump change):

1. The primary pump, which was originally running, is stopped (the contactor is opened)
2. The cooling unit waits for the P2.8.3 Autochange restart delay to elapse.
3. Secondary pump is started (contactor is closed)

B2.8.4	***Pump 1 running time reset***	***ID1522***	***"Reset P11 RunTime"***
B2.8.5	***Pump 2 running time reset***	***ID1523***	***"Reset P12 RunTime"***

These button-type parameters can be used to reset pump running time counter (to zero).

8.14 Heater Control

Cooling module can be equipped with an external (electrical) heater, which can be used for heating the coolant fluid.

Heater operation is controlled by a digital output signal from the drive (P2.3.1.8).

In AUTO mode, the heater is automatically controlled. Heater is activated when coolant temperature TE11 (measured temperature of the coolant) falls below the defined activation limit and deactivated when temperature exceeds the defined deactivation limit.

In SERVICE mode, the heater can be controlled manually by ON/OFF buttons on the panel. If the heater is activated, it stays ON as long as the pump is running and SERVICE mode is active. If the pump stops, the heater must be turned on again manually.

B2.9.1 Heater manual control: Heater ON (Service) ID1172 "Heater ON (Service)"

B2.9.2 Heater manual control: Heater OFF (Service) ID1173 "Heater OFF (Service)"

When SERVICE mode is activated, the heater can be controlled manually ON/OFF by these two button type parameters.

When the heater is activated (B2.9.1), it stays active as long as the pump is running and SERVICE mode is active. If the pump stops, the heater must be turned on again manually.

Note! These parameters can be used only in SERVICE mode.

P2.9.3 Enable heater automatic control ID1600 "Heater Ctrl (Auto)"

This parameter defines heater operation when AUTO –mode is activated.

0 = "Disabled" – Heater disabled

Heater is not used.

1 = "Enabled (Run)" – Automatic heater control enabled in normal operation

Heater control is enabled when the cooling unit is operating in normal AUTO mode (the pump is running). Heater is activated/deactivated automatically according to temperature limits (P2.9.4 and P2.9.5).

P2.9.4 Heater activation limit (auto) ID1601 "Heater ON (Auto)"

P2.9.5 Heater deactivation limit (auto) ID1602 "Heater OFF (Auto)"

Heater is automatically activated when coolant temperature TE11 (measured temperature of the coolant) falls below the limit defined by parameter P2.9.4 Heater ON (Auto) and deactivated when temperature exceeds the limit defined by parameter P2.9.5 Heater OFF (Auto).

8.15 Cabinet Heater Control

Cooling module can be equipped with an optional (electrical) cabinet heater, which can be used for heating the cooling module cabinet. Optional coolant heater can be used, for example, for pre-heating (when starting the system at cold ambient temperature)

P2.10.1 Enable cabinet heater control ID1612 "Cabinet Heater Enable"

This parameter enables the cabinet heater control function.

0 = "Disabled" – Heater disabled

Heater is not used.

1 = "Enabled" – Heater is enabled

Heater control is enabled

P2.10.2 Cabinet Heater activation limit ID1613 "Cabinet Heater ON"

P2.10.3 Cabinet Heater deactivation limit ID1614 "Cabinet Heater OFF"

Cabinet heater is automatically activated when measured ambient temperature TE21 falls below the limit defined by parameter P2.10.2 Cabinet Heater ON and deactivated when temperature exceeds the limit defined by parameter P2.10.3 Cabinet Heater OFF.

8.16 Pump Auto Trial

Pump Auto Trial feature is designed to keep the system running, in case that any alarm or fault occurs in the cooling module. If an alarm or a fault occurs, it forces the system to do the autochange (switch to the secondary pump) and it tries to reset active faults automatically (only once).

Pump Auto Trial can be used only when the cooling module has two pumps available (selected by parameter P2.1.2 Cooling Module Type).

When an alarm occurs, the following actions are done:

- The cooling module forces autochange to switch to the secondary pump immediately and restart the pump.
- The system continues operation with the secondary pump until the cooling station is stopped or the next fault occurs.
- The next time the cooling module will be stopped, the Auto Trial feature will generate a final fault, which must be reset by the operator. The purpose of this fault is to prevent the system from being restarted before the operator has solved/fixed the cause of the original alarm/fault. The event history can be seen from the Fault History of the drive.

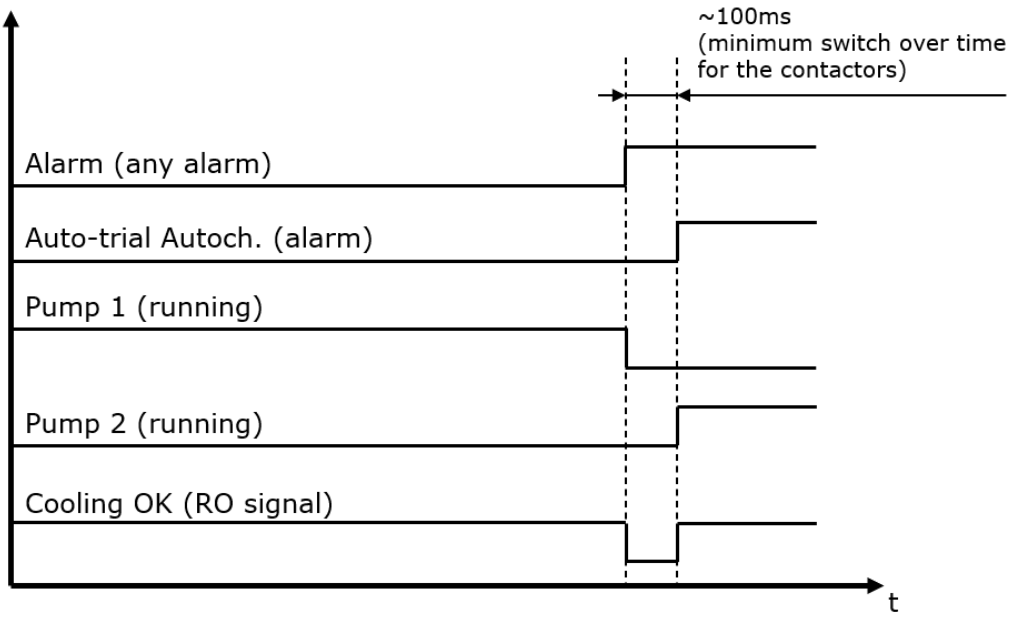


Figure 8. Response of the auto trial function to an alarm

When a fault occurs, the following actions are done:

- The auto trial function waits for the delay time set with parameter *P2.12.2 Auto Trial Wait Time*.
- After the delay time, the auto trial function forces autochange to switch to the secondary pump, resets the faults and restarts the pump.
- Time-based autochange is disabled until the original alarm/fault has been reset.
- The system continues operation with the secondary pump until the cooling station is stopped or the next fault occurs.
- The next time the cooling module is stopped, the Auto Trial feature will generate a final fault, which must be reset by the operator. The purpose of this fault is to prevent the system from being restarted before the operator has solved/fixed the cause of the original alarm/fault. The event history can be seen from the Fault History of the drive.

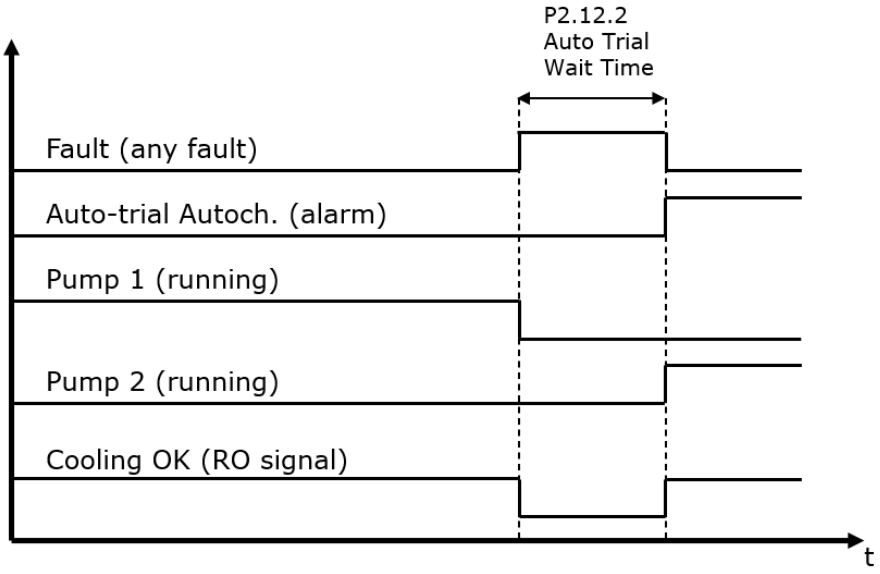


Figure 9. Response of the auto trial function to a fault

Pump Auto Trial feature generates a dedicated alarm (F93), when it has auto reset faults or forced the autochange to switch to the secondary pump. This alarm must be reset by the operator.

P2.12.1 Enable pump auto trial ID1855 "Auto Trial"

This parameter enables the Pump Auto Trial feature, which is designed to keep the system running, in case that any alarm or fault occurs in the drive.

0 = "Disabled"

The function is disabled. The system reacts normally to the alarms and faults.

1 = "Enabled"

In case that an alarm or a fault occurs, the system tries to do the autochange (switch to the secondary pump) and to reset active faults automatically (only once).

P2.12.2 Auto trial wait time ID1856 "Auto Trial Wait Time"

When the auto trial feature is enabled, this parameter defines how long the drive waits before it tries to reset the fault and restart the system.

8.17 Pump Deairing

The automatic deairing feature is designed to start and stop the pumps with 30 s. cycles. Starting and stopping of the pump helps the operator to remove air from the system during the commissioning. This feature is meant to be used only during the commissioning.

P2.13.1 Automatic deairing ID1857 "Automatic deairing"

This parameter enables automatic start/stop cycling of the pump.

0 = "Disabled"

The function is disabled. The system is operated normally.

1 = "Enabled"

The pump operates for 30 s., then it is stopped for 30 s. The same cycle is repeated until the start command is removed.

Note! A normal start command is required to start the deairing sequence.

8.18 Diagnostics

M3.1 Active faults "Active Faults"

This menu shows the active faults of the drive.

When a fault/faults appear, the fault indication starts to blink on the keypad display. The active faults can be browsed by navigating to parameter menu M3.1 Active Faults. Detailed fault-time data can be seen by selecting the fault and pushing the OK button on the keypad.

The fault remains active until it is cleared with the Reset button (push for 2 s) or with a reset signal from the I/O terminal or fieldbus or by selecting P4.2 Reset Faults. The memory of active faults can store the maximum of 10 faults in the order of appearance.

P3.2 Reset faults "Reset Faults"

This (button type) parameter resets all active faults and alarms of the cooling module.

Faults can also be reset with a long keypress (2 s) of the BACK/RESET button on the keypad.

Note! Active faults cannot be reset. Remove the cause of the faults before resetting.

Note! It is recommended to remove the drive start command before resetting the faults to prevent unintentional restart of the unit.

M3.3 Fault history "Faults History"

40 Latest faults are stored in the Fault History menu.

Detailed fault-time data can be seen by selecting the fault and pushing the OK button on the keypad.

8.18.1Total Counters

V3.4.1 ***Energy counter*** ***ID2291*** ***"Energy counter"***

Not available in cooling module.

(V3.4.1b) ***Energy counter format*** ***ID2303*** ***"Energy Counter Format"***

Not available in the cooling module

(V3.4.1c) ***Energy counter unit*** ***ID2305*** ***"Energy Counter Unit"***

Not available in cooling module

V3.4.2 ***Operating time counter*** ***ID ----*** ***"Operating time"***

Control unit operating time counter (total value). This counter cannot be reset.

On keypad display, this counter value is shown on special format which cannot be read from fieldbus.

Note! If the operating Time counter value is read from fieldbus, years, days, hours, minutes, and seconds must be read separately (each value from its individual ID-number). (See the following Example).

Example:
Operating Time Counter value '*1a 143d 02:21'* is read from the Fieldbus:

ID1754:	1	(years)
ID1755:	143	(days)
ID1756:	2	(hours)
ID1757:	21	(minutes)
ID1758:	0	(seconds)

(V3.4.2a) ***Operating time counter (years)*** ***ID1754*** ***"Op. Count. (years)"***

(V3.4.2b) ***Operating time counter (days)*** ***ID1755*** ***"Op. Count. (days)"***

(V3.4.2c) ***Operating time counter (hours)*** ***ID1756*** ***"Op. Count. (hours)"***

(V3.4.2d) ***Operating time counter (minutes)*** ***ID1757*** ***"Op. Count. (min)"***

(V3.4.2e) ***Operating time counter (seconds)*** ***ID1758*** ***"Op. Count. (sec)"***

V3.4.3	***Run time counter***	***ID ----***	***"Run time"***
(V3.4.3a)	***Run time counter (years)***	***ID1772***	***"Run Time (years)"***
(V3.4.3b)	***Run time counter (days)***	***ID1773***	***"Run Time (days)"***
(V3.4.3c)	***Run time counter (hours)***	***ID1774***	***"Run Time (hours)"***
(V3.4.3d)	***Run time counter (minutes)***	***ID1775***	***"Run Time (min)"***
(V3.4.3e)	***Run time counter (seconds)***	***ID1776***	***"Run Time (sec)"***

Not available in the cooling module application.

V3.4.4	***Power-on time counter***	***ID ----***	***"Power On time"***
(V3.4.4a)	***Power on time counter (years)***	***ID1777***	***"Pwr On Time (years)"***
(V3.4.4b)	***Power on time counter (days)***	***ID1778***	***"Pwr On Time (days)"***
(V3.4.4c)	***Power on time counter (hours)***	***ID1779***	***"Pwr On Time (hours)"***
(V3.4.4d)	***Power on time counter (minutes)***	***ID1780***	***"Pwr On Time (min)"***
(V3.4.4e)	***Power on time counter (seconds)***	***ID1781***	***"Pwr On Time (sec)"***

Not available in the cooling module application.

V3.4.5	***Start Command Counter***	***ID2295***	***"Start Cmd Counter"***

Not available in the cooling module application.

8.18.2Trip Counters

V3.5.1	***Energy counter***	***ID2296***	***"Energy counter"***
	Not available in the cooling module application.		
(V3.5.1b)	***Energy counter format***	***ID2307***	***"Energy Counter Format"***
	Not available in the cooling module application.		
(V3.5.1c)	***Energy counter unit***	***ID2309***	***"Energy Counter Unit"***
	Not available in the cooling module application.		
(V3.5.1d)	***Energy counter reset***	***ID2312***	***"Energy Counter Reset"***
	Not available in the cooling module application.		

V3.5.2	***Operating time counter***	***ID ----***	***"Operating time"***
(V3.5.2a)	***Operating time counter (years)***	***ID1766***	***"Op. Count. (years)"***
(V3.5.2b)	***Operating time counter (days)***	***ID1767***	***"Op. Count. (days)"***
(V3.5.2c)	***Operating time counter (hours)***	***ID1768***	***"Op. Count. (hours)"***
(V3.5.2d)	***Operating time counter (minutes)***	***ID1769***	***"Op. Count. (min)"***
(V3.5.2e)	***Operating time counter (seconds)***	***ID1770***	***"Op. Count. (sec)"***

Not available in the cooling module application.

(V3.5.2f)	***Operating time counter reset***	***ID2312***	***"Op. Count. Reset"***

Not available in the cooling module application.

8.18.3Software Info

V3.6.1 ***Software package*** ***ID2524*** ***“Software package”***

Control unit system software version info.

V3.6.4 ***System load*** ***ID2300*** ***“System load”***

Control units actual CPU usage in [%] –units (filtered value).

V3.6.5 ***Application name*** ***ID2525*** ***“Application Name”***

Name of the application software.

Note! See also application version info from monitoring values V3.6.6 and V3.6.7.

V3.6.6 ***Application software ID*** ***ID837*** ***“Application ID”***

Application software identification number.

V3.6.7 ***Application software version*** ***ID838*** ***“Application Ver.”***

Application software version number.

8.19 I/O and Hardware

8.19.1Basic I/O

V5.1.1	***Digital input 1 status***	***ID2502***	***"Digital Input 1"***
V5.1.2	***Digital input 2 status***	***ID2503***	***"Digital Input 2"***
V5.1.3	***Digital input 3 status***	***ID2504***	***"Digital Input 3"***
V5.1.4	***Digital input 4 status***	***ID2505***	***"Digital Input 4"***
V5.1.5	***Digital input 5 status***	***ID2506***	***"Digital Input 5"***
V5.1.6	***Digital input 6 status***	***ID2507***	***"Digital Input 6"***

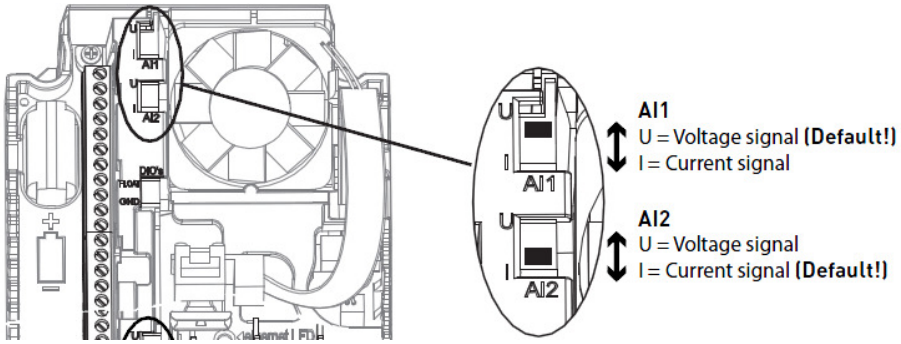
State of digital input signals 1–6 on the basic I/O-board (Slot A).

V5.1.7	***Analog input 1 mode***	***ID2508***	***"Analog Input 1 Mode"***

This monitoring value shows the mode of analog input 1 signal on the basic I/O-board (Slot B).

1 = Current signal (0..20 mA)
3 = Voltage signal (0..10 V)

Note! Analog input signal mode can be changed by DIP switches on the control board (see the following figure):



Note! If you are using signal range 4..20 mA or 2..10V, set the analog input DIP switch according to signal type (voltage or current) and select "4..20mA/2..10V" signal range by analog input signal range –parameter in corresponding parameter P2.3.3.1 AO Range Sel.(2V/4mA).

V5.1.8	***Analog input 1 state***	***ID2509***	***"Analog Input 1"***

State of analog input signal 1 on basic I/O-board (Slot A).

V5.1.9 ***Analog input 2 mode*** ***ID2510*** ***"Analog Input 2 Mode"***

This monitoring value shows the mode of analog input 2 signal on the basic I/O-board (Slot B).

Note! See monitoring value V5.1.7 for further information.

V5.1.10 ***Analog input 2 state*** ***ID2511*** ***"Analog Input 2"***

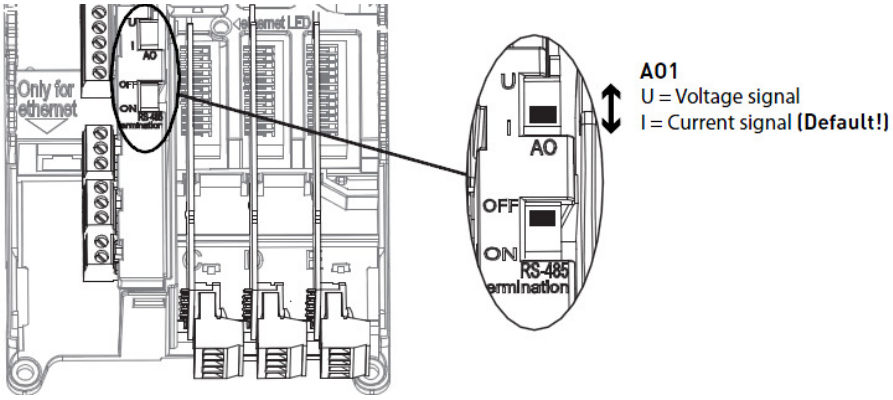
State of analog input signal 2 on the basic I/O-board (Slot A).

V5.1.11 ***Analog output 1 mode*** ***ID2512*** ***"Analog Output 1 Mode"***

This monitoring value shows the mode of analog output 1 signal on the basic I/O-board (Slot B).

1 = Current signal (0..20 mA)
3 = Voltage signal (0..10 V)

Note! Analog output signal mode can be changed by a DIP switch on the control board (see the following figure):



Note! If you are using signal range 4..20 mA or 2..10V, set the analog input DIP switch according to signal type (voltage or current) and select "4..20mA/2..10V" signal range by analog input signal range –parameter in corresponding parameter P2.3.3.1 AO Range Sel.(2V/4mA).

V5.1.12 ***Analog output 1 state*** ***ID2513*** ***"Analog Output 1"***

State of analog output signal 1 on the basic I/O-board (Slot A).

V5.1.13 ***Relay output 1 status*** ***ID2514*** ***"Relay output 1"***

V5.1.14 ***Relay output 2 status*** ***ID2515*** ***"Relay output 2"***

V5.1.15 ***Relay output 3 status*** ***ID2516*** ***"Relay output 3"***

State of relay outputs 1–3 on the basic I/O-board (Slot B).

8.19.2Real Time Clock

V5.5.1 ***Battery state*** ***ID2205*** ***“Battery state”***

This monitoring shows the status of the RTC battery (Real Time Clock).

1 = Battery not installed
2 = Battery installed, battery condition OK
3 = Battery installed, battery must be changed

P5.5.2 ***Real time clock: time*** ***ID2201*** ***“Time”***

This parameter defines the current time of day. The value of this parameter can be set either by keypad or PC-tool (VACON® Live).

Note! If using the PC-tool (VACON® Live), real time clock (time, date, and year) can be synchronized with PC time by clicking “Synchronize PC time to drive” button on the VACON® Live toolbar.

P5.5.3 ***Real time clock: date*** ***ID2202*** ***“Date”***

This parameter defines the current date. The value of this parameter can be set either by keypad or PC-tool (VACON® Live).

Note! If using the PC-tool (VACON® Live), real time clock (time, date, and year) can be synchronized with PC time by clicking “Synchronize PC time to drive” button on the VACON® Live toolbar.

P5.5.4 ***Real time clock: year*** ***ID2203*** ***“Year”***

This parameter defines the current year. The value of this parameter can be set either by keypad or PC-tool (VACON® Live).

Note! If using the PC-tool (VACON® Live), real time clock (time, date, and year) can be synchronized with PC time by clicking “Synchronize PC time to drive” button on the VACON® Live toolbar.

P5.5.5 Daylight saving ID2204 "Daylight saving"

This parameter defines the daylight saving rule. This parameter can be set based on the location. This parameter defines when the daylight saving transition occurs.

1 = "OFF"
Daylight saving is not used.

2 = "EU"
Starts on the last Sunday in March and ends on the first Sunday in October.

3 = "US"
Starts on the second Sunday in March and ends on the first Sunday in November.

4 = "Russia"
Permanent.

8.19.3Power Unit Settings

P5.6.1.1 ***Fan control mode*** ***ID2377*** ***“Fan control mode”***

Not available in the cooling module application.

V5.6.1.5 ***Fan lifetime counter*** ***ID849*** ***“Fan lifetime”***

Not available in the cooling module application.

P5.6.1.6 ***Fan lifetime alarm limit*** ***ID824*** ***“Fan lifetime alarm lim.”***

Not available in the cooling module application.

B5.6.1.7 ***Fan lifetime reset*** ***ID823*** ***“Fan lifetime reset”***

Not available in the cooling module application.

P5.6.2.1 ***Brake chopper mode*** ***ID2526*** ***“Brake chopper mode”***

Not available in the cooling module application.

P5.6.4.1 ***Sine filter*** ***ID2527*** ***“Sine filter”***

Not available in the cooling module application.

8.19.4Keypad Settings

P5.7.1 ***Keypad timeout*** ***ID804*** ***"Timeout Time"***

This parameter defines the timeout time after which the keypad display view goes back to the selected default page if no keypad buttons are pressed.

0 = Disabled (display view does not go back to the default page automatically)

Note! The default page can be selected by parameter P5.7.2.

P5.7.2 ***Keypad default page*** ***ID2318*** ***"Default Page"***

This parameter defines the default page (view) on the keypad display.

If the keypad timeout parameter (P5.7.1) is defined to greater than zero, the keypad display will jump automatically back to the defined default page after defined timeout, if no keypad buttons are pressed.

Note! This parameter also defines the default page which will be shown on the keypad display after powering up the control unit.

0 = "None"
The default page is not defined.
After a power down, the keypad display returns to the same page it was before power down.

1 = "Enter menu index"
The default page (menu index) is defined by parameter P5.7.3.
In power-up or keypad timeout (P5.7.1) situations, keypad display goes automatically to the defined menu index (P5.7.3).

2 = "Main Menu"
In power-up or keypad timeout (P5.7.1) situations, the keypad display goes automatically to the main menu.

3 = "Control Page"
In power-up or keypad timeout (P5.7.1) situations, keypad display goes automatically to the Control Page view.

4 = "Multimonitor"
In power-up or keypad timeout (P5.7.1) situations, the keypad display goes automatically to multimonitoring view.

P5.7.3 ***Default page menu index*** ***ID2499*** ***"Menu Index"***

This parameter defines the default page (view) menu index if option "Enter menu index" is selected to parameter P5.7.2.

P5.7.4 ***Keypad display contrast*** ***ID830*** ***"Contrast"***

Contrast of keypad LCD.

P5.7.5 ***Keypad backlight time*** ***ID818*** ***"Backlight Time"***

Timeout time for keypad backlight.

0 = Backlight is always on.

8.20 User Settings

P6.1 ***Drive language selection*** ***ID802*** ***"Language Selections"***

Selection of active language used in user interface texts. Selectable languages depend on the language package.

8.20.1 Parameter Backup

B5.5.1 ***Restore factory defaults*** ***ID831*** ***"Restore Factory Defaults"***

This button-type parameter restores all settings and parameters to factory defaults.

Note! Activation of this parameter restarts the control unit if the pump is not running!

Note! Activation of this parameter also initiates the start-up wizard.

P6.5.2 ***Save parameters to keypad*** ***ID831*** ***"Save to Keypad"***

Activation of this parameter saves all parameter values to the keypad to, for example, copy them to another unit.

0 = No
1 = Yes

P6.5.3 ***Save parameters from keypad*** ***ID2488*** ***"Restore from Keypad"***

Activation of this parameter restores (load) all parameter values from the keypad to the cooling module.

0 = No
1 = Yes

B5.5.4 Save parameter values to SET 1 ID831 "Save to Set 1"

Activation of this button-type parameter saves all parameter values to internal parameter set 1. Parameter values can be restored from parameter set 1 by activating parameter B5.5.5.

The status of the parameter value saving can be seen from the value of this parameter:

0 = Ready
3 = Saving the parameter values

B5.5.5 Restore parameter values from SET 1 ID2489 "Restore from Set 1"

Activation of this button-type parameter restores parameter values which are saved to internal parameter set 1.

The status of the parameter value restoring can be seen from the value of this parameter:

0 = Ready
2 = Not available (no parameter values saved to parameter set 1)

B5.5.6 Save parameter values to SET 2 ID2491 "Save to Set 2"

Activation of this button-type parameter saves all parameter values to internal parameter set 2. Parameter values can be restored from parameter set 1 by activating parameter B5.5.7.

The status of the parameter value saving can be seen from the value of this parameter:

0 = Ready
3 = Saving the parameter values

B5.5.7 Restore parameter values from SET 2 ID2492 "Restore from Set 2"

Activation of this button-type parameter restores parameter values which are saved to internal parameter set 2.

The status of the parameter value restoring can be seen from the value of this parameter:

0 = Ready
2 = Not available (no parameter values saved to parameter set 2)

8.20.2Parameter Compare

Parameter comparison function can be used to compare current (actual) parameter values to factory default values or to parameter values which are stored to Parameter Set 1, Parameter Set 2 or keypad. The comparison function lists the parameters (and shows their values) whose values differ.

B5.6.1 ***Compare active parameter values to Parameter Set 1 values***
ID2493 ***"Active set – Set 1"***

Activation of this button-type parameter compares current parameter values to the parameter values which are stored to Parameter Set 1.

Note! If no parameter values are stored to Parameter Set 1, the comparison fails.

B5.6.2 ***Compare active parameter values to Parameter Set 2 values***
ID2494 ***"Active set – Set 2"***

Activation of this button-type parameter compares current parameter values to the parameter values which are stored to Parameter Set 2.

Note! If no parameter values are stored to Parameter Set 2, the comparison fails.

B5.6.3 ***Compare active parameter values to factory default values***
ID2495 ***"Active set – Defaults"***

Activation of this button-type parameter compares current parameter values to the factory default parameter values.

B5.6.4 ***Compare active parameter values to factory default values***
ID2495 ***"Active set – Defaults"***

Activation of this button-type parameter compares current parameter values to the parameter values which are stored to Keypad.

Note! If no parameter values are stored to Keypad, the comparison fails.

P6.7 ***Drive name*** ***ID2528*** ***"Drive name"***

Name of the cooling module.

Note! The value of this parameter can be changed only by the VACON® Live PC-tool.

Individual names help the operator to separate the devices from each other, for example, in large installations or when connecting the cooling module by using VACON® Live –tool.

8.21 User Levels

Note! This menu is available only in graphical LCP.

User-level parameters are intended to restrict the visibility of parameters and to prevent unauthorized and inadvertent parameterization on the keypad.

P7.1 User level selection ID1194 "User Level"

This parameter defines the selected user level.

Depending on the selected user level, some of the parameter or monitoring value menus are concealed from the keypad display to prevent unauthorized and inadvertent parameterization on the keypad.

Note! This parameter is available only in the graphical LCP.

Note! User level selection can also be protected by a password. When the desired user level is selected by P7.1, its password can be entered to P7.2. The password is requested when changing the user level (P7.1). See the description of P7.2.

1 = "Normal"
All parameter and monitoring menus are visible in the Main menu.

2 = "Monitoring"
Only '*M2 Monitor'* and '*M8 User Levels'* -menus are visible in the Main menu.

3 = "Favorites"
Only '*M7 Favorites*' and '*M8 User Levels'* -menus are visible in the Main menu.

P7.2 User level access code ID1194 "Access Code"

This parameter defines the access code (password) for the selected user level.

When the desired user level is selected by P7.1, its password can be entered to this parameter. Each user level can have a unique access code. The access code is requested when changing the user level (P7.1).

0 = Access code protection not used.
Access code is not requested when the user level (P7.1) is changed

Note! Do not lose the code! If the code is lost, contact the nearest service center/partner.

8.22 Favorites

Note! This menu is available only in graphical LCP.

The favorites menu is typically used to collect a set of commonly used parameters or monitoring signals from any of the keypad menus.

See chapter 3.1.1.7 for further information.

9. FIELDBUS CONTROL IN DETAIL

9.1 Fieldbus Control Word (in bypass mode)

Bit	Descriptions	
	Value = 0 (FALSE)	Value = 1 (TRUE)
Bit 0	Stop request from Fieldbus	Start request from Fieldbus
Bit 1	Reserved	Reserved
Bit 2	No action	Reset active faults and alarms (on rising edge 0=>1)
Bit 3	No action	Stop request
Bit 4	No action	Stop request
Bit 5	Reserved	Reserved
Bit 6	Reserved	Reserved
Bit 7	Reserved	Reserved
Bit 8	Reserved	Reserved
Bit 9	Reserved	Reserved
Bit 10	Reserved	Reserved
Bit 11	Watchdog	Watchdog
Bit 12	Reserved	Reserved
Bit 13	Reserved	Reserved
Bit 14	Reserved	Reserved
Bit 15	Reserved	Reserved

9.2 Fieldbus Status Word (in bypass mode)

Fieldbus Status Word (lowest 16-bit)**:**

Bit	Descriptions	
	Value = 0 (FALSE)	**Value = 1 (TRUE)**
Bit 0	Not ready to operate	Ready to operate
Bit 1	Not running	Running
Bit 2	Cooling not OK	Cooling OK
Bit 3	No fault	Fault is active
Bit 4	No alarm	Alarm is active
Bit 5	Reserved	Reserved
Bit 6	Reserved	Reserved
Bit 7	Reserved	Reserved
Bit 8	Reserved	Reserved
Bit 9	Reserved	Reserved
Bit 10	Watchdog	Watchdog
Bit 11	Normal operating mode is active	Service mode is active
Bit 12	Pump 1 is off	Pump 1 is active
Bit 13	Pump 2 is off	Pump 2 is active
Bit 14	Liquid heater is off	Liquid heater is active
Bit 15	Cabinet heater is off	Cabinet heater is active

Fieldbus Status Word (highest 16-bit) (*FB General Status Word*)**:**

Bit	Descriptions	
	Value = 0 (FALSE)	**Value = 1 (TRUE)**
Bit 0	Reserved	PC or Fieldbus control is active
Bit 1	Reserved	Reserved
Bit 2	Reserved	Reserved
Bit 3	Reserved	Reserved
Bit 4	Reserved	Reserved
Bit 5	Reserved	Reserved
Bit 6	Reserved	Reserved
Bit 7	Reserved	Reserved
Bit 8	Reserved	Reserved
Bit 9	Reserved	Reserved
Bit 10	Reserved	Reserved
Bit 11	Reserved	Reserved
Bit 12	Reserved	Reserved
Bit 13	I/O control is not active	I/O control is active
Bit 14	Keypad control is not active	Keypad control is active
Bit 15	Fieldbus control is not active	Fieldbus control is active

10. FAULT TRACING

When an unusual operating condition is detected by the cooling module control diagnostics, the cooling module initiates a notification visible, for example, on the keypad. The keypad shows the code, the name, and a short description of the fault or alarm.

The notifications vary in consequence and required action. Faults make the unit stop running and require the operator to reset the unit. Alarms inform of unusual operating conditions and require resetting, but the unit continues running. Infos require resetting but do not affect the functioning of the unit.

For some faults you can program different responses in the application. See parameter menu M3.8 Protections.

The fault can be reset with the Reset button on the control panel or through the I/O terminal, fieldbus, or PC tool. The faults are stored in the Fault history menu which can be browsed. The different fault codes are listed in the following table.

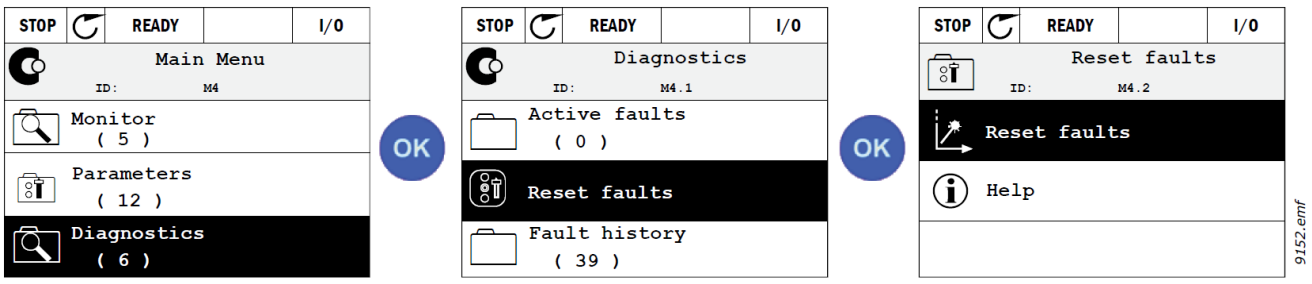
Note! When contacting the distributor or factory because of a fault condition, always write down all texts on the display, the fault code, the fault ID, the source info, the Active Fault list, and the Fault History.

Source info tells the operator the origin of the fault, what caused it, where it happened, and other detailed information.

10.1 Fault Appears

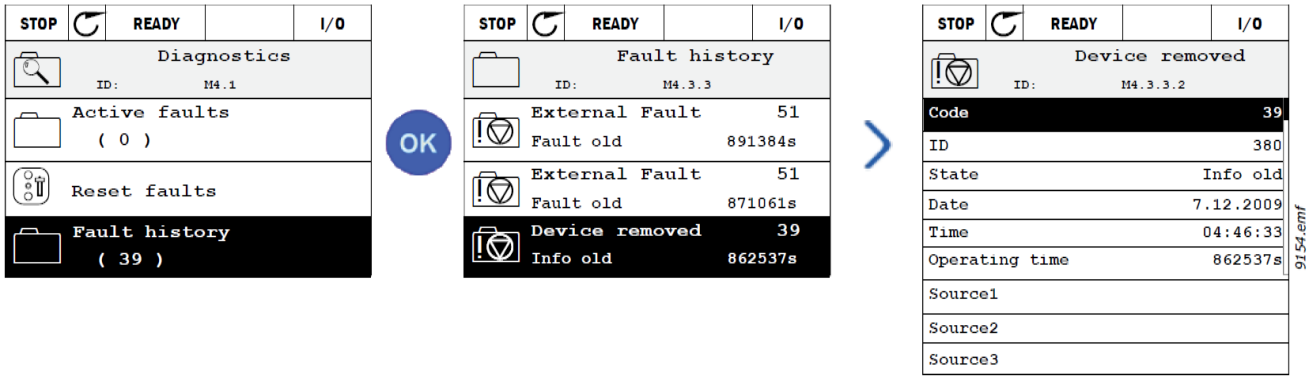
When a fault appears and the pump stops, examine the cause of the fault, perform the actions advised here and reset the fault either

1. With a long (2 s.) press on the Reset button on the keypad, or
2. By entering the Diagnostics Menu (M4), entering Reset faults (M3.2), and selecting the Reset faults parameter.



10.2 Fault History

In the menu M3.3 Fault History, there are a maximum of 40 occurred faults. For each fault in the history, there is additional information, as shown in the following image.



10.3 Fault Codes

Fault code	Fault ID	Fault name	Possible cause	Remedy
8	600	System fault	Communication between control board and power unit has failed.	Reset the fault and restart. Download and update with the latest software available on the Danfoss website. If the fault re-occurs, contact the distributor near you.
	601			
	602		Component failure. Faulty operation.	
	603		Component failure. Faulty operation. The voltage of auxiliary power in the power unit is too low.	
	604		Component failure. Faulty operation. Output phase voltage does not follow the reference. Feedback fault.	
	605		Component failure. Faulty operation.	
	606		Control and power unit software are incompatible	
	607		Software version cannot be read. There is no software in the power unit. Component failure. Faulty operation (power board or measurement board problem).	
	608		CPU overload.	
	609		Component failure. Faulty operation.	Reset the fault and power the control unit down twice. Download and update with the latest software available on the Danfoss website.
	610		Component failure. Faulty operation.	Reset the fault and restart. Download and update with the latest software available on the Danfoss website. If the fault re-occurs, contact the distributor near you.
	614		Configuration error Software error Component failure (control board) Faulty operation	
	647		Component failure. Faulty operation.	

	648		Faulty operation. System software and application are not compatible.	
	649		Resource overload. Parameter loading, restoring or saving failure.	Load factory default settings. Download and update with the latest software available on the Danfoss website.
29	280	ATEX thermistor	An ATEX thermistor has detected an overtemperature	Reset the fault. Check the thermistor and its connections.
37	361	Device changed (same type)	The power unit has been changed for another of corresponding size. The device is ready to use. Parameters are already available in the control unit.	Reset the fault. NOTE! Drive reboots after reset.
	362	Device changed (same type)	Option board in slot B changed for one previously inserted in the same slot. The device is ready to use.	Reset the fault. Old parameter settings are used.
	363	Device changed (same type)	Same as ID362 but refers to Slot C.	See above.
	364	Device changed (same type)	Same as ID362 but refers to Slot D.	See above.
	365	Device changed (same type)	Same as ID362 but refers to Slot E.	See above.
38	372	Device added (same type)	Option board added into slot B. The option board was previously inserted in the same slot. The device is ready to use.	Device is ready for use. Old parameter settings are used.
	373	Device added (same type)	Same as ID372 but refers to Slot C.	See above.
	374	Device added (same type)	Same as ID372 but refers to Slot D.	See above.
	375	Device added (same type)	Same as ID372 but refers to Slot E.	See above.
39	382	Device removed	Option board removed from slot A or B.	Device no longer available. Reset the fault.
	383	Device removed	Same as ID380 but refers to Slot C	
	384	Device removed	Same as ID380 but refers to Slot D	
	385	Device removed	Same as ID380 but refers to Slot E	

40	390	Device unknown	Unknown device connected (power unit/option board)	Device no longer available. If the fault reoccurs contact your nearest distributor.
44	431	Device changed (different type)	Different type of power unit changed. Parameters are not available in the settings.	Reset the fault. NOTE! Control unit reboots after the reset. Set the power unit parameters again.
	433	Device changed (different type)	Option board in slot C changed for one not present in the same slot before. No parameter settings are saved.	Reset the fault. Set option board parameters again.
	434	Device changed (different type)	Same as ID433 but refers to Slot D.	See above.
	435	Device changed (different type)	Same as ID433 but refers to Slot D.	See above.
45	441	Device added (different type)	A different type of power unit is added. Parameters are not available in the settings.	Reset the fault. NOTE! Control unit reboots after the reset. Set the power unit parameters again.
	443	Device added (different type)	Option board not present in the same slot before added in slot C. No parameter settings are saved.	Set option board parameters again.
	444	Device added (different type)	Same as ID443 but refers to Slot D.	See above.
	445	Device added (different type)	Same as ID443 but refers to Slot E.	See above.
46	662	Real Time Clock	RTC battery voltage level is low and the battery must be changed.	Replace the battery.
47	663	Software updated	Software of the control unit has been updated (either the whole software package or application).	No actions needed.
51	1051	Device external fault	Digital input signal defined by parameter P3.5.1.11 or P3.5.1.12 has been activated to indicate the fault situation in an external device.	User-defined fault. Check digital inputs/schematics.
52	1052 1352	Keypad communication fault	The connection between the control panel and the control unit is broken	Check keypad connection and possible keypad cable
53	1053	Fieldbus communication fault	The data connection between the fieldbus master and fieldbus board is broken	Check installation and fieldbus master.

53	1897	Fieldbus Watchdog	Fieldbus watchdog function has detected a timeout in the data connection to the fieldbus master.	Check installation and fieldbus master.
54	1354	Slot A fault	Defective option board or slot	Check board and slot. Contact your nearest distributor.
	1454	Slot B fault		
	1554	Slot C fault		
	1654	Slot D fault		
	1754	Slot E fault		
65	1065	PC communication fault	The data connection between the PC and the control unit is broken	Check the installation, cable, and terminals between the PC and the control unit.
66	1366	Thermistor input 1 fault	The thermistor input has detected an increase of motor temperature	Check motor cooling and load. Check thermistor connection If thermistor input is not in use, it must be short-circuited. Contact your nearest distributor.
	1466	Thermistor input 2 fault		
	1566	Thermistor input 3 fault		
69	1310	Fieldbus communication fault	Non-existing ID number is used for mapping values to Fieldbus Process Data Out.	Check parameters in the Fieldbus Data Mapping menu.
	1311		Not possible to convert one or more values for Fieldbus Process Data Out.	The value being mapped may be of undefined type. Check parameters in the Fieldbus DataMapping menu.
	1312		Overflow when mapping and converting values for Fieldbus Process Data Out (16-bit).	Check parameters in the Fieldbus Data Mapping menu.
80	1800	Tank level low (LLS11)	(FAULT) Excessively low coolant tank level. **Note!** This fault stops the pump also in SERVICE mode.	Check coolant tank level.
80	1811	Tank level low (LLS11)	(ALARM) Abnormal low coolant tank level.	Check coolant tank level.
82	1821	Coolant Flow	(FAULT) Excessively low coolant flow.	Check: • pressure measurements • pipe lines

			Note! Flow is internally calculated.	
	1823		(ALARM) Abnormal low coolant flow. **Note!** Flow is internally calculated.	Check: • pressure measurements • pipe lines
	1824		(FAULT) Excessively high coolant flow. **Note!** Flow is internally calculated.	Check: • pressure measurements • pipe lines
	1825		(ALARM) Abnormal high coolant flow. **Note!** Flow is internally calculated.	Check: • pressure measurements • pipe lines
83	1831	Pressure sensor (PT12) failure	(ALARM) Pressure sensor (PT12) failure.	Check the sensor and wirings.
	1832	Pump output pressure (PT12) low	(FAULT) Excessively low pump output pressure (PT12).	Check: • pump • pressure measurements
	1833		(ALARM) Abnormal low pump output pressure (PT12).	Check: • pump • pressure measurements
	1834	Delta Pressure (PT12)	(ALARM) Pressure difference between pump inlet and outlet is too low. Pressure difference is checked only when the pump has been turned on (the pump is running)	Check: • pump: make sure that the pump is running and it has ac-voltage available • pressure measurements
84	1841	Pressure sensor (PT11) failure	(ALARM) Pressure sensor (PT11) failure.	Check the sensor and wirings.
	1842	Tank pressure (PT11) low	(FAULT) Excessively low cooling tank pressure (PT11).	Find the cause for the pressure drop. Check limit settings from the M2.4 Protections menu.
	1843		(ALARM) Abnormal low cooling tank pressure (PT11).	Find the cause for the pressure drop. Check limit settings from the M2.4 Protections menu.
	1844	Tank pressure (PT11) high	(ALARM) Abnormal high cooling tank pressure (PT11).	Find the cause for the pressure drop. Check limit settings from the M2.4 Protections menu.
86	1861	Temperature sensor (TE11) failure	(ALARM) Temperature sensor (TE11) failure.	Check the sensor and wirings.

	1862	Coolant temperature (TE11) high	(FAULT) Excessively high coolant temperature	Find the cause for temperature raise. Check limit settings from the M2.4 Protections menu.
	1863	Coolant temperature (TE11) high	(ALARM) Abnormal high coolant temperature	Find the cause for temperature raise. Check limit settings from the M2.4 Protections menu.
	1864	Ambient temperature (TE21) high	(ALARM) Abnormal high ambient temperature. Temperature reference is increased automatically above the measured ambient temperature (TE21) to avoid the condensation problems in the system (for example, pipe lines).	Find the cause for ambient temperature raise. Check temperature reference settings from the M2.7 FV11 Temp. Control menu.
	1867	Coolant temperature (TE11) high	(ALARM) Abnormal low coolant temperature	Find the cause for low temperature. Check limit settings from the M2.4 Protections menu.
	1866	Coolant temperature (TE11) high	(FAULT) Abnormal low coolant temperature	Find the cause for low temperature. Check limit settings from the M2.4 Protections menu.
	1890	Ambient temperature (TE21)	(ALARM) Abnormal low ambient temperature	Find the cause for low ambient temperature. Check limit settings from the M2.4 Protections menu.
	1891	Ambient temperature (TE21)	(ALARM) Abnormal high ambient temperature	Find the cause for high ambient temperature. Check limit settings from the M2.4 Protections menu.
	1898	Ambient temperature (TE21)	(ALARM) Temperature sensor (TE21) failure.	Check the sensor and wirings.
87	1871	Leakage Switch	(ALARM) Coolant leakage detected (leakage switch open) (LS22)	Check the reason for leakage.
88	1888	Heater, Overheat switch	(ALARM) Overheat detected on electrical heater	Check the coolant level in the system.
89	1889	Humidity (ME21)	(ALARM) Abnormal high ambient humidity measured. The risk for condensation has increased.	Check the reason for high ambient humidity

	1899	Humidity (ME21)	(ALARM) Humidity sensor (ME21) failure.	Check the sensor and wirings.
92	1892	Motor Overheat	(FAULT) Motor overheat detected.	Check motor thermal overload relay
	1893	Motor Overheat (Pump 1)	(ALARM) Motor overheat detected at pump 1. If pump autochange function is in use, the secondary pump is used.	Check motor thermal overload relay
	1893	Motor Overheat (Pump 2)	(ALARM) Motor overheat detected at pump 2. If pump autochange function is in use, the primary pump is used.	Check motor thermal overload relay
93	1895	Auto Trial (Autochange Occurred)	(ALARM) Auto Trial function has detected an alarm or fault and it has forced the autochange function to switch to the secondary pump. If a fault has occurred, the auto trial function has tried to reset it once.	Check the fault history and solve/fix the problem, which caused the original alarm/fault.
93	1896	Auto Trial (Final Fault)	(FAULT) Auto trial function has reset active alarms/faults and switched to the secondary pump. This fault is generated at the end of the auto trial sequence when the system is stopped. The purpose of this fault is to prevent to restart the system before the reason of the original alarm/fault has been solved.	Check the fault history and solve/fix the problem, which caused the original alarm/fault.
300	700	Unsupported	Unsupported application used.	Change the application
	701		Unsupported option board or slot used.	Remove the option board

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