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Vacon 100 Flow Course

Version 22.13F

DRIVEN BY DRIVES

Index

Preface

This course book is issued to those who have followed the Vacon 100 Flow course at Van der Ende Pompen B.V. It is also issued with each Vacon 100 Flow regulator.

The course book is also intended as a quick and handy instruction manual for commissioning the Vacon 100 Flow. This textbook also shows a few sample applications.
We therefore emphatically recommend that the original instruction manuals provided with the regulator are always read very carefully.

No rights can be derived from the information provided in this course book.
Errors and/or typographical errors that could result in incorrect settings and/or damage to the regulator or connected equipment may never give rise to warranty or damage claims, and are hereby expressly rejected.

The parameters listed in this booklet are merely examples from which no rights can be derived.

In this new version, a number of parameters have been changed or added compared to the previous version.

1 Safety

ONLY QUALIFIED TECHNICIANS MAY CARRY OUT WORK ON THE ELECTRICAL INSTALLATION

WARNING	1	The components of the power unit of the frequency converter are live when the Vacon 100 is connected to the mains. Contact with this live voltage is extremely dangerous, and can result in serious injuries or death. The control unit is potential-free.
	2	The Vacon 100 has a leakage current of 3.5 mA AC according to EN61800-5-1.
	3	If the frequency converter is part of a machine, the machine manufacturer is responsible for installing a main switch for the machine (EN 60204-1).
	4	Only spare parts supplied by Vacon may be used.
	5	The motor cables must be disconnected from the frequency converter before insulation and other measurements are carried out on the motor or motor cables.
	6	Do not touch the IC-circuits on the boards. Static voltage can damage the components.
	7	Check that the EMC level of the frequency converter corresponds to the required value as determined by the environment.
	8	The motor starts automatically if you set the parameter setting (ID 731) 'reaction after an error message' to automatic. Read more about this in the application manual.
	9	The Vacon 100 frequency converter must be used for permanent installations.
	10	Be aware that the frequency converter can start automatically when it is connected to the power supply. To prevent this, unplug the motor from the frequency converter if sudden starting might be hazardous.

	1	The U, V, and W motor terminals and the DC rail / brake resistor -/+ terminals are live when the Vacon 100 is connected to the mains, even if the motor is not running.
	2	The I/O connectors for the controllers are electrically isolated from the mains. However, even when the Vacon 100 is disconnected from the mains, the relay outputs and other I/O terminals may have a dangerous external voltage.
	3	Before the frequency converter is connected to the mains, make sure that the Vacon 100 covers and cable connections are covered.
	4	Do not carry out any measurements when the frequency converter is connected to the mains.
	5	After disconnecting the frequency converter from the mains, wait until the fan stops and the control panel turns off (if no panel is attached, see the indicators on the cover). **Wait 5 minutes** before performing any work on the Vacon 100 terminals. Do not even open the cover before this time has passed.
	6	Do not perform any insulation resistance tests on the Vacon 100. There is a specific procedure for carrying out such tests. Failure to follow this procedure may cause damage to the device.

Safety instructions
Earthing and earth error protection
The Vacon 100 frequency converter must always be earthed on the earth terminal ⏚

2 Wiring and display

2.1 Cable diameter and fuses

Frame	Type	I_L [A]	Fuse (gG/gL) [A]	Mains and motor cable Cu [mm²]	Terminal size	
					Mains connection [mm²]	Earth connection [mm²]
MR4	0003 4 - 0004 4	3.4 to 4.8	6	3 x 1.5 + 1.5	1 to 6 solid 1 to 4 flexible	1 to 6
	0005 4 -0008 4	5.6 to 8.0	10	3 x 1.5 + 1.5	1 to 6 solid 1 to 4 flexible	1 to 6
	0009 4 -0012 4	9.6 to 12.0	16	3 x 1.5 + 1.5	1 to 6 solid 1 to 4 flexible	1 to 6
MR5	0016 4	16.0	20	3 x 6 + 6	1 to 10 Cu	1 to 10
	0023 4	23.0	25	3 x 6 + 6	1 to 10 Cu	1 to 10
	0031 4	31.0	32	3 x 10 + 10	1 to 10 Cu	1 to 10
MR6	0038 4	38.0	40	3 x 10 + 10	2.5 to 50 Cu/Al	2.5 to 35
	0046 4	46.0	50	3 x 16 + 16 (Cu) 3 x 25 + 16 (Al)	2.5 to 50 Cu/Al	2.5 to 35
	0061 4	61.0	63	3 x 25 + 16 (Cu) 3 x 35 + 10 (Al)	2.5 to 50 Cu/Al	2.5 to 35
MR7	0072 4	72.0	80	3 x 35 + 16 (Cu) 3 x 50 + 16 (Al)	6 to 70 Cu/Al	6 to 70
	0087 4	87.0	100	3 x 35 + 16 (Cu) 3 x 70 + 21 (Al)	6 to 70 Cu/Al	6 to 70
	0105 4	105.0	125	3 x 50 + 25 (Cu) 3 x 70 + 21 (Al)	6 to 70 Cu/Al	6 to 70
MR8	0140 4	140.0	160	3 x 70 + 35 (Cu) 3 x 95 + 29 (Al)	Bolt size M8	Bolt size M8
	0170 4	170.0	200	3 x 95 + 50 (Cu) 3 x 150 + 41 (Al)	Bolt size M8	Bolt size M8
	0205 4	205.0	250	3 x 120 + 70 (Cu) 3 x 185 + 57 (Al)	Bolt size M8	Bolt size M8
MR9	0261 4	261.0	315	3 x 185 + 95 (Cu) 2 x 3 x 120 + 41 (Al)	Bolt size M8	Bolt size M8
	0310 4	310.0	350	2 x 3 x 95 +50 (Cu) 2 x 3 x 120 + 41 (Al)	Bolt size M8	Bolt size M8

2.2 Shielded cables

The cables of the control signals and of the motor must be shielded in order to meet radio interference rules, in accordance with IEC 60364-5-52 and EMC specifications.
The shielding of the motor and control cables must be connected to the earth terminal in the frequency converter and in the motor and sensors, PLC etc.
If unshielded cables are used, signal interference can occur in the control inputs. Such interference will not normally damage the frequency converter, but will interfere with regulation.

Max. length of motor cable	MR4	MR5 and MR6	MR7, MR8 and MR9
	100 m	150 m	200 m

Be careful! Reinforcement designed as mechanical protection (e.g. earth cable) is not suitable for an EMC-correct installation.

Our preference is to use twisted cable for signal cables.

2.3 Control keys

Back/Reset
This key returns you to the menu. You can also use this key to end an entry without it being stored.
If a problem has been resolved, the frequency converter can be reset by holding this key for a few seconds.

Funct
The funct key can be used anywhere in the programme to switch from Local (keypad) to Remote (I/O or fieldbus) operation. The operation page can also be selected.

OK
This key allows you to enter a folder or parameter. It also confirms a change to a parameter (stored in EPROM).

Menu key up
Use this key to scroll up through main menus and sub-menus, or change the value in a parameter.

Menu key down
Use this key to scroll down through main menus and sub-menus, or change the value in a parameter.

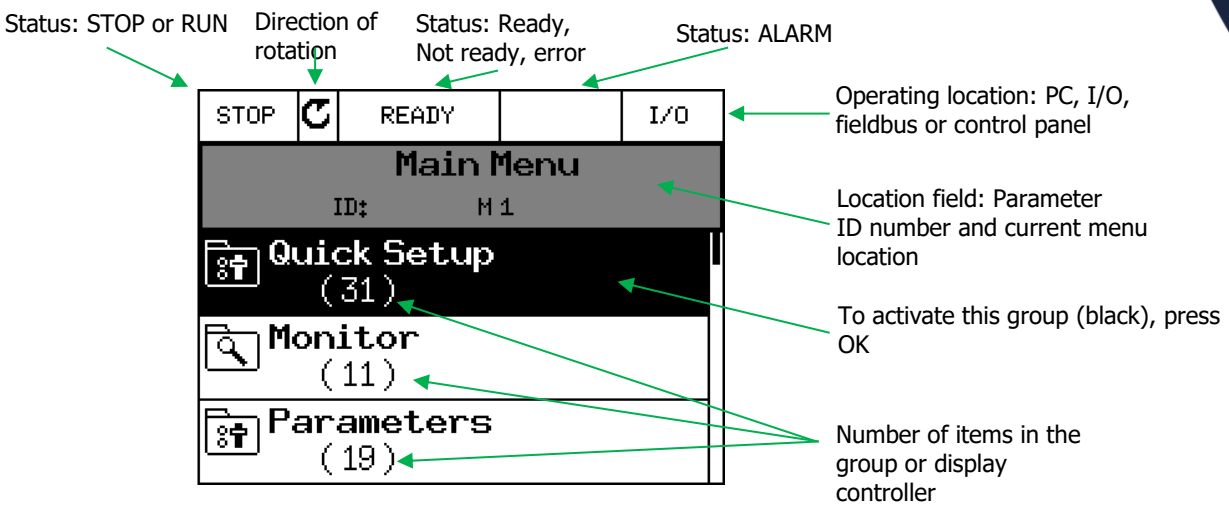
Menu key left
This key can be used when changing each digit of a parameter.

Menu key right
This key can be used when changing each digit of a parameter.
If the parameter is selected, you can change the parameter immediately by holding down this key.

Start
This key starts the motor when in local control mode (see Loc/Rem).

Stop
This key stops the motor when in local control mode (see Loc/Rem). In remote control mode, this key also stops the motor when "keypad stop key" is enabled (parameter M3.2.2).

2.4 Operation of the display



The information appearing on the display is divided into menus and submenus.
Scroll through the menus with the up and down arrow keys.
To enter a group, press the OK key.
To return to the previous level, press the Back/*Reset* key.
The location field indicates the menu in which frequency converter can be found.

2.4.1 Icons


File folder


Folder with monitoring parameters


Folder with error history


Favourites folder


Folder with parameters


Parameter


Multiselect parameter


Monitor parameter


Status monitor parameter


Multi-monitoring (9/6/4 parameters in 1 image)


Help


Add to favourites


View details of selected error


Reset active error + retrieve or store parameters

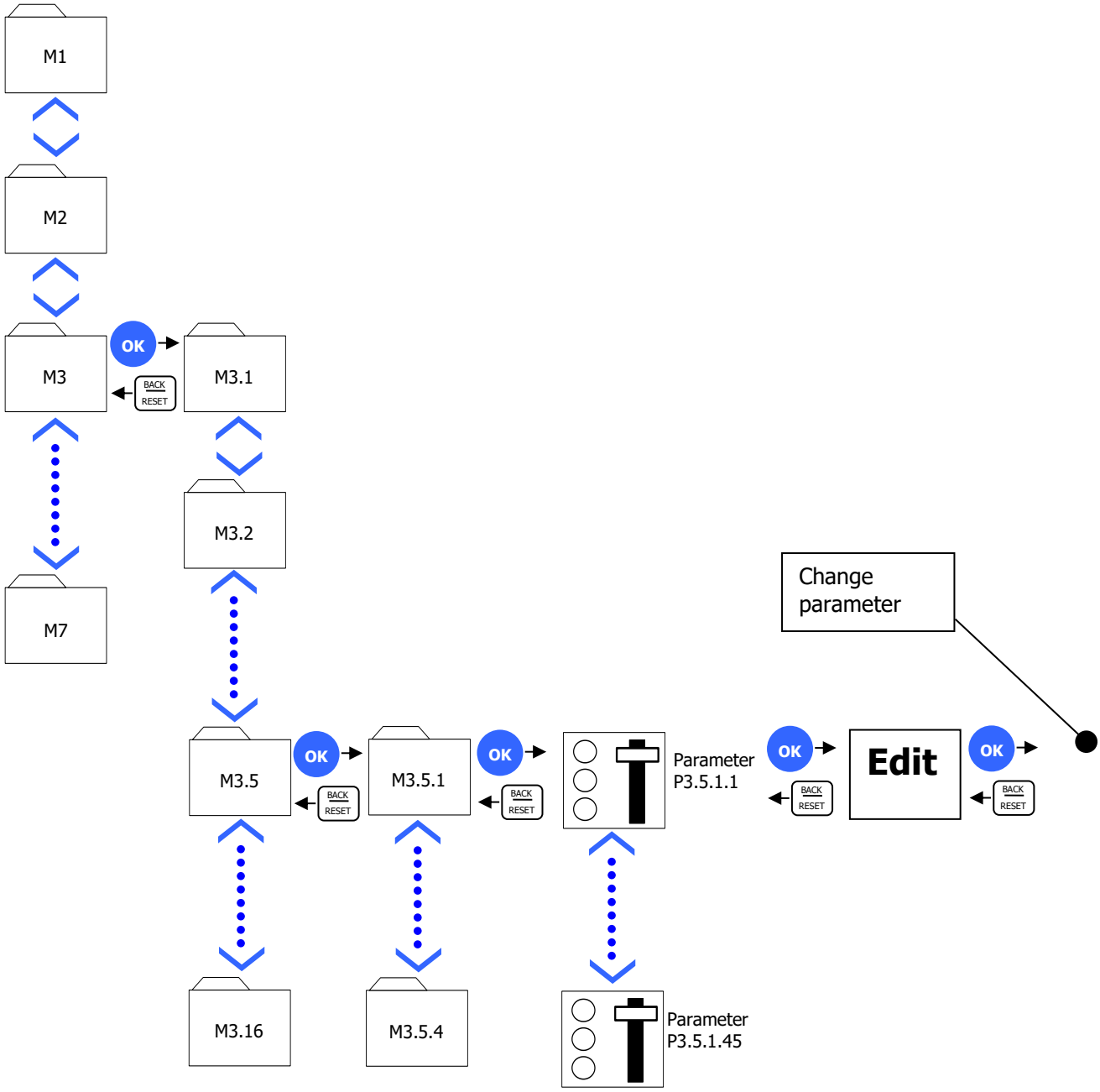

Remove from favourites


Load/save parameter settings

3 Parameters

3.1 Scrolling through parameters

main menu



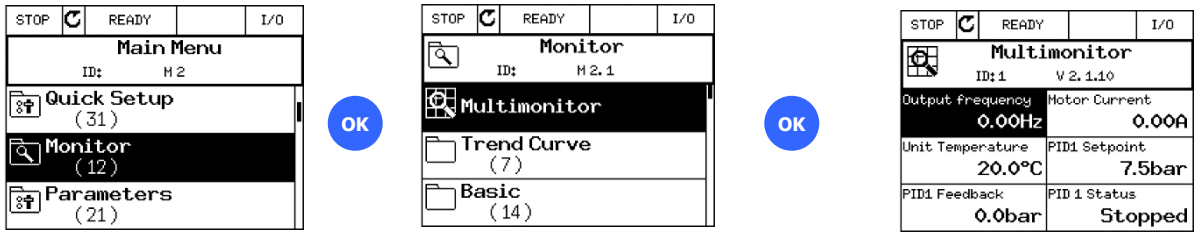
3.2 Viewing and modifying a parameter

For example, we want to view and change the maximum frequency (P 3.3.1.2).
Go to the Main Menu, and scroll up or down with the arrow keys to the Parameters folder, then press OK. Scroll through this menu to References, then press OK.
Scroll to Max. frequency, and press OK.
You have three options; Edit/Help/Add to favourites.
Scroll to Edit, then press OK (the value now starts to flash).
The target frequency can now be entered with the arrow keys. *The place where the change is being made can also be selected with the left and right arrow keys. This figure is underlined.* After changing the value, you can save it by pressing OK.

3.3 Monitoring Menu

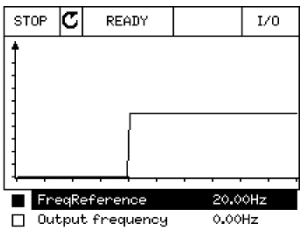
In the monitoring menu, monitor values can be displayed simultaneously via multimonitor 9, 6 or 4. A graph with 2 monitor values can be viewed via the trend curve.

3.3.1 Change multimonitor menu



If you hover over one of the Multimonitor fields and then press OK, you can select the required monitor parameter by scrolling up or down, and confirm with the OK key. (now it's possible to change the values with parameter 6.9.?? in Vacon Live)
The number of display fields can be changed with parameter (P3.11.4); the options are 3x3, 3x2 and 2x2

3.3.2 Trend Curve



Selecting a monitor value below the graph shows a graph of this value. In the trend menus, it is possible to adjust the interval time and the minimum and maximum of the value to be displayed, or to switch to auto-scaling.

3.4 Vacon 100 Wizard.

The Startup Wizard allows you to quickly change the basic settings to values that best suit your application.
The following keys are used in the wizard:

Arrows left and right; these change digits and decimals.

Arrows up and down; scroll through the various options, and change values.

OK This confirms the selection.

BACK / RESET Pressing this key returns you to the previous question in the wizard. If this key is pressed during the first question, the wizard closes.

3.5 Startup Wizard.

When the frequency converter is started for the first time, it automatically starts the Startup Wizard, which can also be started with parameter (P1.1.1)

	Setting	Value
1	Language selection	
2	Daylight saving time(only with a battery power supply)	Russia US EU OFF
3	Time setting	hh:mm:ss
4	Year setting	- - - -
5	Date setting	dd:mm
6	Use Startup Wizard?	Yes No (exit wizard)
7	Application	Standard HVAC PID control Multi-pump (single drive) Multi-pump (multi-drive)
8	Motor type	PM motor (permanent magnet) Induction motor Reluctance motor
9	Rated motor voltage(see motor nameplate)	Varies
10	Rated motor frequency(see motor nameplate)	8 to 320 Hz.
11	Rated motor speed(see motor nameplate)	24 to 19,200 rpm
12	Rated motor current(see motor nameplate)	Varies
13	Motor Cos Phi (see motor nameplate)	0.30 to 1.00
14	Minimum frequency	0 to max. frequency Hz.
15	Maximum frequency	min frequency to 320 Hz.
16	Acceleration time 1	0.1 to 3,000 sec
17	deceleration time 1	0.1 to 3,000 sec
18	Application Wizard	Yes* No (exit wizard)

*) If yes is selected, the key parameters are gone through for each application.

3.6 Quick setup parameter group

In addition to the Startup Wizard, the Vacon 100 has a quick setup menu for the most basic parameters. By changing a setting in the quick setup parameter group, this setting will also be changed in the corresponding parameter group.

code	Parameter	Min	Max		ID	
M1.1	Wizards					Starting various wizards
P1.2	Application				212	Standard HVAC PID control Multi-pump (single drive) Multi-pump (multi-drive)
P1.3	Minimum frequency	0	50	Hz	101	
P1.4	Maximum frequency	20	320	Hz	102	
P1.5	Acceleration time 1	0.1	3,000	s	103	
P1.6	Deceleration time 1	0.1	3,000	s	104	
P1.7	Current limit	3	variable	A	107	
P1.8	Motor type	PM	Induction			PM motor (permanent magnet) Induction motor
P1.9	Rated motor voltage	180	690	V	110	
P1.10	Rated motor frequency	0	320	Hz	111	
P1.11	Rated motor speed	0	62,500	RPM	112	
P1.12	Rated motor current	0	variable	A	113	
P1.13	Motor Cos phi	0	1		120	
P1.14	Energy optimisation	enable	disable		666	
P1.15	Identification				631	No action At standstill With the motor running
P1.16	Start function				505	Running start Ramping
P1.17	Stop function				506	Ramping Freewheel
P1.18	Automatic reset	enable	disable		731	
P1.19	External error				701	No action Alarm Error Error, freewheel
P1.20	Error AI too low				700	No action Alarm Alarm fixed frequency Alarm last frequency Error Error, freewheel
P1.21	Remote operating location	Fieldbus	I/O terminal		172	
P1.22	Reference selection I/O				117	For options, see manual
P1.23	Control panel selection				121	For options, see manual
P1.24	Fieldbus reference selection				122	For options, see manual
P1.25	AI 1 signal range	0 to 10 V 0 to 20 mA	2 to 10 V 4 to 20 mA		379	
P1.26	AI 2 signal range	0 to 10 V 0 to 20 mA	2 to 10 V 4 to 20 mA		390	
P1.27	RO1 function				11001	For options, see manual
P1.28	RO2 function				11004	For options, see manual
P1.29	RO3 function				11007	For options, see manual
P1.30	AO1 function				10050	For options, see manual

The following parameters may differ, depending on the choice of the application.

- P1.31. ... for Standard and HVAC
- P1.32. ... for PID control
- P1.33. ... for multitopump (single drive)
- P1.34. ... for multitopump (multitodrive)

3.7 Parameter group setting

The following menus are available in this parameter group:

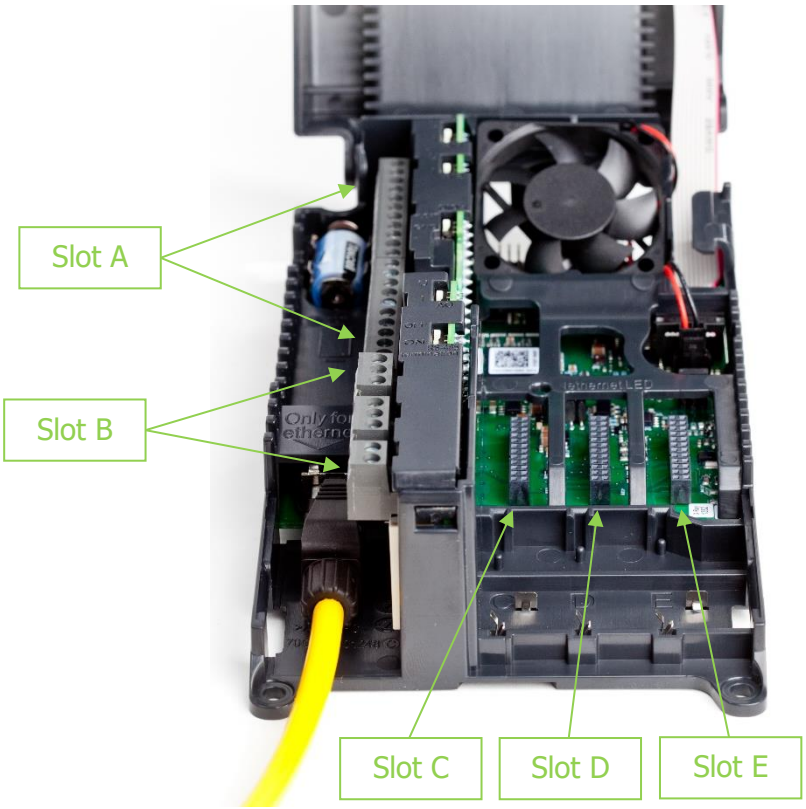
Code	Group name
P3.	**Parameters**
3.1.	Motor settings
3.1.1.	*Motor nameplate*
3.1.2.	*Motor control*
3.1.3.	*Limits*
3.1.4.	*Open loop*
3.1.4.12.	I/f start
3.1.4.12	Stabilators
3.2.	Start/Stop settings
3.3.	References
3.3.1.	*Frequency reference*
3.3.3.	*Fixed frequencies*
3.3.4.	*Motor potentiometer*
3.3.6.	*Flushing*
3.4.	Ramping and Brakes
3.4.1.	*Ramp 1*
3.4.2.	*Ramp 2*
3.4.3.	*Start magnetisation*
3.4.4.	*DC brake*
3.4.5	*Flux Braking*
3.5.	I/O Configuration
3.5.1.	*Digital inputs*
3.5.2.	*Analogue inputs*
3.5.2.1.	Analogue input 1
3.5.2.2.	Analogue input 2
3.5.2.3.	Analogue input 3
3.5.2.4.	Analogue input 4
3.5.2.5.	Analogue input 5
3.5.2.6.	Analogue input 6
3.5.3.	*Digital outputs*
3.5.3.2.	Slot B base
3.5.4.	*Analogue outputs*
3.5.4.1.	Slot A base
3.6.	Fieldbus data map
3.7.	Prohibited frequencies
3.8.	Monitoring limit values
3.9.	Protection
3.9.1.	*General*
3.9.2.	*Motor thermal protection*
3.9.3.	*Motor blocked*
3.9.4.	*Underload*
3.9.5.	*Quick stop*
3.9.8.	*AI low level protection*
3.10.	Automatic reset
3.11.	Application settings
3.12.	Timer functions
3.12.1.	*Interval 1*
3.12.2	*Interval 2*
3.12.3.	*Interval 3*
3.12.4.	*Interval 4*
3.12.5.	*Interval 5*
3.12.6.	*Timer 1*
3.12.7.	*Timer 2*
3.12.8.	*Timer 3*
3.13.	PID regulator
3.13.1.	*Basic settings*
3.13.2.	*Reference values*
3.13.3.	*Feedbacks*
3.13.4.	*Forward control*
3.13.5.	*Sleep function*
3.13.6.	*Feedback monitoring*
3.13.7.	*Pressure loss compensation*
3.13.8.	*Slow fill*
3.13.9.	*Inlet pressure monitoring*
3.13.10.	*Sleep no request detected*
3.13.12.	*Multi setpoint*
3.14.	Ext PID regulator
3.14.1	*Basic settings*
3.14.2.	*Reference values*
3.14.3.	*Feedbacks*
3.14.4.	*Feedback monitoring*
3.15.	Multi-pump
3.15.17.	*Locking signals*
3.15.18.	*Overpressure monitoring*
3.15.19.	*Pump running time*
3.15.22.	*Advanced settings*
3.16.	Maintenance counters
3.17.	Fire mode
3.18.	Motor preheater
3.19.	Frequency convertor customisation
	Divided into 10 blocks
3.21.	Pump control
3.21.1.	*Auto cleaning*
3.21.2.	*Jockey pump*
3.21.3.	*Preparation pump*
3.21.4.	*Anti-blocking*
3.21.5.	*Frost protection*
3.21.6	*Flow switch*
3.23	Adv. Harm. Filter

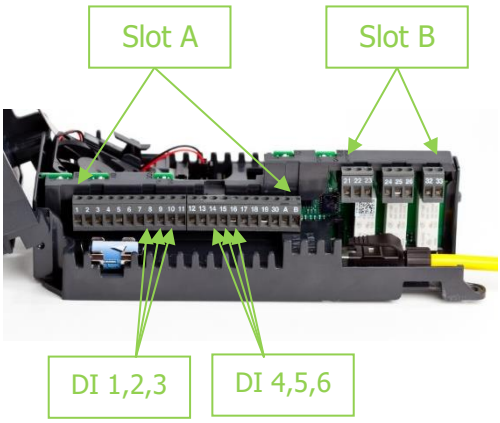
3.8 The distribution of DI (digital inputs)

In the Vacon 100, settings can be per function as to how this has to be activated. This allows multiple functions to be activated with the same DI. It is also possible to control a function with a timer (M3.12), fieldbus or programming block. (M3.19)

The DI can be located in different slots. The standard DIs from 1 to 6 are located on slot A. Depending on the choice of DI expansion, the other DIs may be located on slot C, D or E.

All functions are displayed in parameter group M3.5.1. To associate a function to a DI, first specify in which slot this input is located. Then select the correct DI.





Please note !! When you change a DI, the DI may also be used by another function!

If a function is not in use, it can be set to slot 0. For the regulator, this function does remain active. That means that if a function requests a NO contact, set it to slot 0.1, and if a function requests a NC contact, set it to slot 0.2. Example: If the parameter P3.5.1.11 (close external error) is not used, it should be set to 0.1. Merely changing from slot A (A.3) to slot 0 (0.3) is not sufficient, because the regulator will see a closed contact and generate an error.

Slot 0.1: makes the function false. (Open contact)
Slot 0.2 and higher: makes the function true. (Closed contact)

3.8.1 Functions for DI

Code	Parameter	Default		Description
		slot	position	
P3.5.1.1	Control signal 1 A	A	1	If I/O A is the operating location (forward)
P3.5.1.2	Control signal 2 A	A	2	If I/O A is the operating location (reverse)
P3.5.1.3	Control signal 3 A	0	1	If I/O A is the operating location
P3.5.1.4	Control signal 1 B	0	1	If I/O B is the operating location
P3.5.1.5	Control signal 2 B	0	1	If I/O B is the operating location
P3.5.1.6	Control signal 3 B	0	1	If I/O B is the operating location
P3.5.1.7	Force to I/O B control signal	0	1	Select control signal B
P3.5.1.8	Force to I/O B reference	0	1	Use reference value control signal B (M3.3.1.6)
P3.5.1.9	Force to fieldbus control	0	1	Force operation to fieldbus
P3.5.1.10	Force to display operation	0	1	Force operation to control panel
P3.5.1.11	Close external error	A	3	Open: OK Closed: External error
P3.5.1.12	Open external error	0	2	Open: External error Closed: Ok
P3.5.1.13	Close error reset	A	6	Closed: Reset all active errors
P3.5.1.14	Open error reset	0	1	Open: Reset all active errors
P3.5.1.15	Release	0	2	Closed: regulator is ready
P3.5.1.16	Start block 1	0	2	Open: Regulator ready, starting blocked Closed: Regulator can be started
P3.5.1.17	Start block 2	0	2	Open: Regulator ready, starting blocked Closed: Regulator can be started
P3.5.1.18	Preheating ON	0	1	Open: No action Closed: Preheat activated if (P3.18.1 is set to 2)
P3.5.1.19	Ramp 2 selection	0	1	Switching between ramp 1 and 2
P3.5.1.20	Acc/dec prohibited	0	1	Open: Acceleration and deceleration permitted Closed: Acceleration and deceleration not permitted
P3.5.1.21	Fixed frequency selection 0	A	4	Binary selection for fixed frequency
P3.5.1.22	Fixed frequency selection 1	A	5	Binary selection for fixed frequency
P3.5.1.23	Fixed frequency selection 2	0	1	Binary selection for fixed frequency
P3.5.1.24	Increase motor pot	0	1	Motor pot reference goes up
P3.5.1.25	Decrease motor pot	0	1	Motor pot reference goes down
P3.5.1.26	Quick stop activation	0	2	Open: Activated according to (P3.9.5)
P3.5.1.27	Timer 1	0	1	Start Timer 1 programmed with parameters (P3.12.6)
P3.5.1.28	Timer 2	0	1	Start Timer 2 programmed with parameters (P3.12.7)
P3.5.1.29	Timer 3	0	1	Start Timer 3 programmed with parameters (P3.12.8)
P3.5.1.30	PID 1 reference increase	0	1	Open: No amplification Closed: Amplification
P3.5.1.31	PID 1 SP selection	0	1	Open: Reference value 1 Closed: Reference value 2
P3.5.1.32	External PID - start signal	0	2	Open: External PID stopped Closed: External PID controls (P3.14)
P3.5.1.33	External PID SP selection	0	1	Open: Reference value 1 Closed: Reference value 2
P3.5.1.34	Reset maintenance counter 1	0	1	Closed: Reset maintenance counter
P3.5.1.36	Activate flushing reference	0	1	Closed: Flushing function active (P3.3.6.2) Please note! Regulator starts when activating this function
P3.5.1.38	Open fire mode activation	0	2	Open: Fire mode active (M3.17) Closed: No action

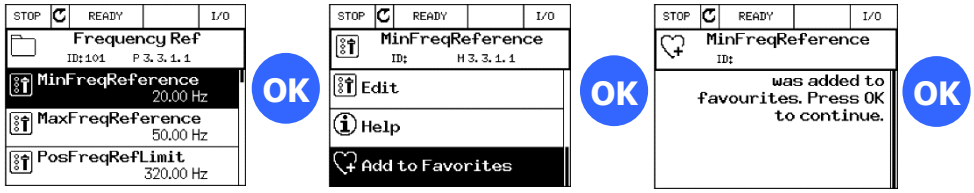
Code	Parameter	Default		Description
		slot	position	
P3.5.1.39	Close fire mode activation	0	1	Open: No action Closed: Fire mode active (M3.17)
P3.5.1.40	Fire mode reverse	0	1	Open: Forward Closed: Reverse This function is only active in fire mode
P3.5.1.41	Auto cleaning active	0	1	Closed: Auto cleaning active (on opening, the function stops) Please note! Regulator starts when activating this function
P3.5.1.42	Pump 1 block	0	1	Open: Inactive Closed: Active
P3.5.1.43	Pump 2 block	0	1	Open: Inactive Closed: Active
P3.5.1.44	Pump 3 block	0	1	Open: Inactive Closed: Active
P3.5.1.45	Pump 4 block	0	1	Open: Inactive Closed: Active
P3.5.1.46	Pump 5 block	0	1	Open: Inactive Closed: Active
P3.5.1.47	Pump 6 block	0	1	Open: Inactive Closed: Active
P3.5.1.48	Pump 7 block	0	1	Open: Inactive Closed: Active
P3.5.1.49	Pump 8 block	0	1	Open: Inactive Closed: Active
P3.5.1.52	Energy counter reset	0	1	Closed: Energy trip counter reset
P3.5.1.53	Parameter set 1/2 selection	0	1	Open: Parameter setting 1 is selected Closed: Parameter setting 2 is selected
P3.5.1.54	Multi setpoint select 0	0	1	Binary selection for multi setpoint
P3.5.1.55	Multi setpoint select 1	0	1	Binary selection for multi setpoint
P3.5.1.56	Multi setpoint select 2	0	1	Binary selection for multi setpoint
P3.5.1.57	Multi setpoint select 3	0	1	Binary selection for multi setpoint
P3.5.1.58	Flow switch	0	2	Select digital input flow switch
P3.5.1.59	AHF over temperature	0	1	Activate AHF over temperature

The default values listed above are applicable when using the default application. These values may change if other applications are used

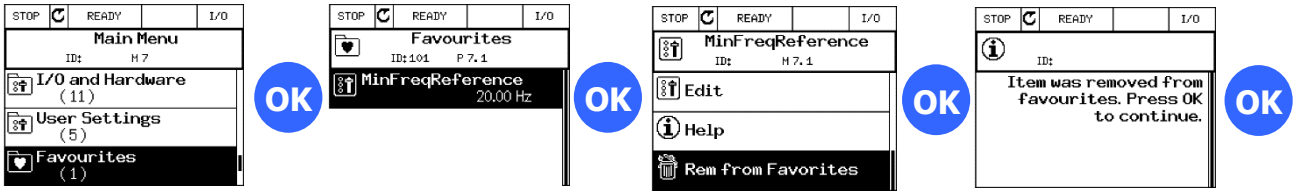
3.9 Favourites folder

The Vacon 100 frequency converter allows compilation of a folder containing frequently-used parameters. It means you can access all the parameters from a single folder, and modify them if necessary. Please note! The favourites folder is deleted when changing the firmware, although it can be saved in the control panel.

3.9.1 Saving parameters in the favourites folder



3.9.2 Removing parameters from the favourites folder



3.10 Cooling fan control

Parameter P5.6.1.1 (Fan optimisation) turns the unit's cooling fan on or off. (From MR6 speed control)

If this parameter is switched on, the cooling fan will be switched to the unit temperature.

When switching the power supply on, the cooling fan will always run and then turn off after around 5 minutes, if:
- the regulator is in ready or sleep state.
- the unit temperature is not too high.

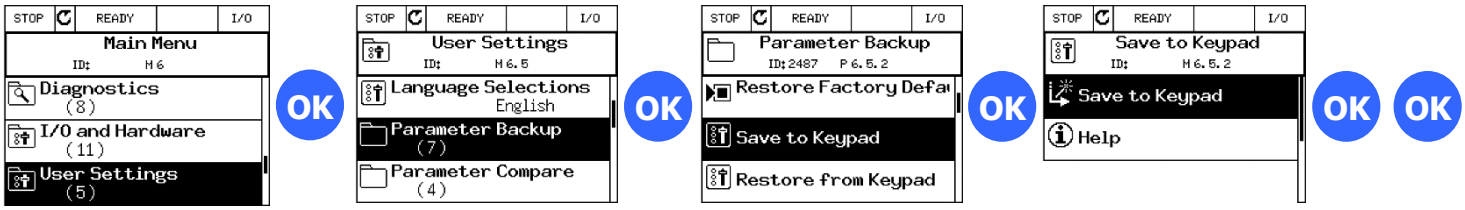
If the regulator is in run mode, the fan will run continuously regardless of the temperature of the unit.

3.11 Default page display

Parameter P5.7.2 allows the default page to be determined (e.g. Multimonitor). The timeout period is entered in parameter P5.7.1.

If the keys of the regulator are not used before the pre-set timeout period, the display will return to the default page.

3.12 Saving and loading parameter setting + factory setting



Parameter backup allows saved parameter settings to be loaded from the control panel. In addition, factory settings can also be loaded, and 2 user-defined parameter settings saved or loaded.

3.13 Parameter lock

To prevent unauthorised changes, it is possible to hide the parameter folders with an access code.
Go to parameter M8.2, and set an access code to protect parameters. Go to parameter M8.1 and change to monitor or favourites.
Monitor: only the monitoring and main menus are visible
Favourites: Only main menus visible, and only parameters in favourites are available.

The parameter lock is deactivated by setting parameter M8.1 to normal and confirming with the access code.

Please note!
Make arrangements within your organisation on the use of this code, so that your colleagues can also modify this control.

3.14 Faults and alarms

Menu M4 (diagnosis) contains active errors and the error history.

3.14.1 Errors

Error code	Error
1	Overcurrent
2	Overvoltage
3	Earthing error
5	Charging switch
7	Saturation trip
8	System error
9	Undervoltage
10	Input phase
11	Monitoring output phase
12	Braking chopper monitor
13	Heatsink temperature too low
14	Heatsink temperature too high
15	Motor blocked
16	Motor temperature too high
17	Motor under load
19	Overload power
25	Operation error motor
26	Cannot start
29	ATEX - thermistor
30	Safety configuration
32	Fan cooling
33	Fire mode enabled
37	Component changed
38	Component added
39	Component removed
40	Component unknown

Error code	Error
41	IGBT temperature
44	Component changed
45	Component added
46	Real-time clock
47	Software update
50	Error AI too low
51	External error
52	Keypad communication error
53	Fieldbus error
54	Option board slot error
57	Identification
63	Fault/alarm quick stop
65	PC communication error
66	Thermistor error
68	Fault/alarm maintenance counter
69	Fieldbus indication error
76	Start blocked
77	> 5 connections
100	Timeout slow fill
101	PID 1 outside pre-set values
105	PID 2 outside pre-set values
109	Inlet pressure monitoring
111	Temperature error 1
112	Temperature error 2
113	Pump running time
300	Not supported

Errors are explained in the application manual.

3.15 Monitoring values

Monitor value, Extras & Advanced		Value	ID
V2.6.1	Frequency convertor status word		43
V2.6.2	Ready		78
V2.6.3	Application status word 1		89
V2.6.4	Application status word 2		90
V2.6.5	DIN status word 1		56
V2.6.6	DIN status word 2		57
V2.6.7	Motor current, 1 decimal		45
V2.6.8	Frequency reference source		1405
V2.6.9	Last active error code		37
V2.6.10	Last active error ID		95
V2.6.11	Last active alarm code		74
V2.6.12	Motor preheater		1228
V2.6.13	Status motor regulator		77
V2.6.14	Motor shaft power 1 decimal		88
V2.9.1	Output frequency	Hz	1
V2.9.2	Reference frequency	Hz	25
V2.9.3	Motor speed	RPM	2
V2.9.4	Motor current	A	3
V2.9.5	Motor torque	%	4
V2.9.7	Motor shaft power	%	5
V2.9.8	Motor shaft power	kW/hp	73
V2.9.9	Motor voltage	V	6
V2.9.10	DC link voltage	V	7
V2.9.11	Unit temperature	°C	8
V2.9.12	Motor temperature (calculated)	%	9
V2.9.13	Motor preheater		1228
V2.9.15	kWh trip counter low	kWh	1054
V2.9.16	kWh trip meter high	kWh	1067

Monitor value, I/O		Value	ID
V2.4.1	Slot A DIN 1,2,3		15
V2.4.2	Slot A DIN 4,5,6		16
V2.4.3	Slot B RO 1,2,3		17
V2.4.4	Analogue input 1	%	59
V2.4.5	Analogue input 2	%	60
V2.4.6	Analogue input 3	%	61
V2.4.7	Analogue input 4	%	62
V2.4.8	Analogue input 5	%	75
V2.4.9	Analogue input 6	%	76
V2.4.10	Slot A AO1	%	81

Monitor value, Temperature inputs		Value	ID
V2.5.1	Temperature input 1	° C/F	50
V2.5.2	Temperature input 2	° C/F	51
V2.5.3	Temperature input 3	° C/F	52

Monitor value, Timer functions		Value	ID
V2.7.1	TC 1, TC 2, TC 3		1441
V2.7.2	Interval 1		1442
V2.7.3	Interval 2		1443
V2.7.4	Interval 3		1444
V2.7.5	Interval 4		1445
V2.7.6	Interval 5		1446
V2.7.7	Timer 1		1447
V2.7.8	Timer 2		1448
V2.7.9	Timer 3		1449
V2.7.10	Real-time clock		1450

Monitor value PID regulator		Value	ID
V2.8.1	PID1 reference value	var.	20
V2.8.2	PID1 feedback	var.	21
V2.8.3	PID1 feedback (1)	var	15541
V2.8.4	PID1 feedback (2)	var	15542
V2.8.5	PID1 error value (difference)	var.	22
V2.8.6	PID1 output value	%	23
V2.8.7	PID1 status		24

Monitor value, External PID regulator		Value	ID
V2.9.1	External PID reference value	var.	83
V2.9.2	External PID actual value	var.	84
V2.9.3	External PID error value (difference)	var.	85
V2.9.4	External PID output value	%	86
V2.9.5	External PID status		87

Multi-pump monitor		Value	ID
V2.10.1	No. of motors in operation (active)		30
V2.10.2	Autochange		1113
V2.10.3	Next autochange		1503
V2.10.4.	Operating mode		1505
V2.10.5	Multi-pump, status		15507
V2.10.6	Communication status		15506
V2.10.7	Pump (1) running time	h	15510
V2.10.8	Pump (2) running time	h	15511
V2.10.9	Pump (3) running time	h	15512
V2.10.10	Pump (4) running time	h	15513
V2.10.11	Pump (5) running time	h	15514
V2.10.12	Pump (6) running time	h	15515
V2.10.13	Pump (7) running time	h	15516
V2.10.14	Pump (8) running time	h	15517

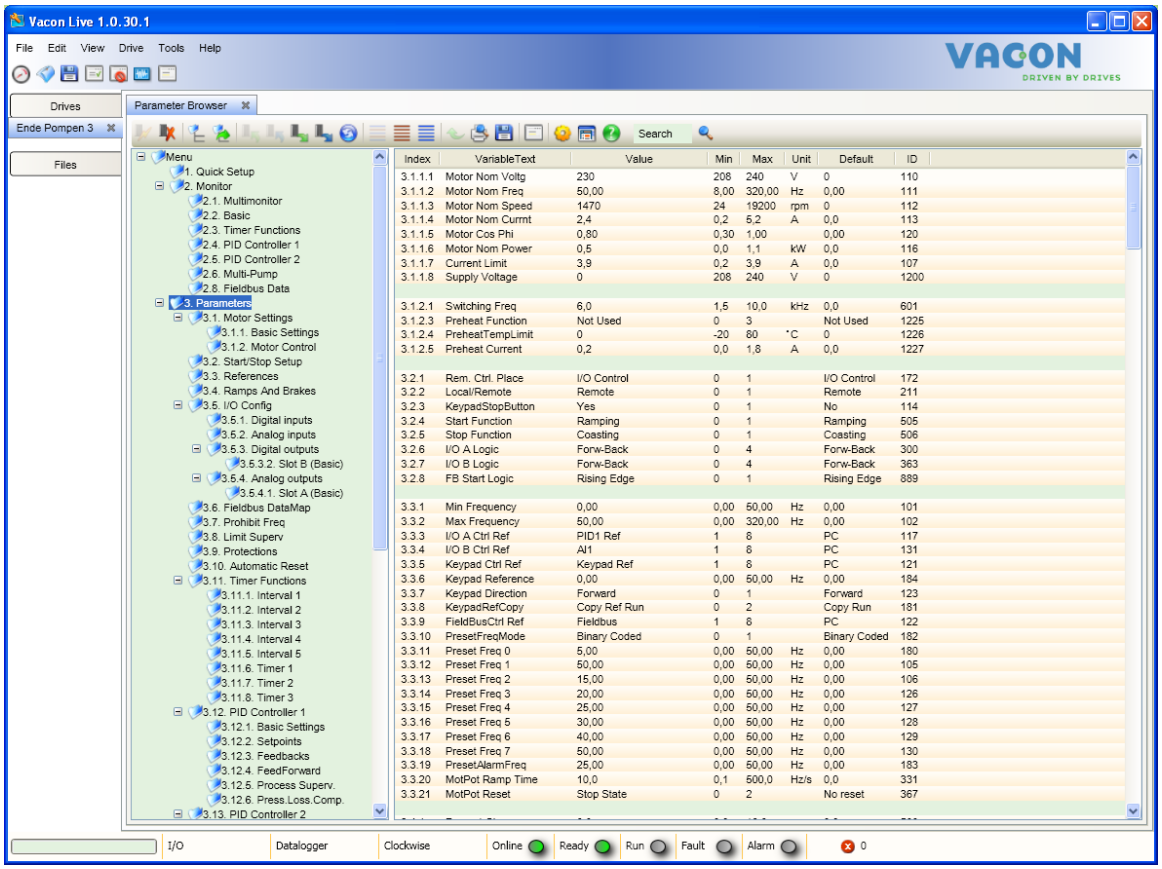
Monitor value, Maintenance counters		Value	ID
V2.11.1	Maintenance counter 1	h/kRev	1101

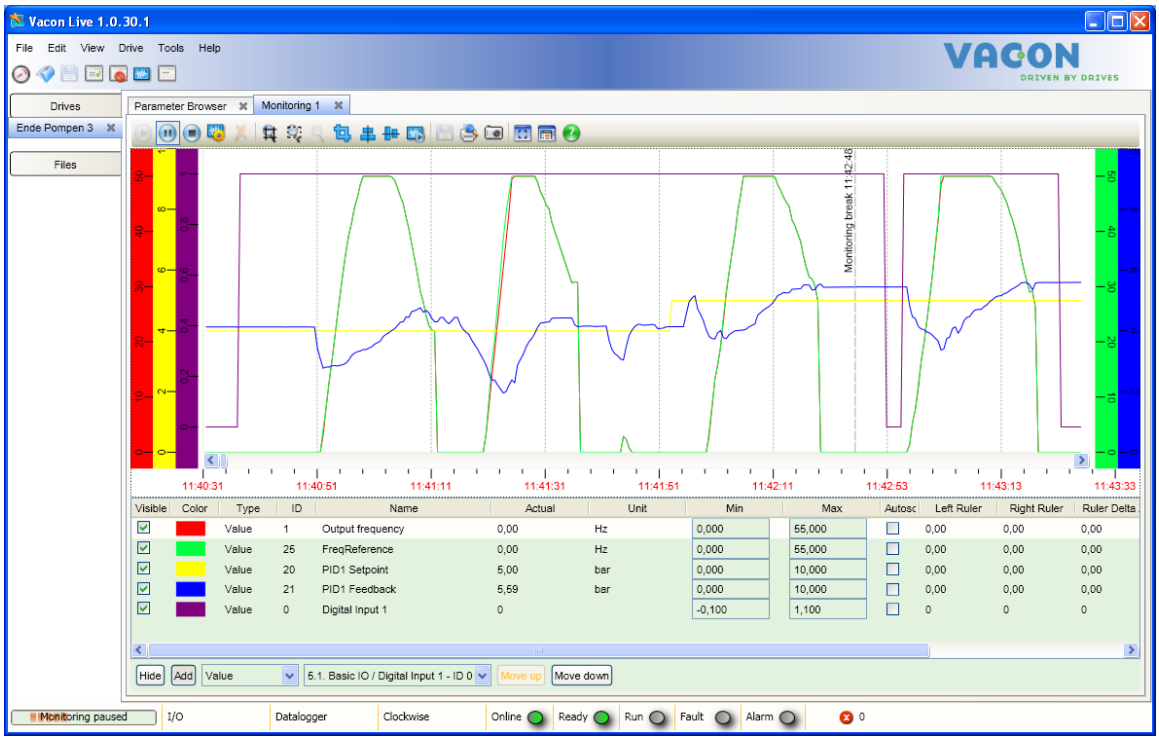
Monitor value, Fieldbus		Value	ID
V2.12.1 to V2.12.8.16	Various Fieldbus values		864 to 883

Monitor Drive Customizer		Value	ID
V2.13.1 to V2.13.11	Various Drive Customizer values		15020 to 15200

4 Vacon Live

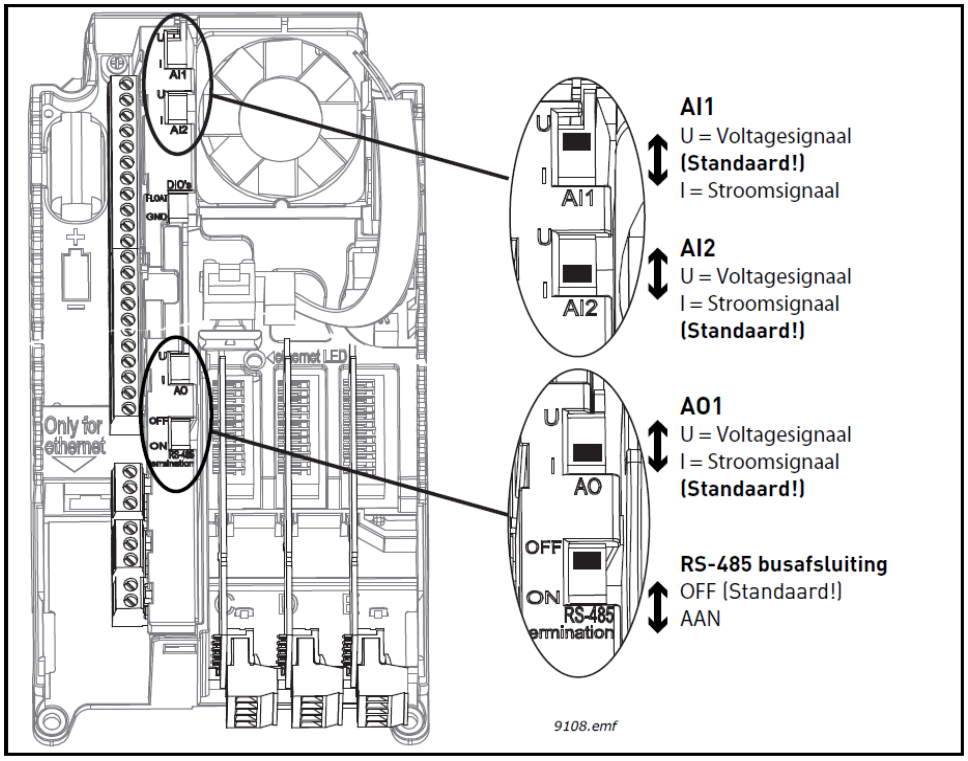
In Vacon Live, you can change and view parameters with your PC.
The Vacon Live programme also includes the Loader programme which means you can upload other software, applications and languages to the regulator.





5 Commissioning the drive

1. Carefully read the safety instructions in the **Safety** chapter of the Vacon 100 installation manual.
2. After installation, but before the power is turned on, check that:
   a. the inverter and motor are earthed;
   b. the power supply and motor cables comply with the requirements of the installation instruction manual; see Chapter 4 of the installation manual for more on this (the motor cables and control cables must comply with the EMC requirements, and the shielding must be earthed on both sides);
   c. the cable routing of the control cables is separated from the power cables, and that the shielding of the cables is earthed. During installation, the wires may not touch any electrical components of the frequency converter;
   d. check the switch setting of the analogue inputs and outputs.



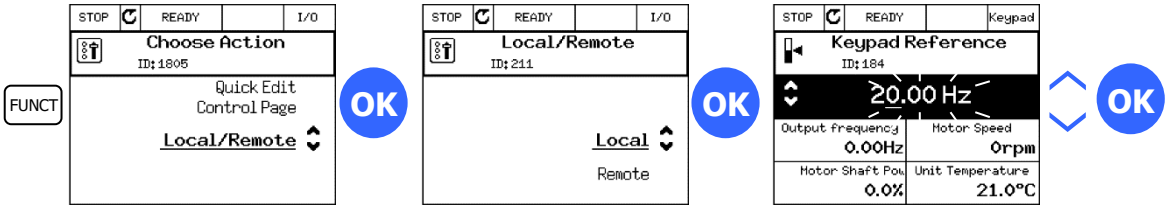
3. Check the quality and quantity of the cooling air.
4. Check for any condensation inside the frequency converter.
5. Check that all Start/Stop switches on the I/O terminals are in the **Stop** position.
6. Connect the frequency converter to the mains.
7. Set the parameters (see Application Manual). Note; Enter all rated motor data according to the rating plate of the motor used.
8. Conduct a functional test **before the motor is connected to the regulator**.

Conduct test a.:

a. **Control from the keypad:**

I. check that the display indicates the operating location as Keypad (if not, change it using the Funct key (keypad));

II. change the frequency reference listed under "Keypad Reference" using the OK and arrow keys;



III. *Be aware that you can/may rotate the motor/drive with the pre-set frequency* (see point 9);

IV. give start signal (with start button on frequency converter);

V. the status now displays RUN (in test mode, the motor will start turning, check it turns in the right direction);

VI. give a stop signal (with stop button on frequency converter).

9. After functional testing **without the motor,** tests can be carried out **with the motor**. Check whether the driven device or process may run. If necessary, disconnect the motor shaft from the device or process. Monitor safety aspects at all times, and inform employees in advance about the trial run:

   a. turn the power supply off and wait until the frequency converter is no longer energised
   (This takes at least 5 minutes; see instruction manual);

   b. connect the motor cables to the motor terminals of the frequency converter **be careful!!!** make sure that the earth and shielding of the shielded motor cable is always connected to the earth of the frequency converter;

   c. verify that all Start/Stop switches are in the stop position;

   d. Turn the power supply on;

   e. repeat test 8.a;

   f. check that the rotation of the motor corresponds to the direction arrow in the display (if not, stop the frequency converter, start with 9.a., and **swap two wires connected to the motor terminals**).

10. Disconnect the motor from the device or process (if the test is performed without motor connected according to 9.).

   a. make sure that it is safe to start;

   b. inform employees about the test;

   c. repeat test 8.a.

Make sure you switch the operating location to the correct position again (using the Funct key).

6 Applications

6.1 Application defaults

The default values for each selected application are shown by in the table below.

Code	Parameter	Default setting					ID	Description
		Standard	HVAC	PID control	Multi-pump (single drive)	Multi-pump (multi-drive)		
P3.2.1	Remote operating location	0	0	0	0	0	172	0 = Control I/O
P3.2.2	Local/Distance	0	0	0	0	0	211	0 = Remote
P3.2.6	Logic I/O A	2	2	2	2	2	300	2 = Forward-Reverse (Pulse)
P3.2.7	Logic I/OB	2	2	2	2	2	363	2 = Forward-Reverse (Pulse)
P3.3.1.5	Reference Selection I/O A	6	6	7	7	7	117	6 = AI 1 + AI 2 7 = PID
P3.3.1.6	Selection I/O reference B	4	4	4	4	4	131	4 = AI 1
P3.3.6.2	Flushing reference	0 Hz	0 Hz	0 Hz	0 Hz	50 Hz	1239	
P3.5.1.1	Control signal 1 A	A.1	A.1	A.1	A.1	A.1	403	
P3.5.1.2	Control signal 2 A	A.2	A.2	0.1	0.1	0.1	404	
P3.5.1.4	Control signal 1 A	0.1	0.1	A.4	A.2	0.1	423	
P3.5.1.7	Force control to I/O B	0.1	0.1	A.6	A.3	0.1	425	
P3.5.1.8	Force I/O B-reference	0.1	0.1	A.6	A.3	0.1	343	
P3.5.1.11	Close external error	A.3	A.3	A.2	0.1	A.6	405	
P3.5.1.13	Close error reset	A.6	A.6	A.3	0.1	A.4	414	
P3.5.1.21	Fixed frequency selection 0	A.4	A.4	A.5	0.1	0.1	419	
P3.5.1.22	Fixed frequency selection 1	A.5	A.5	0.1	0.1	0.1	420	
P3.5.1.31	PID SP selection	0.1	0.1	0.1	0.1	A.3	1047	
P3.5.1.36	Activation flushing reference	0.1	0.1	0.1	0.1	A.2	530	
P3.5.1.42	Pump 1 block	0.1	0.1	0.1	A.4	0.1	426	
P3.5.1.43	Pump 2 block	0.1	0.1	0.1	A.5	0.1	427	
P3.5.1.44	Pump 3 block	0.1	0.1	0.1	A.6	0.1	428	
P3.5.3.2.1	RO1 function	2	2	2	49	2	11001	2 = In operation 49 = Multi-pump K1 control
P3.5.3.2.4	RO2 function	3	3	3	50	3	11004	3 = Error 50 = Multi-pump K2 control
P3.5.3.2.7	RO3 function	1	1	1	51	1	11007	1 = Ready 51 = Multi-pump K3 control
P3.13.2.6	Reference point source 1 select	-	-	3	3	3	332	3 = AI 1
P3.13.2.10	Reference point source 2 select	-	-	-	-	1	431	1 = Control panel ref. point 1
P3.13.3.1	PID feedback function	-	-	1	1	1	333	1 = Only source 1 in use
P3.13.3.3	PID feedback source	-	-	2	2	2	334	2 = AI 2
P3.15.1	Multi-pump, mode	-	-	-	0	2	1785	0 = Single drive 2 = Multi-master
P3.15.2	Number of pumps	1	1	1	3	3	1001	
P3.15.5	Pump block	-	-	-	1	1	1032	1 = Unblocked
P3.15.6	Autochange	-	-	-	1	1	1027	1 = enabled
P3.15.7	Autochange pumps	-	-	-	1	1	1028	1 = All pumps
P3.15.8	Autochange interval	-	-	-	48 h	48 h	1029	
P3.15.11	Autochange frequency limit	-	-	-	25 Hz	50 Hz	1031	
P3.15.12	Autochange pump limit	-	-	-	1	3	1030	
P3.15.13	Range	-	-	-	10%	10%	1097	
P3.15.14	Range delay	-	-	-	10 s	10 s	1098	
P3.15.15	Constant production speed	-	-	-	-	100%	1513	

6.2 Start Application via Wizard

The application wizard is launched during first startup, or via parameter (P1.2).
At startup, the date and time must be filled in correctly. You are then asked if you want to open the application wizard.
Then you are asked about what application is being used:

- Standard Continue to Section 6.2.1
- HVAC
- PID - control Continue with Section 6.2.2
- Multi-pump (single drive)
- Multi-pump (multi-drive) Continue to Chapter 8

6.2.1 Default Application (Wizard)

Be careful! The **factory setting** must always be used as a starting point when using the application examples in this book. (P6.5.1)

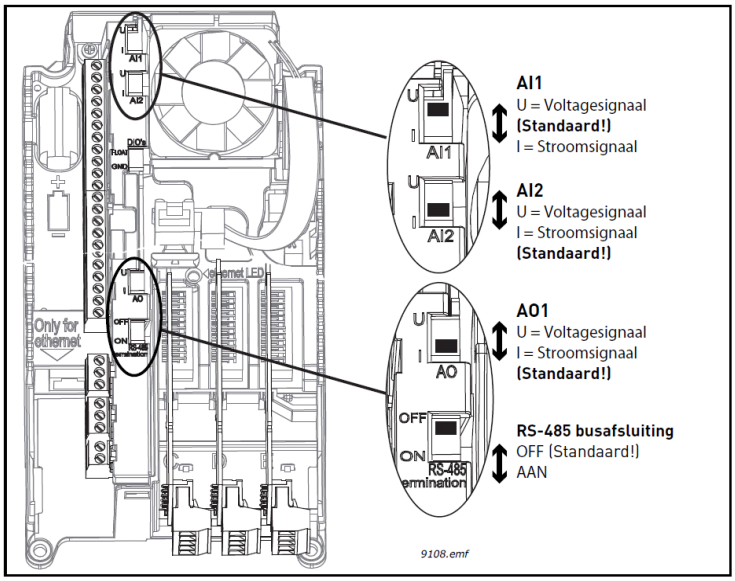
After choosing default, the following parameters appear:

Step	Parameter	Number	Description
1	Motor type	P3.1.2.2	Permanent magnet or induction motor
2	Rated voltage	P3.1.1.1	Varies
3	Rated frequency	P3.1.1.2	8 to 320 Hz.
4	Rated motor speed	P3.1.1.3	24 to 19,200 rpm
5	Rated motor current	P3.1.1.4	Varies
6	Cos phi of the motor	P3.1.1.5	0.3 to 1
7	Minimum frequency	P3.3.1.1	0 Hz. … P3.3.1.2
8	Maximum frequency	P3.3.1.2	P3.3.1.1 … 320 Hz.
9	Acceleration time	P3.4.1.2	0.1 to 300 s
10	Deceleration	P3.4.1.3	0.1 to 300 s
11	Operating location:		I/O - terminals Fieldbus Control panel
12	Logic I/O A	P3.2.6	Forward-reverse (pulse) If reset error, break start contact Forward-reverse If reset error, autostart Change also P3.9.1.15 (no action)

6.2.1.1 Application example: 0 - 10 V tracking control (using Default Wizard 6.2.1)

Parameter group	*Description*	*Setting*
Motor settings		
Motor control		
P3.1.2.3	Internal switching frequency	Modification if excessive motor noise
P3.1.2.4	Identification	Ad stand still (start within 30 sec)
Motor limits		
P3.1.3.1	Current limit	Maximum permissible motor current ± 1.4x In
Start/Stop Settings		
P3.2.4	Start function	Ramping (pump)/Running start (fan)
P3.2.5	Stop function	Freewheel (fan)/Ramping (pump)
References		
Frequency reference		
P3.3.1.5	I/O reference A	AI 1
I/O Configuration		
Analogue input 1		
P3.5.2.1.2	AI 1 signal filter time	0 sec.
P3.5.2.1.3	AI 1 signal range	0 to 10 V/0 to 20 mA
Protections		
Motor thermal protection		
P3.9.2.1	Calculated motor thermal protection	no action

- The 0 to 10 V signal is connected to AI 1 on the 2 (+) and 3 (to) terminals.
- The tracking control is started by connecting 8 (DI 1) to 6 (+24 V).
- Make sure that dipswitch AI 1 is in the Volt signal position (up).

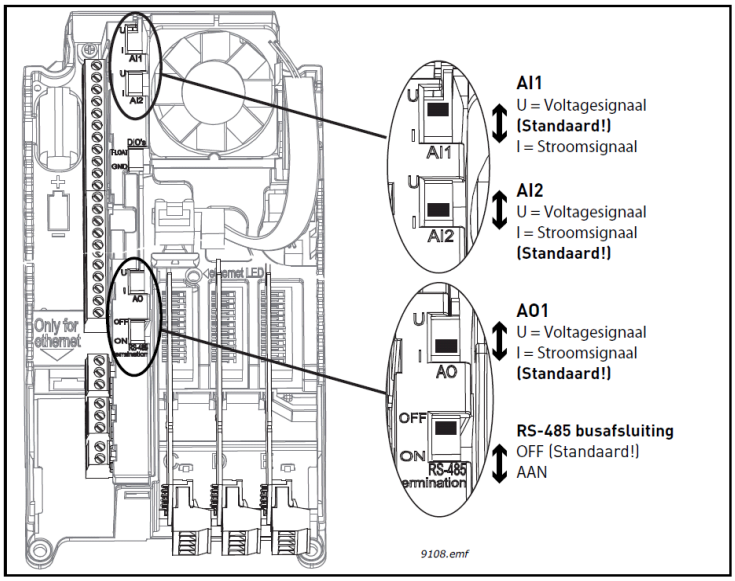


Location and selection of dipswitch AI 1

6.2.1.2 Application example: 4 to 20 mA tracking control (using Default Wizard 6.2.1)

Parameter group	*Description*	*Setting*
Motor settings		
Motor control		
P3.1.2.3	Internal switching frequency	Modification if excessive motor noise
P3.1.2.4	Identification	Ad stand still (start within 30 sec)
Motor limits		
P3.1.3.1	Current limit	Maximum permissible motor current ± 1.4x In
Start/Stop Settings		
P3.2.4	Start function	Ramping (pump)/Running start (fan)
P3.2.5	Stop function	Freewheel (fan)/Ramping (pump)
References		
Frequency reference		
P3.3.1.5	I/O reference A	AI 2
I/O Configuration		
Analogue input 2		
P3.5.2.2.2	AI 2 signal filter time	0 sec.
P3.5.2.2.3	AI 2 signal range	2 to 10 V/4 to 20 mA
Protections		
Motor thermal protection		
P3.9.2.1	Calculated motor thermal protection	no action

- The 4 to 20 mA signal is connected to AI 2 on the 4 (+) and 5 (to) terminals.
- The tracking control is started by connecting 8 (DI 1) to 6 (+24 V).
- Make sure that dipswitch AI 2 is in the Current signal position (down).

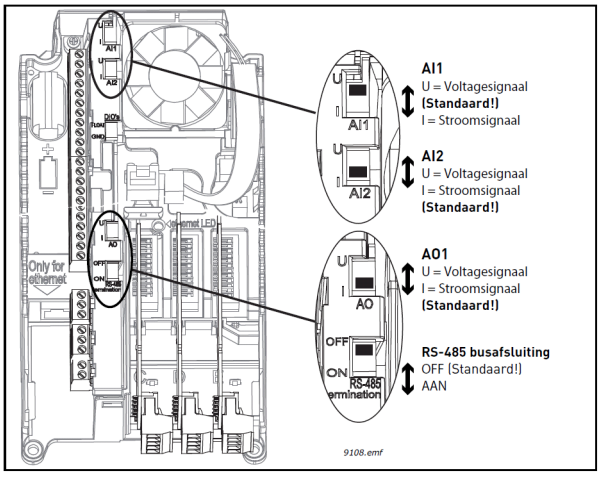


Location and selection of dipswitch AI 2

6.2.1.3 Application example: Up-down control (using Default Wizard 6.2.1)

Parameter group	*Description*	*Setting*
Motor settings		
Motor control		
P3.1.2.3	Internal switching frequency	Modification if excessive motor noise
P3.1.2.4	Identification	Ad stand still (start within 30 sec)
Motor limits		
P3.1.3.1	Current limit	Maximum permissible motor current ± 1.4x In
Start/Stop Settings		
P3.2.4	Start function	Ramping (pump)/Running start (fan)
P3.2.5	Stop function	Freewheel (fan)/Ramping (pump)
References		
Frequency reference		
P3.3.1.5	I/O reference A	Motor potentiometer
Motor potentiometer		
P3.3.4.3	Motor potentiometer ramping time	... Hz/s (equivalent to external control)
P3.3.4.4	Reset motor potentiometer	none/during stop/during power failure
I/O Configuration		
Digital inputs		
P3.5.1.1	Control signal 1 A (start clockwise)	DigIN Slot A.1
P3.5.1.2	Control signal 2 A (start counter clockwise)	DigIN Slot 0.1
P3.5.1.11	Close external error	DigIN Slot 0.1
P3.5.1.24	Increase motor pot	DigIN Slot A.2
P3.5.1.25	Decrease motor pot	DigIN Slot A.3
Analogue output		
P3.5.4.1.1	AO1 function	Output frequency
P3.5.4.1.3	AO 1 signal range	2 to 10 V/4 to 20 mA
Protections		
Motor thermal protection		
P3.9.2.1	Calculated motor thermal protection	no action

- The control is started by connecting 8 (DI 1) to 6 (+24 V).
- Increase speed, connect terminal 9 (DI 2) to 6 (+24 V).
- Decrease speed, connect terminal 10 (DI 3) to 6 (+24 V).
- Make sure that dipswitch AO 1 is in the Current signal position (down).



Location and selection of dipswitch AO 1

6.2.2 PID-Control Application (Wizard)

Please note! The **factory setting** must always be used as a starting point when using the application examples in this book. (P6.5.1)

With the PID control application Wizard, the following parameters appear:

Step	Parameter	Number	Description
1	Motor type	P3.1.2.2	Permanent magnet or induction motor
2	Rated voltage	P3.1.1.1	Varies
3	Rated motor frequency	P3.1.1.2	8 to 320 Hz.
4	Rated motor speed	P3.1.1.3	24 to 19,200 rpm
5	Rated motor current	P3.1.1.4	Varies
6	Cos phi of the motor	P3.1.1.5	0.3 to 1
7	Minimum frequency	P3.3.1.1	0 Hz. … P3.3.1.2
8	Maximum frequency	P3.3.1.2	P3.3.1.1 … 320 Hz.
9	acceleration time	P3.4.1.2	0.1 to 300 s
10	deceleration	P3.4.1.3	0.1 to 300 s
11	Control location		I/O - terminals Fieldbus Control Panel
12	Selection of process unit	P3.13.1.4	Various options
13	Minimum process unit	P3.13.1.5	Minimum value of sensor, e.g. (0 - 10 bar) = 0 bar
14	Maximum process unit	P3.13.1.6	Maximum value of sensor, e.g. 10 bar
15	Decimal process unit	P3.13.1.7	Decimal places (0 to 0.0000)
16	Feedback 1 source selection	P3.13.3.3	Position sensor, e.g. (AI 2)
17	Signal range analogue inputs		0 to 10 V/0 to 20 mA 2 to 10 V/4 to 20 mA
18	Inversion error	P3.13.1.8	Normal/inverted
19	Reference point source selection	P3.13.2.6	Reference location PID (Control panel reference point 1)
20	Control panel reference point 1	P3.13.2.1	Fill in operating point
21	Sleep function?		Yes/no
If no is selected, Wizard complete			
22	Sleep frequency	P3.13.5.1	0 to 320 Hz.
23	Sleep delay 1	P3.13.5.2	0 to 3,000 s
24	Wake-up level	P3.13.5.3	Regulator starting point

6.2.2.1 Application example: PID control (using PID control Wizard 6.2.2)

Parameter group	*Description*	*Setting*
P1.2	Application	PID control
Motor settings		
Motor control		
P3.1.2.3	Internal switching frequency	Modification if excessive motor noise
P3.1.2.4	Identification	Ad stand still (start within 30 sec)
Motor limits		
P3.1.3.1	current limit	Maximum permissible motor current ± 1.4x In
Start/Stop Settings		
P3.2.4	Start function	Ramping (pump)/Running start (fan)
P3.2.5	Stop function	Freewheel (fan)/Ramping (pump)
P3.2.6	Logic I/O A	Forward-reverse (pulse) If reset error, break start contact Forward-reverse If reset error, autostart Change also P3.9.1.15 (no action)
References		
Frequency reference		
P3.3.1.1	Minimum frequency reference	... Hz*
P3.3.1.5	I/O reference A	PID
Flushing		
P3.3.6.2	Flushing frequency	... Hz if DI 6 is made (No start contact required)
I/O Configuration		
Digital inputs		
P3.5.1.1	Control signal 1 A (start clockwise)	DigIN Slot A.1
P3.5.1.4	Control signal 1 A	DigIN Slot 0.1
P3.5.1.7	Force to I/O control	DigIN Slot 0.1
P3.5.1.8	Force to I/O B reference	DigIN Slot 0.1
P3.5.1.11	External error when closed	DigIN Slot 0.1
P3.5.1.12	External error when open	DigIN Slot A.2
P3.5.1.13	Close error reset	DigIN Slot A.3
P3.5.1.31	PID Select SP 2	DigIN Slot A.4
P3.5.1.36	Flushing reference asset	DigIN Slot A.6
Analogue input 2		
P3.5.2.2.3	AI 2 signal range	2 to 10 V/4 to 20 mA
Protections		
Motor thermal protection		
P3.9.2.1	Calculated motor thermal protection	no action
AI level low		
P3.9.8.2	Analogue input low	error
PID Regulator 1		
Basic settings		
P3.13.1.1	PID gain	200% (> the control speeds up)
P3.13.1.2	PID control I time	3 to 10 (> the control slows down)
P3.13.1.3	PID contr. D time	0 to 1 (1 > regulation lags behind)
P3.13.1.4	Selection of process unit	bar, m³/h, %, m/s etc.
P3.13.1.5	Min. process unit	minimum value sensor (reading sensor)
P3.13.1.6	Max. process unit	maximum value sensor (reading sensor)
P3.13.1.7	Decimal process unit	Readout behind decimal point (monitoring)
Reference points		
P3.13.2.1	Control panel reference point 1	Setting operating point 1 (bar)
P3.13.2.2	Control panel reference point 2	Setting operating point 2 (bar)
P3.13.2.6	Reference point source 1 selection	Control panel reference point 1
P3.13.2.10	Reference point source 2 selection	Control panel reference point 2
Feedback		
P3.13.3.3	Feedback 1 source selection	AI 2
Sleep frequency		
P3.13.5.1	Sleep frequency limit SP 1	... .Hz goes to sleep*
P3.13.5.2	Reference 1 sleep delay	….sec.
P3.13.5.3	Reference 1 wake-up level	Set start value SP 1 (bar)*
P3.13.5.7	Sleep frequency limit SP 2	... .Hz goes to sleep*
P3.13.5.8	Reference 2 sleep delay	….sec.
P3.13.5.9	Reference 2 wake-up level	Set start value SP 2 (bar)*
Feedback monitoring		
P3.13.6.1	Enable feedback monitoring	Enabled/Disabled
P3.13.6.2	Upper limit value	Enter maximum pressure (bar)
P3.13.6.3	Lower limit	Enter minimum pressure (bar)
P3.13.6.4	Delay time	…. sec.

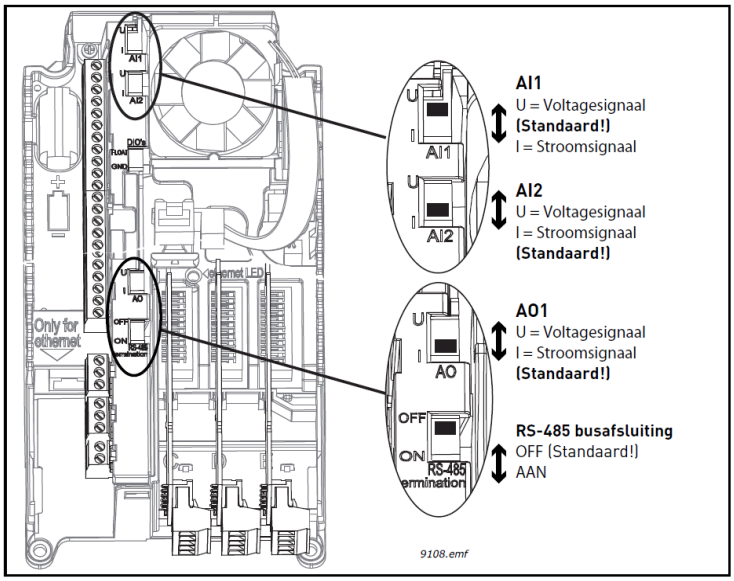
*) For the correct adjustment of the minimum frequency and sleep frequency, see Section 7.2

All these parameters are adjusted via the Wizard

see reverse

The 4 to 20 mA pressure transducer is connected to AI 2 on terminals 4 (-) and 12 (+)

- A through-connection must be made between 5 and 7.
- Make sure that dipswitch AI 2 is in the Current signal position (down).



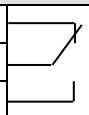
Location and selection of dipswitch AI 2

- PID control is started by connecting 8 (DI 1) to 6 (+24 V).
- Water thermostat (°C) or float must be connected to 9 (DI 2) and 6 (+24 V).
- A fault can be reset remotely by connecting 10 (DI 3) to 6 (+24 V).
- To switch from target setpoint 1 to 2, connect 14 (DI 4) to 12 (+24 V).
- Flushing is activated by connecting 16 (DI 6) to 12 (+24 V).

6.2.2.2 Terminals

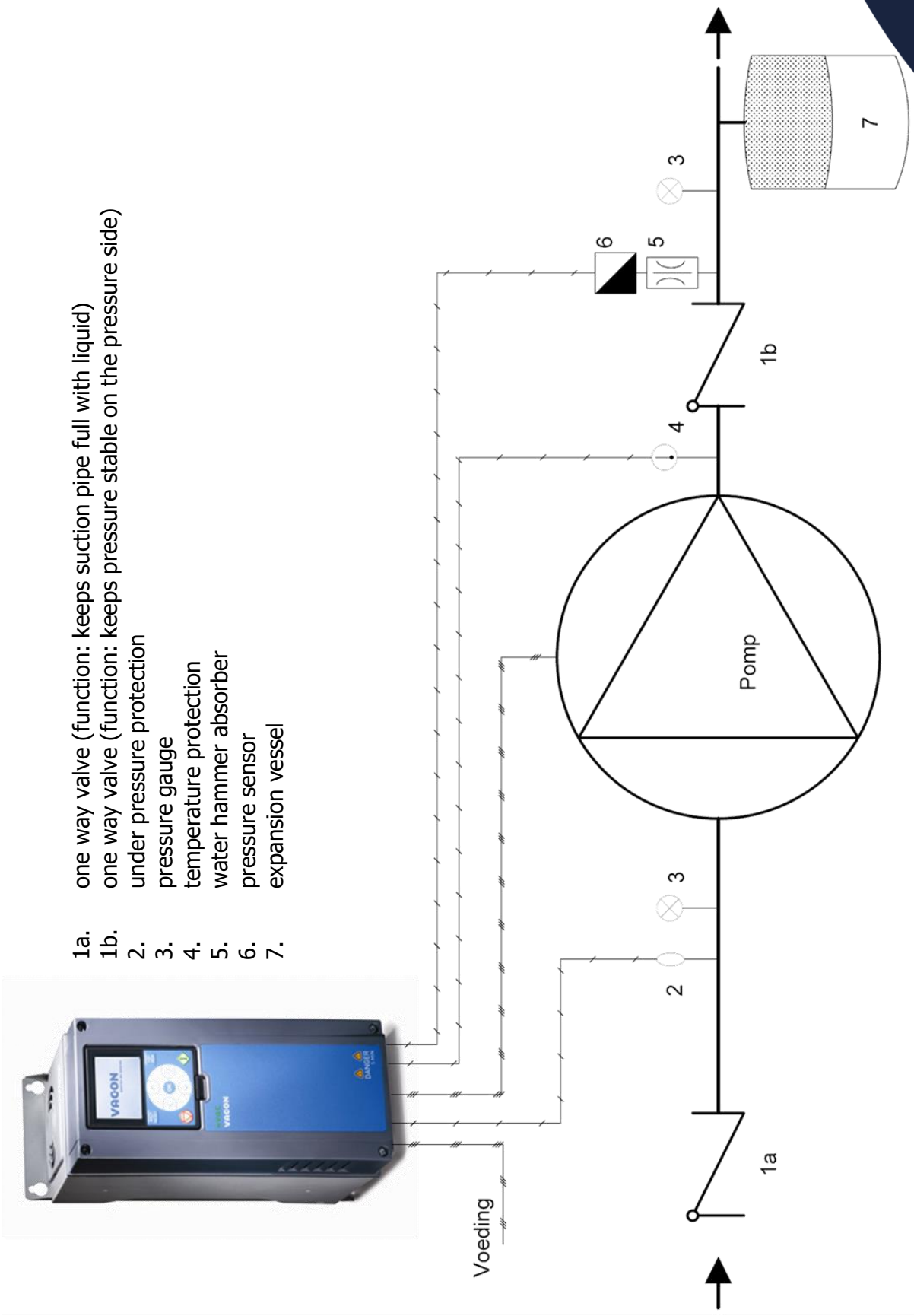
According to the settings of PID control 6.2.2.1

Basic I/O board			
terminal		**signal**	**description (PID settings)**
1	+10 V_{ref}	Reference output	Power supply for potentiometer, etc.
2	AI 1+	Analogue input, 0 to 10 V DC or 0/4 to 20 mA	Voltage input frequency reference
3	AI 1-	Analogue input reference potential	Reference potential inputs and outputs
4	AI 2+	Analogue input, 0 to 10 V DC or 0/4 to 20 mA	Programmable current input
5	AI 2-	Analogue input reference potential	
6	+ 24 V	Output voltage control	Power supply for contacts, etc. max 0.1 A
7	GND	I/O reference potential	Reference potential inputs and outputs
8	DI 1	Digital input 1	Start PID (programmable contact)
9	DI 2	Digital input 2	External error if contact is broken (programmable contact)
10	DI 3	Digital input 3	reset failure (programmable contact)
11	CM	Additional reference potential for DI 1 to DI 6	Is connected to GND (earth). Can also be insulated from GND by jumpers
12	+ 24 V	Output voltage control	Power supply for contacts, etc. max 0.1 A
13	GND	I/O reference potential	Reference potential inputs and outputs
14	DI 4	Digital input 4	Fixed frequency selection 0. (Binary) (programmable contact)
15	DI 5	Digital input 5	PID reference 2 (programmable contact)
16	DI 6	Digital input 6	Switching between control signal source (programmable contact)
17	CM	Additional reference potential for DI 1 to DI 6	Is connected to GND (earth). Can also be insulated from GND by jumpers
18	AO 1+	Analogue output	Programmable range 0 to 20 mA / R max 500.Ω
19	AO-/GND		
30	+24 V in	24 V input voltage	
A	RS-485		
B	RS-485		

Relay board 1				
21	RO1 nc		Relay output 1	Programmable (run)
22	RO1 com			
23	RO1 no			
24	RO2 nc		Relay output 2	Programmable (fault)
25	RO2 com			
26	RO2 no			
32	RO3 com		Relay output 3	Programmable (ready)
33	RO3 no			

7 Pressurised Water Systems

7.1 Pressurised water system wiring plan (PID)



7.2 Setting up pressurised water systems

To turn off a pressurised water system properly with a Vacon 100, a number of parameters have to be adjusted as follows:

- Set the Vacon 100 to manual (keypad).
- Set one of the monitor fields to (PID1 feedback).
- Connect the pressure line, and slowly build up the frequency to the target value P3.13.2.1 (setpoint 1) or P3.13.2.2 (setpoint 2).

Note: In an installation with inlet pressure from a silo,
make sure that the inlet pressure from the lowest level of the silo is used. In case of large differences in level and thus inlet pressure, the motor might not drop below the sleep frequency, meaning the regulator will not enter sleep mode.

Frequency in a closed pipeline and the target value	Increase sleep frequency with	Increase minimum frequency with
up to 40 Hz	± 2.0 Hz	± 1.0 Hz
40 to 44 Hz	± 1.5 Hz	± 0.7 Hz
44 to 47 Hz	± 1.0 Hz	± 0.5 Hz
47 to 49 Hz	± 0.5 Hz	± 0.2 Hz

Now fill in the resulting minimum frequency and sleep frequency according to the above table.

Example:
Frequency in a closed pipeline with target pressure 44.5 Hz
Sleep Frequency: 45.5 Hz
Minimum frequency: 45.0 Hz

If the application works with a 2nd target value, it must be ensured that the minimum frequency is linked to the lowest target value.

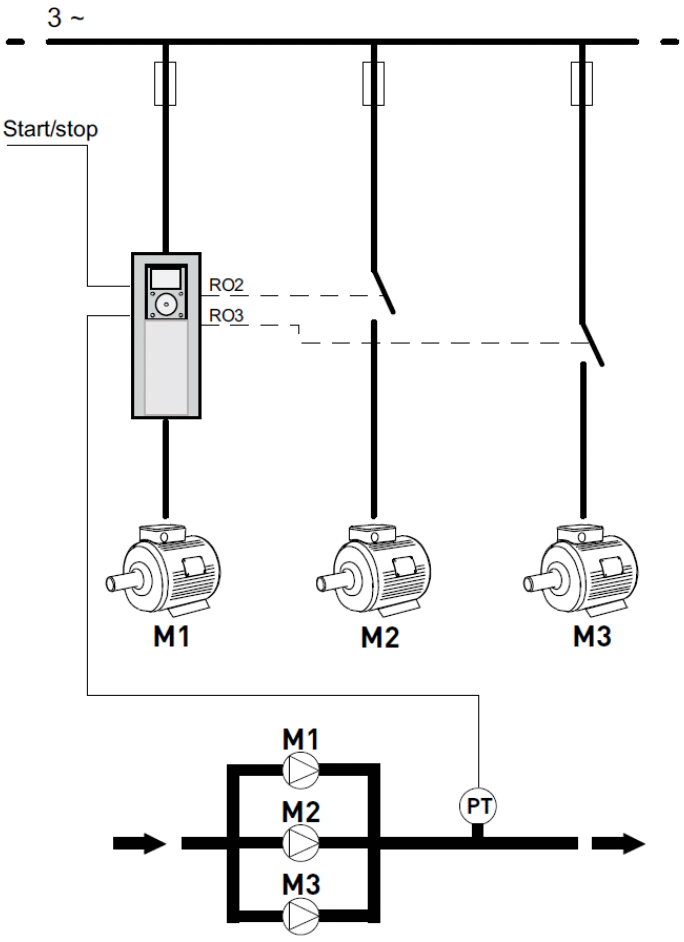
Make sure that the start value is always less than the target value, otherwise the Vacon 100 will never enter into sleep mode.

8 Multi-Pump

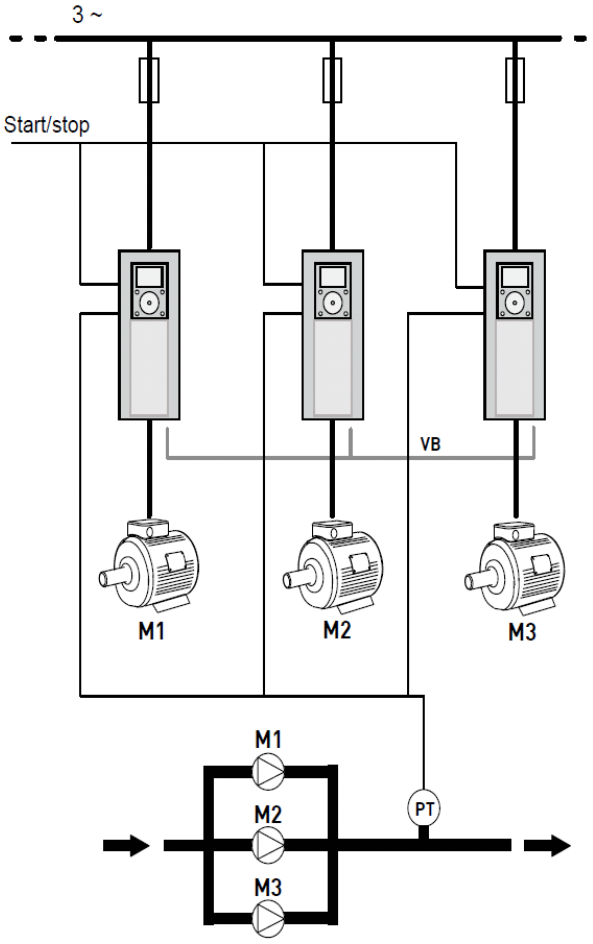
8.1 Multi-Pump Single Drive/Multi-Drive

The Multi-pump application controls systems with multiple pumps.

- Single-drive is a system which can control up to 8 pumps using 1 regulator and multiple contactors/soft starters.
- Multi-drive is a system with multiple (max. 8) regulators. These keep the system pressurised via an independent communication bus.



Single drive



Multi-drive

8.2 Multi-pump Multi-drive application (Wizard)

Please note! The **factory setting** must always be used as a starting point when using the application examples in this book. (P6.5.1)

With the Multi-Pump (Multi-Drive) application, the following parameters appear:

Step	Parameter	Number	Description
1	Motor type	P3.1.2.2	Permanent magnet or induction motor
2	Rated voltage	P3.1.1.1	Varies
3	Rated motor frequency	P3.1.1.2	8 to 320 Hz.
4	Rated motor speed	P3.1.1.3	24 to 19,200 rpm
5	Rated motor current	P3.1.1.4	Varies
6	Cos phi of the motor	P3.1.1.5	0.3 to 1
7	Minimum frequency	P3.3.1.1	0 Hz. … P3.3.1.2
8	Maximum frequency	P3.3.1.2	P3.3.1.1 … 320 Hz
9	Acceleration time	P3.4.1.2	0.1 to 300 s
10	Deceleration	P3.4.1.3	0.1 to 300 s
11	Control location		I/O - terminals Fieldbus Control Panel
12	Selection of process unit	P3.13.1.4	Various options
13	Minimum process unit	P3.13.1.5	Minimum value of sensor, e.g. (0 to 10 bar) = 0 bar
14	Maximum process unit	P3.13.1.6	Maximum value of sensor, e.g. 10 bar
15	Decimal process unit	P3.13.1.7	Decimal places (0 to 0.0000)
16	Feedback 1 source selection	P3.13.3.3	Position sensor, e.g. (AI 2)
17	Signal range analogue inputs		0 to 10 V/0 to 20 mA 2 to 10 V/4 to 20 mA
18	Inversion error	P3.13.1.8	Normal/inverted
19	Reference point source selection	P3.13.2.6	Reference location PID (Control panel reference point 1)
20	Control panel reference point 1	P3.13.2.1	Fill in operating point
21	Sleep function?		Yes Step 20 ➲ No Step 23 ➲
22	Sleep frequency	P3.13.5.1	0 to 320 Hz.
23	Sleep delay 1	P3.13.5.2	0 to 3,000 s
24	Wake-up level	P3.13.5.3	Regulator starting point
25	Multi-pump mode	P3.15.1	Multi-follower / Multi-master
26	Pump ID number	P3.15.3	1 to 8
27	Start and feedback	P3.15.4	Signals connected/Only start signal/Disconnected
28	Number of pumps	P3.15.2	1 to 8
29	Pump block	P3.15.5	Unused/Unblocked
30	Autochange	P3.15.6	Blocked Step 34 ➲ Enabled (interval) Step 31, 34 ➲ Enabled (weekdays) Step 32➲
31	Autochange interval	P3.15.8	0 to 3,000 h
32	Autochange days	P3.15.9	Sunday to Saturday
33	Autochange time	P3.15.10	00:00:00 to 23:59:59
34	Range	P3.15.13	0 to 100%
35	Range delay	P3.15.14	0 to 3600 s

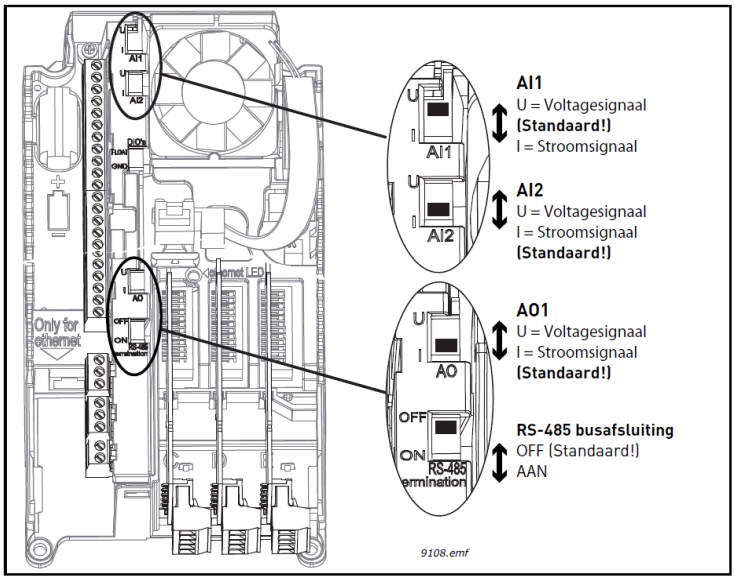
8.2.1 Application example: Multi-pump Multi-drive (Via Multi-pump Wizard 8.2)

Parameter group	*Description*	*Setting*
P1.2	Application	Multi-pump (Multi-drive)
Motor settings		
Motor control		
P3.1.2.3	Internal switching frequency	Modification if excessive motor noise
P3.1.2.4	Identification	Ad stand still (start within 30 sec)
Motor limits		
P3.1.3.1	Current limit	Maximum permissible motor current ± 1.4x In
Start/Stop Settings		
P3.2.4	Start function	Ramping (pump)/Running start (fan)
P3.2.5	Stop function	Freewheel (fan)/Ramping (pump)
P3.2.6	Logic I/O A	Forward-reverse (pulse) If reset error, break start contact Forward-reverse If reset error, autostart Change also P3.9.1.15 (no action)
References		
Frequency reference		
P3.3.1.1	Minimum frequency reference	... Hz*
P3.3.1.5	I/O reference A	PID
Flushing		
P3.3.6.2	Flushing reference	... Hz (Start at DI 2 requires no start contact)
I/O Configuration		
Digital inputs		
P3.5.1.1	Control signal 1 A (start clockwise)	DigIN Slot A.1
P3.5.1.11	External error when closed	DigIN Slot 0.1
P3.5.1.12	External error when open	DigIN Slot A.6
P3.5.1.13	Close error reset	DigIN Slot A.4
P3.5.1.31	PID Select SP 2	DigIN Slot A.3
P3.5.1.36	Activation flushing reference	DigIN Slot A.2
Analogue input 2		
P3.5.2.2.3	AI 2 signal range	2 to 10 V/4 to 20 mA
Protections		
Motor thermal protection		
P3.9.2.1	Calculated motor thermal protection	no action
AI level low		
P3.9.8.2	Analogue input low	error
PID Regulator 1		
Basic settings		
P3.13.1.1	PID gain	200% (> the control speeds up)
P3.13.1.2	PID control I time	3 to 10 (> the control slows down)
P3.13.1.3	PID control D time	0 to 1 (1 > regulation lags behind)
P3.13.1.4	Selection of process unit	bar, m³/h, %, m/s etc.
P3.13.1.5	Min. process unit	minimum value sensor (reading sensor)
P3.13.1.6	Max. process unit	maximum value sensor (reading sensor)
P3.13.1.7	Decimal process unit	Readout behind decimal point (monitoring)
Reference points		
P3.13.2.1	Control panel reference point 1	Setting operating point 1 (bar)
P3.13.2.2	Control panel reference point 2	Setting operating point 2 (bar)
P3.13.2.6	Reference point source 1 selection	Control panel reference point 1
P3.13.2.10	Reference point source 2 selection	Control panel reference point 2
Feedback		
P3.13.3.3	Feedback 1 source selection	AI 2
Sleep frequency		
P3.13.5.1	Sleep frequency limit SP 1	... .Hz goes to sleep*
P3.13.5.2	Reference 1 sleep delay	….sec.
P3.13.5.3	Reference 1 wake-up level	Set start value SP 1 (bar)*
P3.13.5.7	Sleep frequency limit SP 2	... .Hz goes to sleep*
P3.13.5.8	Reference 2 sleep delay	….sec.
P3.13.5.9	Reference 2 wake-up level	Set start value SP 2 (bar)*
Feedback monitoring		
P3.13.6.1	Enable feedback monitoring	Enabled/Disabled
P3.13.6.2	Upper limit value	Enter maximum pressure (bar)
P3.13.6.3	Lower limit	Enter minimum pressure (bar)
P3.13.6.4	Delay time	…. sec.
Multi-pump		
P3.15.1	Multi-pump mode	Single drive Multi-follower (synchronous control) Multi-master (1 pump regulated)
P3.15.2	Number of pumps	1 to 8

Parameter group	*Description*	*Setting*
P3.15.3	Pump ID number	1 to 8
P3.15.4	Start and feedback	Signals connected/Only start signal / Not connected
P3.15.5	Pump block	Not used/Release
P3.15.6	Autochange mode	Blocked Enabled (interval) Enabled (weekdays)
P3.15.7	Autochange pumps	Auxiliary pumps/all pumps
P3.15.8	Autochange interval	0 to 3,000 h
P3.15.9	Autochange days	Sunday to Saturday
P3.15.10	Autochange time	00:00:00 to 23:59:59
P3.15.11	Autochange frequency limit	50 Hz.
P3.15.12	Autochange pump limit	Max. number of pumps
P3.15.13	Range	2% determined when pumps are switched on
P3.15.14	Range delay	5 s
P3.15.15	Constant production speed	100%

*) For the correct adjustment of the minimum frequency and sleep frequency, see Section 7.2
All these parameters are adjusted via the Wizard

- The 4 to 20 mA pressure transducer is connected to AI 2, to the 4 (-) and 12 (+) terminals
- A through-connection must be made between 5 and 7.
- Make sure that dipswitch AI 2 is in the Current signal position (down).
- At the first and last connected regulators, make sure that the RS-485 bus termination dipswitches are set to ON: all others should be set to OFF



Location and selection AI 2 dip switch and RS-485 bus termination

- PID control is started by connecting 8 (DI 1) to 6 (+24 V).
- Flushing is activated by connecting 9 (DI 2) to 6 (+24 V).
- To switch from target value 1 to 2, connect 10 (DI 3) with 6 (+24 V).
- A fault can be reset remotely by connecting 14 (DI 4) with 12 (+24 V).
- Water thermostat (°C) or float must be connected to 16 (DI 6) and 12 (+24 V).
- Connect A and B (RS-485) of the various regulators with each other.

For wiring diagrams, consult:
www.vanderendegroep.nl/nl/producten/frequentieregelaars/vacon-100-flow

Notes

The parameters listed in this booklet are merely examples from which no rights can be derived.

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