



Pump Pro2 (D)



EN Installation and operating manual

EN: Compliance of the product with EU standards:

- Machinery directive (2006/42/EC).
Standard used: EN 809;
- Low Voltage (2014/35/EU).
Standard used: EN 60335-1; EN 60335-2-51;
- Electromagnetic compatibility (2014/30/EU).
Standard used: EN 55014-1; EN 55014-2; EN 61000-3-2; EN 61000-3-3;
- Ecodesign Directive (2009/125/EC).
Standard used: EN 16297-1:2012;
- Circulators: Commission regulation No.614/2009.
For EEI see nameplate.
Standard used: EN 16297-1:2012; EN 16297-2:2012;

English (EN) Installation and operating manual

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Symbols used in this manual:

Warning:



Safety precautions which, if ignored could cause personal injury or machinery damage

Notes:



Tips that could ease pump handling.

1 GENERAL INFORMATION

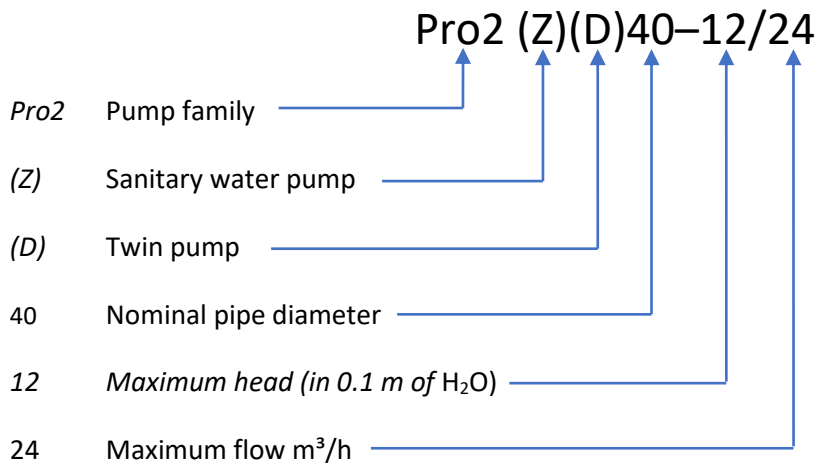
1.1 USES

The Pro2 circulating pumps are used for the transfer of liquid medium within systems for hot-water heating, air-conditioning and ventilation. They are designed as single or twin variable-speed pumping aggregates where the speed is regulated by electronic device. The pump constantly measures pressure and flow and adjusts the speed according to the set pump mode.

The pumps have the option of remote control and monitoring using Ethernet, Modbus, analog inputs and outputs, and relay control. See communication installation for more information.

The main purpose of the twin pump is uninterrupted operation if one of the pumps fails. Common hydraulic housing is equipped with a change-over flap and two pump heads, separately connected to the electrical grid.

1.2 PUMP LABELING



1.3 PUMP MAINTENANCE, SPARE PARTS AND DECOMMISSIONING

Pumps are designed to operate without maintenance for several years.

This product and its components must be disposed of in an environmentally friendly manner.

2 SAFETY

These instructions should be studied carefully before installing or operating the pump. They are meant to help you with installation, use and maintenance and to increase your safety. Installation should only be performed with regards to local standards and directives. Only qualified personnel should maintain and service these products.

Failure in following these instructions can cause damage to the user or product and can void warranty. Safety functions are only guaranteed if the pump is installed, used and maintained as described in this manual.

3 TECHNICAL SPECIFICATIONS

3.1 STANDARDS AND PROTECTIONS

Pumps are made according to the following standards and protections:

Protection class:

IP44

Insulation class:

180 (H)

Motor protection:

Thermal - built in

Installation specification		
Pump type	Nominal pressure	Installation length (mm)
Pro2(Z) 25U-6/9	PN6 and PN10	180
Pro2(Z) 25U-10/12		180
Pro2(Z) 32U-6/9		180
Pro2(Z) 32U-10/12		180
Pro2 32F-6/9		220
Pro2 32F-10/12		220
Pro2 (D)40-8/19		220
Pro2 40-10/12		220
Pro2 (D)40-12/24		250
Pro2 (D) 50-8/32		280
Pro2 50-10/12		240
Pro2 (D) 50-12/37		280

3.2 PUMP MEDIUM

Pump medium can be pure water or a mixture of pure water and glycol, which is appropriate for central heating system. Water must meet water quality standard VDI 2035. The medium must be free from aggressive or explosive additives, free from mixtures of mineral oils and solid or fibrous particles. The pump should not be used for pumping flammable, explosive media and in an explosive atmosphere.

3.3 TEMPERATURES AND AMBIENT HUMIDITY



- Operation outside recommended conditions may shorten pump lifetime and will void the warranty.

Permitted ambient and media temperature:			
Ambient temperature [°C]	Medium temperature [°C]		Relative ambient humidity
	min.	max.	
Up to 25	-10	110	<95 %
30	-10	100	
35	-10	90	
40	-10	80	

3.4 ELECTRICAL SPECIFICATIONS

3.4.1 CURRENT, VOLTAGE AND POWER RATINGS

Electrical ratings					
Pump	Rated voltage	Rated power [W]	Rated current [A]	Rated current (I_{max}) [A]	Startup
Pro2(Z) xxx-6	230 VAC \pm 15 %, 47-63Hz Pumps operate at reduced voltage with limited power ($P=I_{max} * U$)	90	0,75	0,75	Built-in startup circuit
Pro2(Z) xxx-10		180	1,5	1,5	
Pro2(D) 40-80		270	1,3	4,3	
Pro2(D) 40-120		480	2,3	4,3	
Pro2(D) 50-80		345	1,6	4,3	
Pro2(D) 50-120		560	2,5	4,3	
Pro2(D) 65-80		560	2,6	4,3	

3.4.2 COMMUNICATION SPECIFICATIONS

To see communication functions see chapter 5.1 Control and functions

3.4.3 ANALOG INPUTS AND OUTPUTS

Connections can be used either as inputs or outputs, depending on setup. Pump has 3 connectors: SET1, SET2 and SET3.

Electrical properties		
Input voltage	-1 - 32 VDC	When used as input.
Output voltage	0 - 12 VDC	When used as an output. Max. 5 mA load on individual output.
Input impedance	\sim 100 k Ω	0,5 mA additional load for most configurations.
Input sink current	0 - 33 mA	Common sink on COM, if used as output
Galvanic isolation		4 kV up to 1 s, 275 V permanent.

3.4.4 RELAY OUTPUT

Electrical properties	
Rated current	3 A
Maximum voltage	230 VAC, 32 VDC

3.4.5 ETHERNET

Electrical properties	
Connector	RJ-45, 10BASE-T, 10 Mbit/s.
Services	- Web server (port 80) - Software update through web interface. - Option of Modbus RTU through TCP/IP
Default IP address	192.168.0.245 (192.168.0.246 for right pump)
Ethernet visual diagnostics	LED1 LED2 Slowly blinking if module is on. Lights up when the connection is established.

3.4.6 MODBUS

Modbus specification		
Data protocol	Modbus RTU	
Modbus connector	Screwless terminals	2+1 pins. See communication manual.
Modbus connection type	RS-485	
Modbus wire configuration	Two-wire + common	Conductors: A, B and COM (Common). See communication manual.
Communication transceiver	Integrated, 1/8 of standard load	Connect either via passive taps or daisy chain.
Maximum cable length	1200 m	See communication manual.
Slave address	1-247	Default is 245, settable over Modbus. See communication manual.
Line termination	Not present	Line termination is not integrated. For low speed/short distance, termination can be omitted. Otherwise, terminate the line externally on both ends.
Supported transmission speeds	1200, 2400, 4800, 9600, 19200, 38400 baud	Settable over Modbus register [default=19200].
Start bit	1	Fixed.
Data bits	8	Fixed.
Stop bits	1 or 2	1 stop bit minimum, up to 2 when parity not enabled [default=1]
Parity bit	Even/odd/none	[default=Even]
Modbus visual diagnostics	LED2	Flashing yellow when data reception detected. Combined (OR) with Ethernet ACT function.
Maximum number of Modbus devices	247	Limited by possible Modbus addresses to 247. 1/8 nominal load enables 256 devices.
Maximum Modbus packet size	256 bytes	Including address (1) and CRC (2) bytes.
Isolation	Common ground (COM) with SET1, SET2 and SET3.	Modbus shares common ground with other signals.

4 PUMP INSTALLATION

4.1 INSTALLATION INTO PIPE LINES

Pump is protected with a double box during transport. It can be lifted from the box with internal handles or by lifting it by the heat sink.

Pumps are designed to be built in connecting flanges, using all screws. The connecting combined flanges are designed so the pump can be installed in PN6 or PN10 nominal pressure pipelines. Because of the combined flange design, washers must be used on the pump side, when installing the pump.

For a pump to operate with minimal vibrations and noise it should be installed into pipe lines with its 1-1 axis in horizontal position, as showed in figure 1. Pipes should be without curves for at least 5-10 D (D = rated pipe diameter) from the flanges.

Desired head orientation can be achieved by rotating the pump head (allowed positions shown in figure 2 and 3). Pump head is mounted to hydraulic casting with four screws. By unscrewing those, the pump head can then be turned (figure 4).

Ambient around the pump should be dry and illuminated as appropriate and the pump should not be in direct contact with any objects. Pump seals prevents dust and particles from entering as prescribed by IP class. Make sure that the distribution box cover is mounted and that the cable glands are tightened and are sealing.

Pump will provide the longest lifetime with ambient at room temperature and moderate medium temperature. Prolonged operation at elevated temperatures could increase wear. Aging is accelerated by high power and high temperatures.



- Misconnection or overload could cause pump shutdown or even permanent damage.



- Pumps might be heavy. Provide yourself help if needed,
- Pump must not be used in the safety pipelines,
- Pump should not be used as a holder during welding!
- When reassembling, care should be taken to ensure seal fit. Failing that, water could cause damage to pumps internal parts,
- Drains between pump motor housing and hydraulic housing must be left free (should not be thermally insulated), as it could interfere with cooling and condense drainage,
- Hot medium can cause burns! The motor can also reach temperatures that could cause injury.

4.2 ELECTRICAL INSTALLATION

The pump has a built-in over current fuse and protection, temperature protection and basic overvoltage protection. It doesn't need an additional thermal protection switch. Connection leads should be capable of carrying rated power and should be properly fused. Ground lead connection is essential for safety. It should be connected first. Grounding is only meant for pump safety. Pipes should be grounded separately.



- Connection of the pump must be carried out by qualified personnel,
- Connection of the connecting cable must be done in a manner that ensures it is never in contact with the casing of the device, due to the high temperatures of the casing,
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved,
- Children shall not play with the appliance,
- Cleaning and user maintenance shall not be made by children without supervision.

4.3 COMMUNICATION INSTALLATION

4.3.1 ANALOG INPUT/OUTPUT

Detailed description is available in communication module manual.

4.3.2 RELAY OUTPUT

Detailed description is available in communication module manual.

4.3.3 ETHERNET

Detailed description is available in communication module manual.

4.3.4 MODBUS

Detailed description is available in communication module manual.

5 SETUP AND OPERATION

5.1 CONTROL AND FUNCTIONS

The pump can be controlled by display panel, 10-step switch, analog inputs, modbus or Ethernet connection.

- Display panel controls and overviews pump modes, parameters and on/off status,
- 10-step switch allows changing of relay output, analog inputs/outputs and resetting the pumps communication configuration,
- Analog inputs gives control over the pump (start, stop, max. curve, min. curve, 0 - 10 V, 4 – 20 mA, ...),
- Analog outputs are used for getting analog information about the pumps performance (errors, speed, mode, flow, height),
- Relay output signalizes pumps status,
- Ethernet connections offers control over all pump functions and settings (pumps variables, digital inputs, error overview),
- Modbus connection gives overview of all parameters and settings (pumps variables, analog inputs/outputs, error overview).

Several signals will influence the pump operation. For this reason, settings have different priorities as shown in the table below. If two or more functions are active at the same time, the one with highest priority will take precedence.

Priority	Pump control panel and Ethernet settings	External signals ¹	Modbus control
1	Stop (OFF)		
2	Active night mode ²		
3	Max. speed (Hi)		
4		Minimal curve	
5		Stop (RUN not active)	
6		Max. speed (Hi) ³	Stop
7			Reference point
8		Reference point	
9	Reference point		

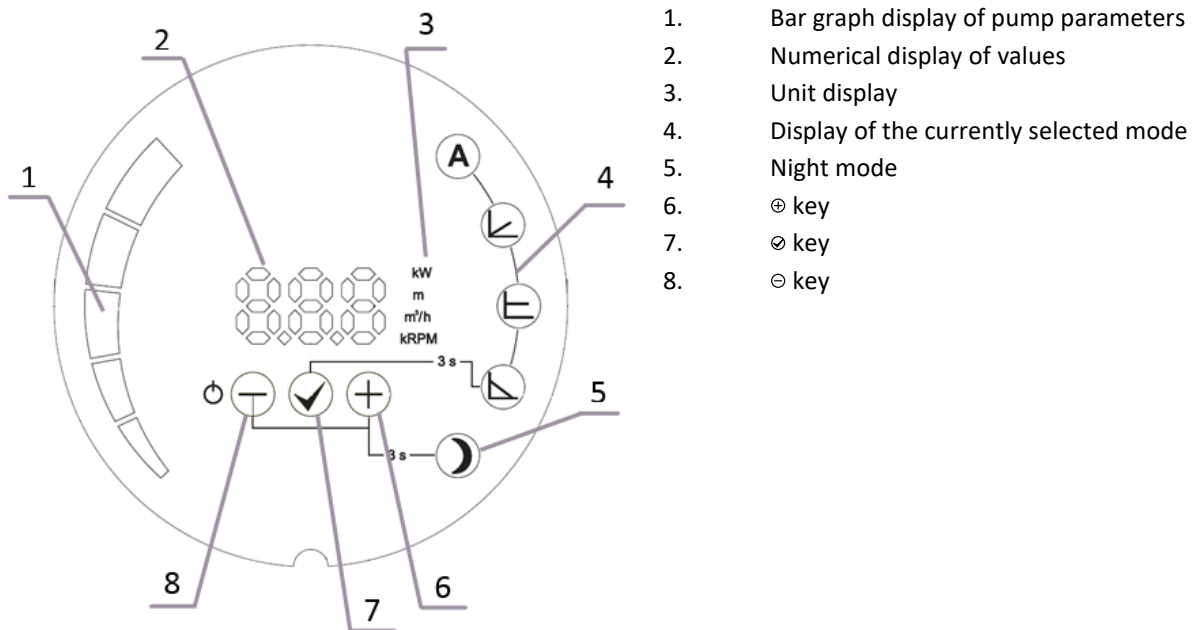
¹ All inputs are not available in every mode of operation.

² In night mode the external signals and Modbus stop signal become active. Due to the possibility of confusion it is not recommended using the night mode while using external signals.

³ Not available if using Modbus communication.

5.1.1.1 DISPLAY PANEL

With the use of the display panel, you can control and overview pump modes, on/off control, pump parameters and errors. To see how pump modes work, see chapter 5.2 Operation.



1. Bar graph display of pump parameters
2. Numerical display of values
3. Unit display
4. Display of the currently selected mode
5. Night mode
6. ⊕ key
7. ⊗ key
8. ⊖ key

5.1.1.1.1 KEY FUNCTIONS

⊖ Key

Short press:

- Scrolling through parameters downwards when not changing parameter values,
- Scrolling through modes downwards when mode selection is selected,
- Changing parameters downwards when setting parameter values.

Long press:

- 3 seconds together with ⊕ turns on night mode,
- 3 seconds together with ⊗ locks pumps current operation,
- 5 seconds to turn off pump,
- 5 seconds together with ⊗ and ⊕ keys to restore pump to factory settings.

⊗ Key

Short press:

- To confirm currently selected values of both mode and parameter.

Long press:

- 3 seconds to trigger mode selection,
- 3 seconds together with ⊖ locks pumps current operation,
- 5 seconds together with long press on ⊖ and ⊕ keys to restore pump to factory settings.

⊕ Key

Short press:

- Scrolling through parameters upwards when not changing parameter values,
- Scrolling through modes upwards when mode selection is selected,
- Changing parameters upwards when setting parameter values.

Long press:

- 3 seconds together with ⊖ puts us in night mode,
- 5 seconds together with ⊖ and ⊗ keys to restore pump to factory settings.

5.1.1.2 TURNING ON AND OFF

On first start up the pump will operate with factory settings in automatic mode.

With subsequent start-ups, the pump will operate with the last settings that were set prior to its shut-down.

To switch the pump off, press and hold the ⊖ key for 5 seconds, until OFF is shown on the display. When the pump is switched off, the numerical display shows OFF.

To turn the pump on, press the ⊖ key briefly.

5.1.1.3 PUMP MODES AND PARAMETERS

For transition between modes, we hold the ⊗ key for 3 seconds and then select the mode in which we wish the pump to operate with ⊕ or ⊖ keys. We confirm the selection with the ⊗ key.

After confirming the mode, the parameter, which can be set, will automatically be displayed and blink (except for auto mode). If necessary, we set the parameter value with ⊕ and ⊖ keys, then confirm the setting with the ⊗ key or just press the ⊗ key to accept the given parameter.

We can scroll through the parameters within a mode with ⊕ and ⊖ keys. We select the parameter that can be adjusted (see individual mode) in the mode with the ⊗ key and set the desired value with ⊕ and ⊖ keys. We confirm the selected value with the ⊗ key.

5.1.1.4 PUMP OPERATION LOCK

For locking and unlocking pump current pump mode and parameters, hold ⊖ and ⊗ keys for 3 seconds. When the pump is locked, it is possible to turn the pump on and off, view parameters and reset the pump to factory settings that also unlocks the pump.

5.1.2 10-STEP SWITCH

There is a mode selection rotary switch in the terminal box. It can be rotated by gently inserting a screwdriver into the arrow mark on top and rotating the switch to desired value.

Switch setting is read when the pump turns on! More details about different modes can be found in communications manual.

Mode switch position	Function	Description
0	Free configuration	Terminal functions are configured over Ethernet interface.
1	Mode 1	SET1 = RUN input SET2 = MAX input SET3 = FB (10.5 V) output, used to supply RUN and MAX inputs. External voltage source can also be used. RS-485 = Modbus interface.
2	Mode 2	SET1 = RUN input SET2 = SPEED input SET3 = FB (10.5 V) output, used to supply RUN and MAX inputs. External 5-24 V voltage source can also be used. RS-485 = Modbus interface
3..5	Reserved	Reserved for future or customer specific use.
6	Show relay configuration	LED1 and LED2 will show relay configuration.
7	Change relay configuration	Relay configuration will be increased (0->1, 1->2, 2->0) when power is turned on. LED1 and LED2 will show current relay configuration.
8	Twin reset to factory	Same as Mode 9, with exception of: module IP address is set to 192.168.0.246 Twin IP address is set to 192.168.0.245
9	Reset to factory	This mode will set communication interface to default values. Main purpose is to restore default settings. NOTE: <ul style="list-style-type: none"> Disconnect any SET1, SET2 and SET3 connections when using this mode to prevent possible harm to controller. SET1, SET2, SET3 will output test voltages of 10 V, 7 V and 5 V respectively. RS-485 port is actively driven. Relay will cycle. This is used for testing purposes. It is recommended that all module wires are disconnected to prevent possible harm to external controllers.

5.1.3 ANALOG INPUT/OUTPUT

The pump has three analog inputs/outputs with different functions. They can be configured through the web interface (page “pump”) or through Modbus.

Input/Output	Function	Function description
SET1	Run [Default - Mode 1]	Turning the pump on/off. By default activating with connection to SET3.
SET2	Max/Min [Default - Mode 1]	Set the pump to max. settings when SET1 is active and to min. settings when SET1 is inactive.
SET3	FB [Default - Mode 1]	10 V voltage output used for activating SET 1 and SET2 by connecting them to SET3.

5.1.4 RELAY OUTPUT

Configuration	Description
Run	Shows when pump is running.
Operate	Shows when pump is standby.
Error[Default]	Shows when pump has an error.
No function	Relay output doesn't show anything.
Always on	Relay always closed.

5.1.5 ETHERNET

The pump has a built in web server which allows you to access your pump directly via an existing Ethernet connection. The default address for access to the pump is "perfectapro" or 192.168.0.245

The web server uses HTML pages to set/view:

- Regulation mode settings
- Regulation parameters (power, RPM, head, flow)
- Relay settings
- External control inputs settings
- Current and previews error
- Pump statistics (power consumption, run time and other)

5.1.6 MODBUS

Pump has built in Modbus client, through which we can access pump information using the RS 485 standard.

Modbus allows to set and view:

- Regulation mode settings,
- Regulation parameters (power, RPM, head, flow),
- Relay settings,
- External control inputs settings,
- Current and previews error,
- Pump statistics (power consumption, run time and other).

5.1.7 RESETTING PUMP TO FACTORY SETTINGS

For resetting the pump to factory settings all three buttons must be held for 5 seconds. This way the pump will set itself to automatic mode, delete previous height and power settings and unlock setting pump operation (if locked).

Resetting of communications module needs following steps:

1. Disconnecting power from pump,
2. Set the 10-step switch to number 9⁴ (or 8 for right twin pump),
3. Turning the pump on and off again,
4. Setting the 10-step switch to number 1,
5. Turning the pump on.

Communications module should now be set to factory settings.

⁴ This also sets up the right twin pump.

5.2 OPERATION

The pump can operate in 5 different modes. We can set the pump in the most appropriate mode, depending on the system where the pump operates.

The pump modes:

- Automatic mode (factory default),
- Proportional pressure,
- Constant pressure,
- Constant speed,
- Combined mode (all mode indicators are off)

A Automatic mode

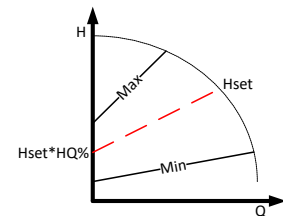
In automatic mode the pump automatically sets the operating pressure, depending on the hydraulic system. By doing so, the pump finds the optimal operating position.

This mode is recommended in most systems.

The parameters cannot be set; they can only be scrolled through.

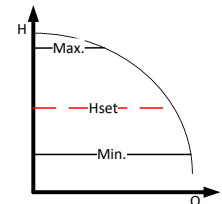
L Proportional pressure

The pump maintains the pressure with relation to the current flow. The pressure is equal to the set pressure (Hset on the drawing) at maximum power; at 0 flow it is equal to HQ % (default 50%, HQ % can be set on the pump webpage) of the set pressure. In between, the pressure changes linearly, relative to the flow. In regulated mode we can only set the pump pressure (Hset on the drawing). We can only scroll through the other parameters.



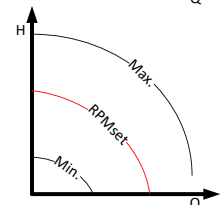
L Constant pressure

The pump maintains the currently set pressure (Hset on the drawing), from 0 flow to maximum power, where the pressure begins to drop. At constant pressure, we can only set the pressure (Hset on the drawing) which the pump will maintain. We can only scroll through the other parameters.



b Constant speed

The pump operates with the currently set speed (RPMset on the drawing). In the unregulated mode, we can only set the speed at which the pump will operate. We can only scroll through the other parameters.



Combined mode

Multiple limits can be set only over the web interface. None of the other modes are on.

☾ Night mode

When the pump is operating in night mode, it automatically switches between the current mode and night mode. Switch occurs based on the temperature of the medium.

While in night mode its icon is turned on and the pump operates in chosen mode. If the pump senses drop in temperature of the medium for 15 -20 °C (in time frame of 2 hours), icon starts to blink and the pump switches to night mode. When the temperature of the medium rises, blinking stops and the pump goes back to previously chosen operation mode.

Night mode can only work in compliment to other modes and is not a mode that can run by itself.

5.2.1 TWIN PUMP OPERATION

Twin pump has double hydraulic housing with integrated check valve, which automatically turns based on medium flow, and two separated motors. Pumps communicate with each other through Ethernet connection. Night mode is not recommended in this mode of operation.

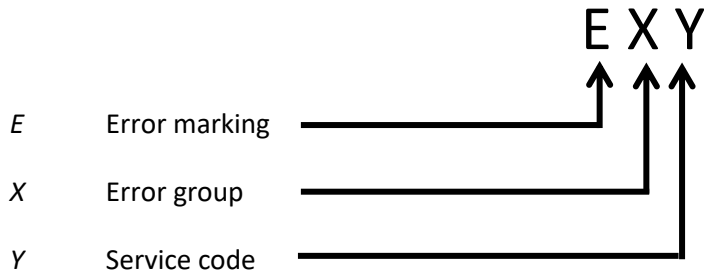
Pumps can operate in several different modes, switching between the pumps is done by the communications module:

- Alternating operation [**default setting**] – One pump is operating while the other one is on standby. Pumps switch their role every 24 hours or when an error occurs on one pump.
- Backup operation – One pump operates constantly and the other one is on standby. If an error occurs on the operating pump the one on standby will automatically start working. This mode can be set up by turning off the pump that we wish to be on standby. That is done by holding the ⊖ button for 5 seconds.
- Parallel operation – Both pumps work at the same time with the same settings of constant pressure. This mode is used when greater flow than one single pump can output is needed. When the first pump hits its flow limit the second one turns on and complements the first to reach desired flow. This mode is activated when we set both pumps to constant pressure mode.

6 ERROR AND TROUBLESHOOTING

If pump failure occurs, the error causing the failure will appear in the display screen.

Errors on the screen are identified as:



Error group	Error description	Possible cause and solution
1	Low load detected	There is no medium in the pump. Check if there is medium in the system.
2	Motor overload	Excessive current load or blocked rotor. If the issue persists, check if the rotor is spinning freely.
3	Motor too hot	Motor has exceeded allowed temperature and is now stopped to cool down. Once cooled, it will automatically restart.
4	Electronics error	An electronics error was detected. The pump can still operate, but needs servicing.
5	Motor/stator failure	There could be an interruption in the motor winding. Pump needs servicing.

The **service code (Y)** is intended for service personal.

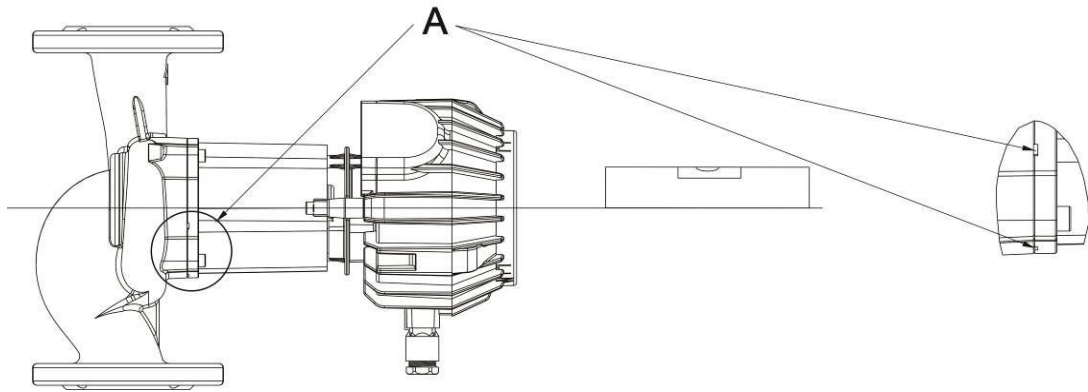
If the pump is unresponsive, disconnect and connect it back to the electrical grid.

7 FAULT FINDING

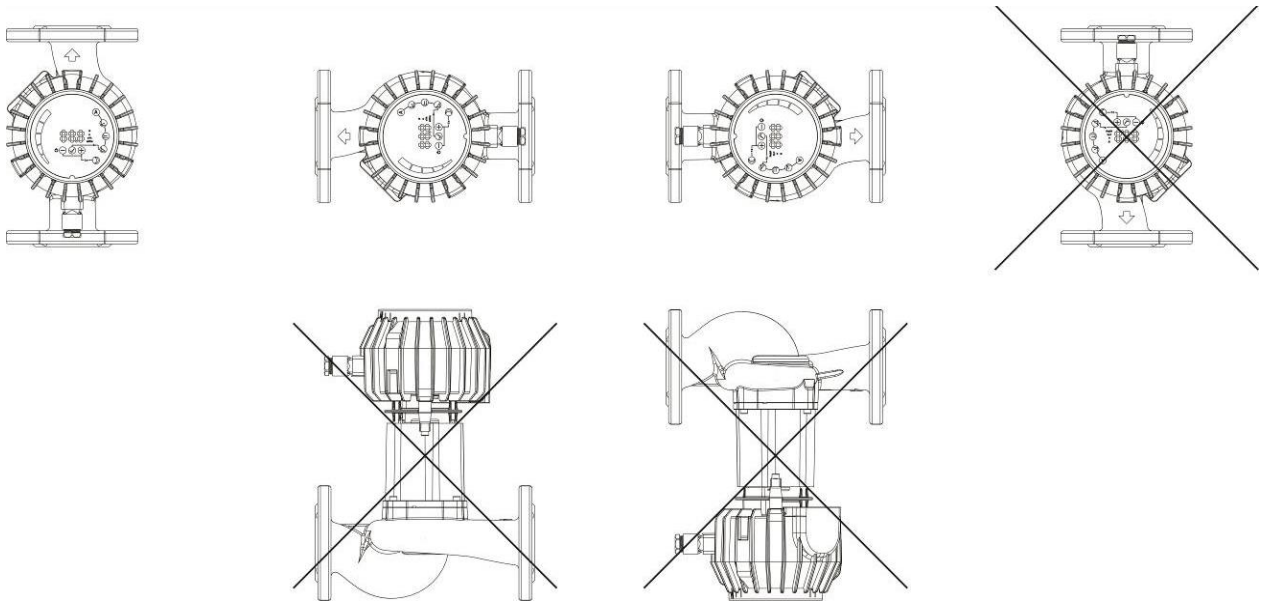
7.1 ERROR CODES

The following codes will show up on display panel and on the appropriate Modbus registers to help you diagnose the cause of improper operation.

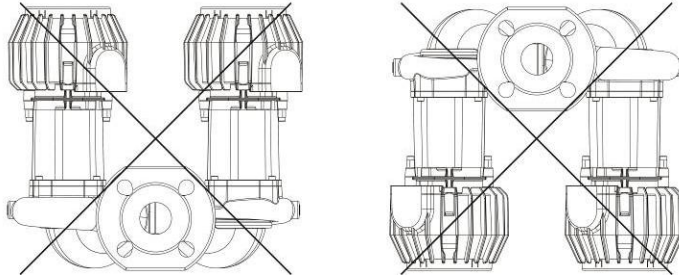
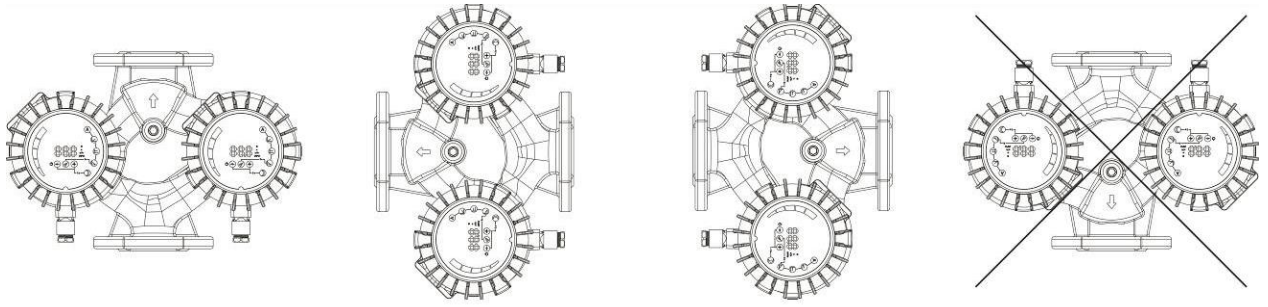
Error code	Description	Probable cause
<i>E1x</i>	<i>Load errors</i>	
E10 (drY)	Low motor load	Low load detected. Pump is running dry.
E11	High motor load	Motor might be faulty or viscous medium is present.
<i>E2x</i>	<i>Protection active</i>	
E22 (hot)	Converter temperature limit	Circuit is too hot and power was reduced to less than 2/3 of rated power.
E23	Converter temperature protection	Circuit is too hot to run, pump stopped
E24	Converter overcurrent	Hardware overcurrent protection triggered.
E25	Overvoltage	Line voltage is too high
E26	Undervoltage	Line voltage is too low for proper operation.
E27	PFC Overcurrent	Power correction circuit current cannot be controlled
<i>E3x</i>	<i>Pump errors</i>	
E31	Software motor protection active.	Average motor current was too high, pump load is much higher than expected
<i>E4x</i>	<i>Device specific error codes</i>	
E40	General frequency converter error	Electrical circuitry did not pass self-test.
E42 (LEd)	LED faulty	One of the display segment diodes is faulty (open/short)
E43 (con)	Communications failed	Display board does not detect proper connection to main board, but power supply is present
E44	DC link current offset	Voltage on DC link shunt (R34) not in expected range
E45	Motor temperature outside limits	During MFG. TEST, this is 10 kΩ, 1% resistor for 10 °C..30 °C During operation, expected values are -55 °C..150 °C
E46	Circuit temperature outside limits	During MFG. TEST, this is 0 °C..50 °C. During operation, expected values are -55 °C..150 °C
E47	Voltage reference outside limits.	Comparison between internal references does not match
E48	15V outside limits	15V supply is not 15V.
E49	Test load does not match	No test load detected or current measurement does not work properly (MFG. TEST)
<i>E5x</i>	<i>Motor error codes</i>	
E51	Motor parameters out of range	Motor does not behave as expected
E52	Thermal protection active	Motor temperature is too hot to operate.
E53	Invalid model selected	Pump model not valid or out of reach



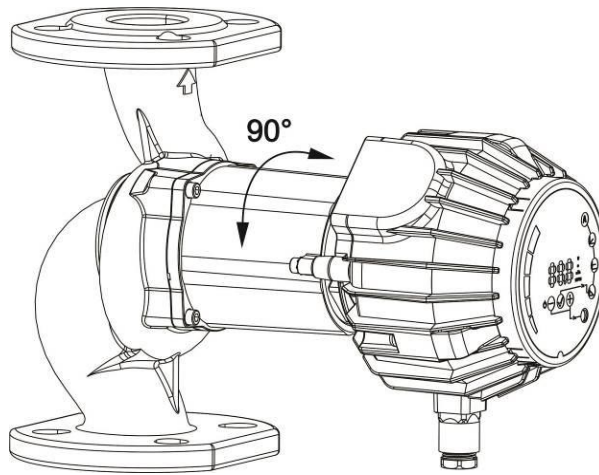
1



2



3



4

