

CRE, CRIE, CRNE, SPKE, MTRE, CME

Installation and operating instructions



Original installation and operating instructions.

CONTENTS

	Page
1. Symbols used in this document	2
2. Abbreviations and definitions	2
3. General information	3
4. General description	3
4.1 Pumps without factory-fitted sensor	3
4.2 Pumps with factory-fitted pressure sensor	3
4.3 Settings	3
4.4 Radio communication	3
4.5 Battery	3
5. Mechanical installation	3
5.1 Mounting	3
5.2 Cable entries	3
5.3 Ensuring motor cooling	4
5.4 Outdoor installation	4
5.5 Drain holes	4
6. Electrical installation	4
6.1 Protection against electric shock, indirect contact	4
6.2 Mains supply	5
6.3 Additional protection	6
6.4 Connection terminals	6
6.5 Signal cables	10
6.6 Bus connection cable	10
7. Operating conditions	10
7.1 Maximum number of starts and stops	10
7.2 Ambient temperature	10
7.3 Installation altitude	10
7.4 Air humidity	11
7.5 Motor cooling	11
8. Operating and control modes	11
8.1 Overview	11
8.2 Operating mode	11
8.3 Control mode	12
9. User interfaces	12
9.1 Standard control panel	12
9.2 Changing the position of the control panel	15
9.3 R100 remote control	16
9.4 Grundfos GO Remote	28
10. External setpoint signal	29
10.1 Operation with sensor feedback	29
10.2 Constant-curve operation	29
11. Bus signal	30
12. Priority of settings	30
13. Grundfos Eye	31
14. Signal relays	32
15. Megging	33
16. Technical data, single-phase motors	33
16.1 Supply voltage	33
16.2 Leakage current	33
17. Technical data, three-phase motors	33
17.1 Supply voltage	33
17.2 Leakage current	33
18. Inputs/outputs	33
19. Other technical data	34
19.1 Sound pressure level	34
20. Disposal	35

**Warning**

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document**Warning**

If these safety instructions are not observed, it may result in personal injury.

**Warning**

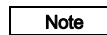
If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

**Warning**

The surface of the product may be so hot that it may cause burns or personal injury.

**Caution**

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

**Note**

Notes or instructions that make the job easier and ensure safe operation.

2. Abbreviations and definitions

AI	Analog input.
AL	Alarm, out of range at lower limit.
AO	Analog output.
AU	Alarm, out of range at upper limit.
CIM	Communication interface module.
Current sinking	The ability to draw current into the terminal and guide it towards GND in the internal circuitry.
Current sourcing	The ability to push current out of the terminal and into an external load which must return it to GND.
DI	Digital input.
DO	Digital output.
ELCB	Earth leakage circuit breaker.
GDS	Grundfos Digital Sensor. Factory-fitted sensor in some Grundfos pumps.
GENIbus	Proprietary Grundfos fieldbus standard.
GFCI	Ground fault circuit interrupter. (USA and Canada).
GND	Ground.
Grundfos Eye	Status indicator light.
LIVE	Low voltage with the risk of electric shock if the terminals are touched.
OC	Open collector: Configurable open-collector output.
PE	Protective earth.
	Protective extra-low voltage.
PELV	A voltage that cannot exceed ELV under normal conditions and under single-fault conditions, except earth faults in other circuits.
	Safety extra-low voltage.
SELV	A voltage that cannot exceed ELV under normal conditions and under single-fault conditions, including earth faults in other circuits.

3. General information

These installation and operating instructions are a supplement to the installation and operating instructions for the corresponding standard pumps CR, CRI, CRN, SPK, MTR and CM.

For instructions not mentioned specifically in this manual, see the installation and operating instructions for the standard pump.

4. General description

Grundfos E-pumps are fitted with frequency-controlled permanent-magnet motors for single-phase or three-phase mains connection.

4.1 Pumps without factory-fitted sensor

The pumps have a built-in PI controller and can be set up for an external sensor enabling the control of the following parameters:

- constant pressure
- constant differential pressure
- constant temperature
- constant differential temperature
- constant flow rate
- constant level
- constant curve
- constant other value.

The pumps have been factory-set to constant-curve control mode. The control mode can be changed with the R100 or Grundfos GO Remote.

4.2 Pumps with factory-fitted pressure sensor

The pumps have a built-in PI controller and are set up with a pressure sensor enabling the control of the pump discharge pressure.

The pumps have been factory-set to constant-pressure control mode. The pumps are typically used to keep a constant pressure in variable-demand systems.

4.3 Settings

The description of settings applies both to pumps without factory-fitted sensor and to pumps with a factory-fitted pressure sensor.

Setpoint

The desired setpoint can be set in three ways:

- on the pump control panel
- via an input for external setpoint signal
- with the Grundfos wireless R100 remote control or Grundfos GO Remote.

Other settings

All other settings can only be made with the R100 or Grundfos GO Remote.

Important parameters, such as actual value of the control parameter and power consumption, can be read via the R100 or Grundfos GO Remote.

If special or customised settings are required, use the Grundfos PC Tool. Contact your local Grundfos company for more information.

4.4 Radio communication

This product incorporates a radio module for remote control which is a class 1 device and can be used anywhere in the EU member states without restrictions.

For use in USA and Canada, see page 36.

Note

Some variants of these products and all products sold in China and Korea have no possibility of radio communication according to local legislation.

This product can communicate with the Grundfos GO Remote and other products of the same type via the built-in radio module.

In some cases, an external antenna may be required.

Only Grundfos-approved external antennas may be connected to this product, and only by a Grundfos-approved installer.

4.5 Battery

A Li-ion battery is fitted in CRE, CRIE, CRNE, SPKE and MTRE pumps. The Li-ion battery complies with the Battery Directive (2006/66/EC). The battery does not contain mercury, lead and cadmium.

5. Mechanical installation



Warning

Installation and operation must comply with local regulations and accepted codes of good practice.

5.1 Mounting

The pump must be secured to a solid foundation by bolts through the holes in the flange or the base plate.

Note

In order to maintain the ETL mark, additional installation procedures must be followed. See page 36.

5.2 Cable entries

The motor has four M20 screwed cable entries fitted with blind plugs from factory.

The following cable glands are included:

- 2 x M20 cable gland, cable diameter \varnothing 5 mm
- 1 x M20 cable gland, cable diameter \varnothing 7-14 mm.

5.3 Ensuring motor cooling

In order to ensure sufficient cooling of the motor, the distance (D) between the end of the fan cover and a wall or other fixed objects must always be at least 50 mm, irrespective of motor size. See fig. 1.

Note

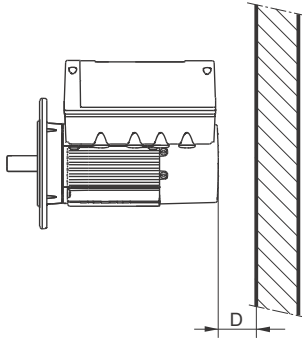


Fig. 1 Minimum distance (D) from the motor to a wall or other fixed objects

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5.4 Outdoor installation

When installed outdoors, the motor must be provided with a suitable cover to avoid condensation on the electronic components. See fig. 2.

Note

When fitting a cover to the motor, observe the guideline in section 5.3 Ensuring motor cooling.

The cover must be sufficiently large to ensure that the motor is not exposed to direct sunlight, rain or snow. Grundfos does not supply covers. We therefore recommend that you have a cover built for the specific application. In areas with high air humidity, we recommend that you enable the built-in standstill heating function. See section *Standstill heating*, page 27.

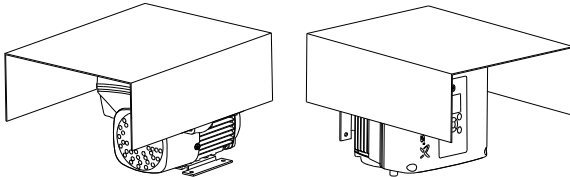


Fig. 2 Examples of covers (not supplied by Grundfos)

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5.5 Drain holes

When the motor is installed in moist surroundings or areas with high air humidity, the bottom drain hole should be open.

The enclosure class of the motor will then be lower. The open drain hole helps prevent condensation in the motor as it will make the motor self-venting and allow water and humid air to escape.

The motor has a plugged drain hole on the drive side. The flange can be turned 90 ° to both sides or 180 °.

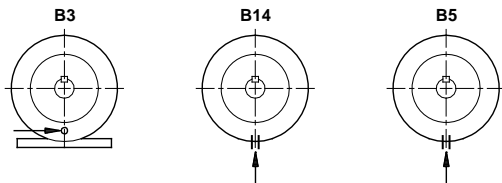


Fig. 3 Drain holes

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6. Electrical installation

Carry out the electrical connection according to local regulations. Check that the supply voltage and frequency correspond to the values stated on the nameplate.

Warning

Do not make any connections in the terminal box unless the power supply has been switched off for at least 5 minutes.



Make sure that the power supply cannot be accidentally switched on.

The motor must be earthed and protected against indirect contact in accordance with local regulations.

If the power supply cable is damaged, it must be replaced by the manufacturer, the manufacturer's service partner or a similarly qualified person.

The user or the installer is responsible for the installation of correct earthing and protection according to local regulations. All operations must be carried out by a qualified electrician.

Note

6.1 Protection against electric shock, indirect contact



Warning

The motor must be earthed and protected against indirect contact in accordance with local regulations.

Protective-earth conductors must always have a yellow/green (PE) or yellow/green/blue (PEN) colour marking.

6.1.1 Protection against mains voltage transients

The motor is protected against mains voltage transients in accordance with EN 61800-3.

6.1.2 Motor protection

The motor requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking.

6.2 Mains supply

6.2.1 Single-phase supply voltage

- 1 x 200-240 V - 10 %/+ 10 %, 50/60 Hz, PE.

Check that the supply voltage and frequency correspond to the values stated on the nameplate.

Note *If the motor is supplied through an IT network, a dedicated IT network motor should be used. Contact Grundfos.*

The wires in the motor terminal box must be as short as possible. Excepted from this is the separated earth conductor which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

For maximum backup fuse, see section 16.1 Supply voltage.

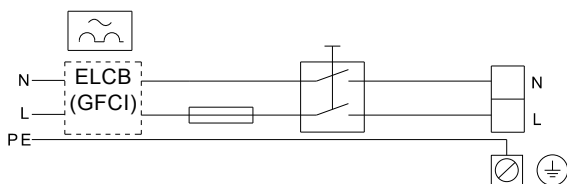


Fig. 4 Example of a mains-connected motor with mains switch, backup fuse and additional protection

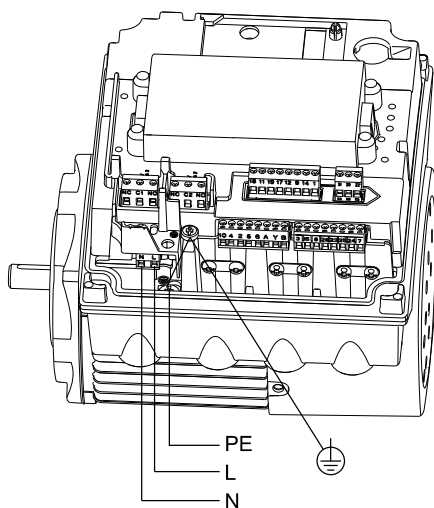


Fig. 5 Mains connection, single-phase motors

6.2.2 Three-phase supply voltage

- 3 x 380-500 V - 10 %/+ 10 %, 50/60 Hz, PE.

Caution *In order to avoid loose connections, ensure that the terminal block for L1, L2 and L3 is pressed home in its socket when the supply cable has been connected.*

Note *Corner grounding is not allowed for supply voltages above 3 x 480 V, 50/60 Hz.*

Check that the supply voltage and frequency correspond to the values stated on the nameplate.

Note *If the motor is supplied through an IT network, a dedicated IT network motor should be used. Contact Grundfos.*

The wires in the motor terminal box must be as short as possible. Excepted from this is the separated earth conductor which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

For maximum backup fuse, see section 17.1 Supply voltage.

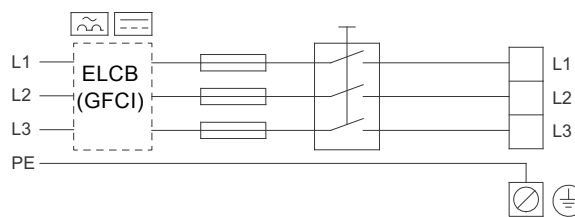


Fig. 6 Example of a mains-connected motor with mains switch, backup fuses and additional protection

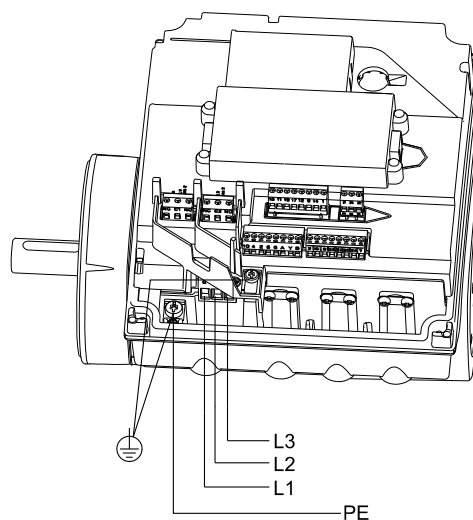


Fig. 7 Mains connection, three-phase motors

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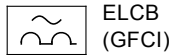
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6.3 Additional protection

6.3.1 Single-phase motors

If the motor is connected to an electric installation where an earth leakage circuit breaker (ELCB) or ground fault circuit interrupter (GFCI) is used as additional protection, this circuit breaker or interrupter must be marked with the following symbol:



ELCB
(GFCI)

When an earth leakage circuit breaker or ground fault circuit interrupter is selected, the total leakage current of all the electrical equipment in the installation must be taken into account.

Note

The leakage current of the motor can be found in section 16.2 *Leakage current*.

6.3.2 Three-phase motors

If the motor is connected to an electric installation where an earth leakage circuit breaker (ELCB) or ground fault circuit interrupter (GFCI) is used as additional protection, this circuit breaker or interrupter must be of the following type:

- It must be suitable for handling leakage currents and cutting-in with short pulse-shaped leakage.
- It must trip out when alternating fault currents and fault currents with DC content, i.e. pulsating DC and smooth DC fault currents, occur.

For these motors an earth leakage circuit breaker or ground fault circuit interrupter, type B, must be used.

This circuit breaker or interrupter must be marked with the following symbols:



ELCB
(GFCI)

When an earth leakage circuit breaker or ground fault circuit interrupter is selected, the total leakage current of all the electrical equipment in the installation must be taken into account.

Note

The leakage current of the motor can be found in section 17.2 *Leakage current*.

Protection against phase unbalance

The motor must be connected to a power supply with a quality corresponding to IEC 60146-1-1, class C, to ensure correct motor operation at phase unbalance.

This also ensures long life of the components.

6.4 Connection terminals

The descriptions and terminal overviews in this section apply to both single- and three-phase motors.

For maximum tightening torques, see section *Torques*, page 34.

6.4.1 Connection terminals, CRE, CRIE, CRNE, SPKE and MTRE pumps

CRE, CRIE, CRNE, SPKE and MTRE pumps have a number of inputs and outputs enabling the pumps to be used in advanced applications where many inputs and outputs are required.

The pumps have these connections:

- three analog inputs
- one analog output
- two dedicated digital inputs
- two configurable digital inputs or open-collector outputs
- Grundfos Digital Sensor input and output
- two Pt100/1000 inputs
- two LiqTec sensor inputs
- two signal relay outputs
- GENIbus connection.

See fig. 8.

Digital input 1 is factory-set to be start/stop input where open circuit will result in stop. A jumper has been factory-fitted between terminals 2 and 6. Remove the jumper if digital input 1 is to be used as external start/stop or any other external function.

Note

As a precaution, the wires to be connected to the connection groups below must be separated from each other by reinforced insulation in their entire lengths.

Note

• Inputs and outputs

All inputs and outputs are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits. All control terminals are supplied by safety extra-low voltage (SELV), thus ensuring protection against electric shock.

• Signal relay outputs

– Signal relay 1:

LIVE:

Mains supply voltages up to 250 VAC can be connected to this output.

SELV:

The output is galvanically separated from other circuits. Therefore, the supply voltage or safety extra-low voltage can be connected to the output as desired.

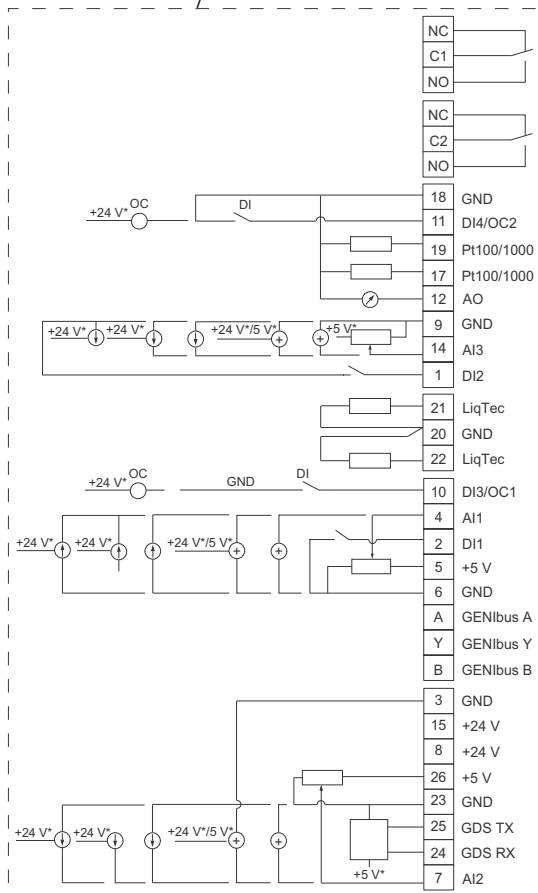
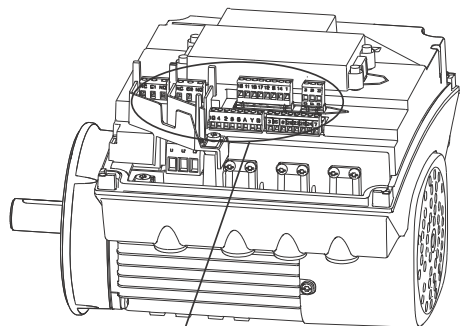
– Signal relay 2:

SELV:

The output is galvanically separated from other circuits. Therefore, the supply voltage or safety extra-low voltage can be connected to the output as desired.

• Mains supply (terminals N, PE, L or L1, L2, L3, PE).

A galvanically safe separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 61800-5-1.



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* If an external supply source is used, there must be a connection to GND.

Fig. 8 Connection terminals, CRE, CRIE, CRNE, SPKE and MTRE pumps

Terminal	Type	Function
NC	Normally closed contact	Signal relay 1 (LIVE or SELV)
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2 (SELV only)
C2	Common	
NO	Normally open contact	
18	GND	Ground
11	DI4/OC2	Digital input/output, configurable. Open collector: Max. 24 V resistive or inductive.
19	Pt100/1000 input 2	Pt100/1000 sensor input
17	Pt100/1000 input 1	Pt100/1000 sensor input
12	AO	Analog output: 0-20 mA / 4-20 mA 0-10 V
9	GND	Ground
14	AI3	Analog input: 0-20 mA / 4-20 mA 0-10 V
1	DI2	Digital input, configurable
21	LiqTec sensor input 1	LiqTec sensor input (white conductor)
20	GND	Ground (brown and black conductors)
22	LiqTec sensor input 2	LiqTec sensor input (blue conductor)
10	DI3/OC1	Digital input/output, configurable. Open collector: Max. 24 V resistive or inductive.
4	AI1	Analog input: 0-20 mA / 4-20 mA 0.5 - 3.5 V / 0-5 V / 0-10 V
2	DI1	Digital input, configurable
5	+5 V	Supply to potentiometer and sensor
6	GND	Ground
A	GENIbus, A	GENIbus, A (+)
Y	GENIbus, Y	GENIbus, GND
B	GENIbus, B	GENIbus, B (-)
3	GND	Ground
15	+24 V	Supply
8	+24 V	Supply
26	+5 V	Supply to potentiometer and sensor
23	GND	Ground
25	GDS TX	Grundfos Digital Sensor output
24	GDS RX	Grundfos Digital Sensor input
7	AI2	Analog input: 0-20 mA / 4-20 mA 0.5 - 3.5 V / 0-5 V / 0-10 V

6.4.2 Connection terminals, CME pumps

The CME pump has these connections:

- two analog inputs
- two digital inputs or one digital input and one open-collector output
- Grundfos Digital Sensor input and output
- two signal relay outputs
- GENIbus connection.

See fig. 9.

Digital input 1 is factory-set to be start/stop input where open circuit will result in stop. A jumper has been factory-fitted between terminals 2 and 6. Remove the jumper if digital input 1 is to be used as external start/stop or any other external function.

Note

As a precaution, the wires to be connected to the connection groups below must be separated from each other by reinforced insulation in their entire lengths.

Note

- **Inputs and outputs**

All inputs and outputs are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.

All control terminals are supplied by safety extra-low voltage (SELV), thus ensuring protection against electric shock.

- **Signal relay outputs**

– Signal relay 1:

LIVE:

Mains supply voltages up to 250 VAC can be connected to this output.

SELV:

The output is galvanically separated from other circuits.

Therefore, the supply voltage or safety extra-low voltage can be connected to the output as desired.

– Signal relay 2:

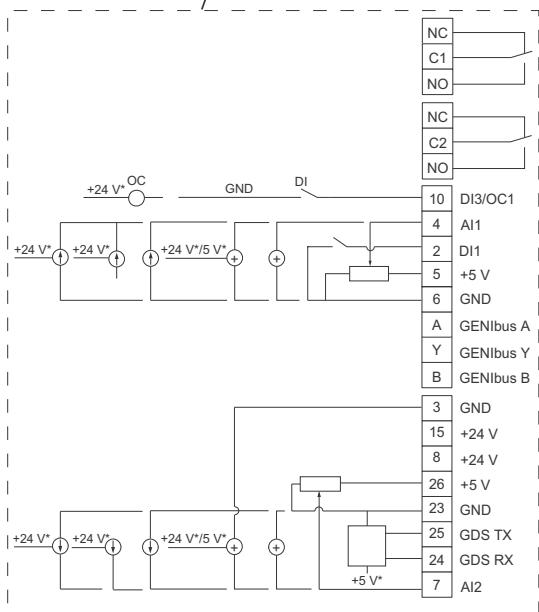
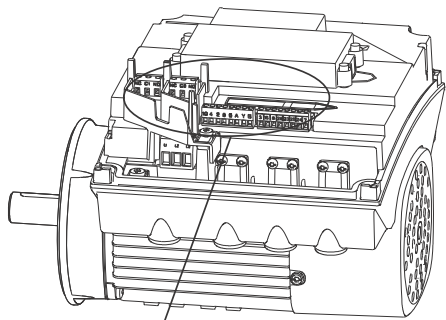
SELV:

The output is galvanically separated from other circuits.

Therefore, the supply voltage or safety extra-low voltage can be connected to the output as desired.

- **Mains supply** (terminals N, PE, L or L1, L2, L3, PE).

A galvanically safe separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 61800-5-1.



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* If an external supply source is used, there must be a connection to GND.

Fig. 9 Connection terminals, CME pump (optional for CRE, CRIE, CRNE, SPKE and MTRE pumps)

Terminal	Type	Function
NC	Normally closed contact	
C1	Common	Signal relay 1 (LIVE or SELV)
NO	Normally open contact	
NC	Normally closed contact	
C2	Common	Signal relay 2 (SELV only)
NO	Normally open contact	
10	DI3/OC1	Digital input/output, configurable. Open collector: Max. 24 V resistive or inductive.
4	AI1	Analog input: 0-20 mA / 4-20 mA
2	DI1	Digital input, configurable
5	+5 V	Supply to potentiometer and sensor
6	GND	Ground
A	GENibus, A	GENibus, A (+)
Y	GENibus, Y	GENibus, GND
B	GENibus, B	GENibus, B (-)
3	GND	Ground
15	+24 V	Supply
8	+24 V	Supply
26	+5 V	Supply to potentiometer and sensor
23	GND	Ground
25	GDS TX	Grundfos Digital Sensor output
24	GDS RX	Grundfos Digital Sensor input
7	AI2	Analog input: 0-20 mA / 4-20 mA

6.5 Signal cables

- Use screened cables with a cross-sectional area of min. 0.5 mm² and max. 1.5 mm² for external on/off switch, digital inputs, setpoint and sensor signals.
- Connect the screens of the cables to frame at both ends with good connection. The screens must be as close as possible to the terminals. See fig. 10.

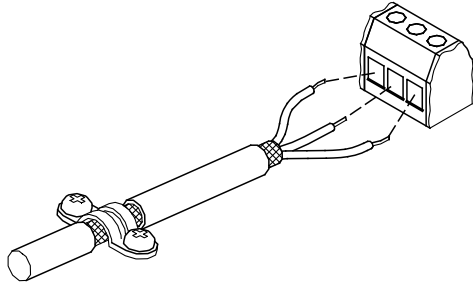


Fig. 10 Stripped cable with screen and wire connections

- Screws for frame connections must always be tightened whether a cable is fitted or not.
- The wires in the motor terminal box must be as short as possible.

6.6 Bus connection cable

6.6.1 New installations

For the bus connection, use a screened 3-core cable with a cross-sectional area of min. 0.5 mm² and max. 1.5 mm².

- If the motor is connected to a unit with a cable clamp which is identical to the one on the motor, connect the screen to this cable clamp.
- If the unit has no cable clamp as shown in fig. 11, leave the screen unconnected at this end.

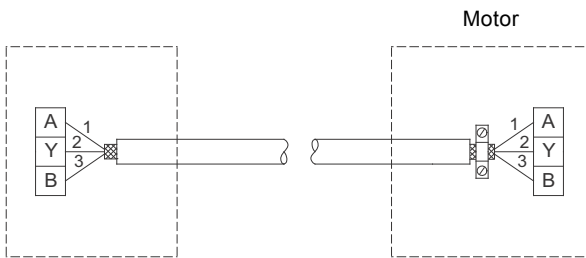


Fig. 11 Connection with screened 3-core cable

6.6.2 Replacing an existing motor

- If a screened 2-core cable is used in the existing installation, connect it as shown in fig. 12.

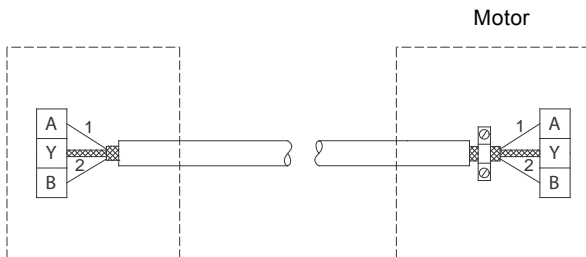


Fig. 12 Connection with screened 2-core cable

- If a screened 3-core cable is used in the existing installation, follow the instructions in section 6.6.1 *New installations*.

7. Operating conditions

7.1 Maximum number of starts and stops

The number of starts and stops via the power supply must not exceed four times per hour.

When switched on via the power supply, the pump will start after approx. 5 seconds.

If a higher number of starts and stops is desired, use the input for external start/stop when starting/stopping the pump.

When started via an external on/off switch, the pump will start immediately.

7.2 Ambient temperature

7.2.1 Ambient temperature during storage and transportation

Minimum -30 °C

Maximum +60 °C.

7.2.2 Ambient temperature during operation

Minimum -20 °C

Maximum +50 °C.

The motor can operate with the rated power output (P2) at 50 °C, but continuous operation at higher temperatures will reduce the expected product life. If the motor is to operate at ambient temperatures between 50 and 60 °C, an oversized motor must be selected. Contact Grundfos for further information.

7.3 Installation altitude

Caution *The motor must not be installed more than 2000 metres above sea level.*

Installation altitude is the height above sea level of the installation site.

- Motors installed up to 1000 metres above sea level can be loaded 100 %.
- Motors installed more than 1000 metres above sea level must not be fully loaded due to the low density and consequent low cooling effect of the air. See fig. 13.

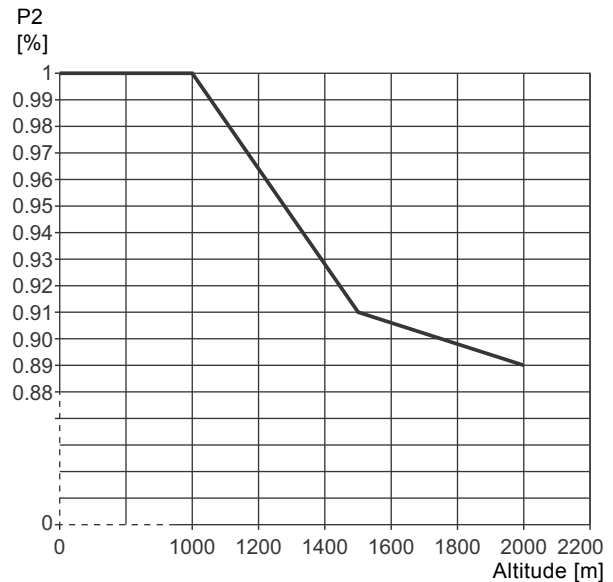


Fig. 13 Derating of motor output power (P2) in relation to altitude above sea level

7.4 Air humidity

Maximum air humidity: 95 %.

If the air humidity is constantly high and above 85 %, the drain holes in the drive-end flange should be open.

See section 5.5 *Drain holes*.

7.5 Motor cooling

To ensure cooling of motor and electronics, the following must be observed:

- Position the motor in such a way that adequate cooling is ensured. See section 5.3 *Ensuring motor cooling*.
- The temperature of the cooling air must not exceed 50 °C.
- Keep cooling fins and fan blades clean.

8. Operating and control modes

Grundfos E-pumps are set and controlled according to operating and control modes.

8.1 Overview

Operating modes

- Normal
- Stop
- Min.
- Max.
- Manual

Control modes

- Constant pressure
- Constant differential pressure
- Constant temperature
- Constant differential temperature
- Constant flow rate
- Constant level
- Constant curve
- Constant other value

Example

If the pump is fitted with a pressure sensor, the control mode must be set to constant pressure. If the pump is for instance fitted with a temperature sensor, the control mode should be constant temperature. See section 8.3 *Control mode* for further information.

8.2 Operating mode

When the operating mode is set to "Normal", the control mode can be set to constant curve or any other control mode. See section 8.3 *Control mode*.

Other operating modes:

- Stop
The pump has been stopped.
- Min.
The pump is operating at its minimum speed.
- Max.
The pump is operating at its maximum speed.
- Manual
The pump is operating at a manually set speed.

Figure 14 illustrates the min. and max. curves.

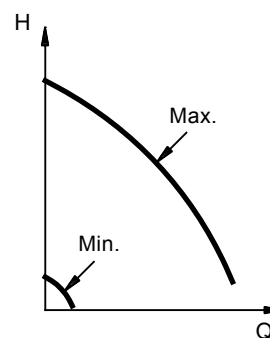


Fig. 14 Min. and max. curves

The max. curve can for instance be used in connection with the venting procedure during installation.

The min. curve can be used in periods in which a minimum flow is required.

If the power supply to the pump is disconnected, the setting of operating mode will be stored.

TM00 5547 0995

8.3 Control mode

8.3.1 Pumps without factory-fitted sensor

The pumps have been factory-set to constant-curve control mode.

In this control mode, the pump will operate according to the constant curve set. See fig. 15.

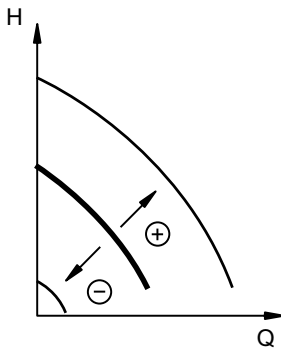


Fig. 15 Pump in constant-curve control mode

Factory setting

Pumps supplied without sensor have been factory-set to constant-curve control mode.

The setpoint value corresponds to 100 % of the maximum pump performance. See data booklet or WebCAPS.

8.3.2 Pumps with factory-fitted pressure sensor

The pressure sensor is fitted on the pump discharge side, and the pump is set to constant pressure.

In this control mode, the pump will adjust its performance, i.e. pump discharge pressure, to the desired setpoint (H_{set}). See fig. 16.

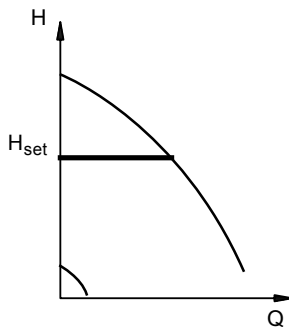


Fig. 16 Pump in constant-pressure control mode

Factory setting

Pumps supplied with pressure sensor have been factory-set to constant-pressure control mode.

The setpoint value corresponds to 50 % of the sensor measuring range. See sensor nameplate.

9. User interfaces



Warning

The product may be so hot that only the buttons should be touched to avoid burns.

Pump settings can be made by means of the following user interfaces:

Control panel

- Standard control panel.
See section 9.1 *Standard control panel*.

Remote controls

- Grundfos R100 remote control.
See section 9.3 *R100 remote control*.
- Grundfos GO Remote.
See section 9.4 *Grundfos GO Remote*.

If the power supply to the pump is switched off, the settings will be stored.

9.1 Standard control panel

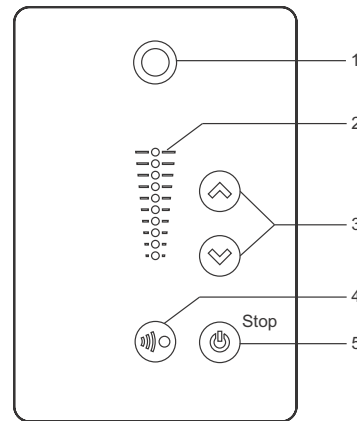


Fig. 17 Standard control panel

Pos.	Symbol	Description
1		Grundfos Eye Shows the operating status of the pump. See section 13. <i>Grundfos Eye</i> for further information.
2	-	Light fields for indication of setpoint.
3		Changes the setpoint.
4		Enables radio communication with the Grundfos GO Remote and other products of the same type.
5		Makes the pump ready for operation/starts and stops the pump. Start: If the button is pressed when the pump is stopped, the pump will only start if no other functions with higher priority have been enabled. See section 12. <i>Priority of settings</i> . Stop: If the button is pressed when the pump is running, the pump will always be stopped. When the pump is stopped via this button, the "Stop" text next to the button will illuminate.

TM05 6403 4712

TM05 6398 4712

TM05 4848 3512

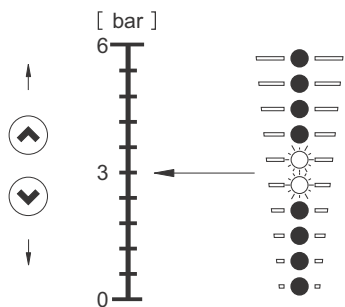
9.1.1 Setpoint setting

Set the desired setpoint of the pump by pressing \odot or \ominus . The light fields on the control panel will indicate the setpoint set.

Pump in constant-pressure control mode

The following example applies to a pump in an application where a pressure sensor gives a feedback to the pump. If the sensor is retrofitted to the pump, it must be set up manually as the pump does not automatically register a connected sensor.

Figure 18 shows that the light fields 5 and 6 are activated, indicating a desired setpoint of 3 bar with a sensor measuring range from 0 to 6 bar. The setting range is equal to the sensor measuring range.

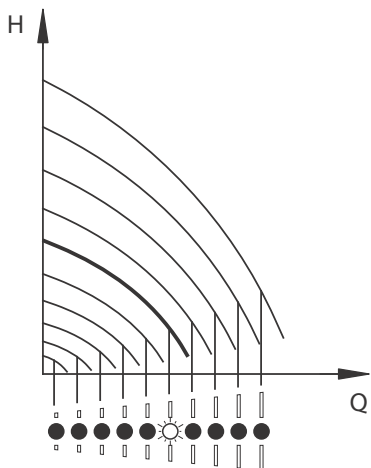


TM05 4894 3512

Fig. 18 Setpoint set to 3 bar, constant-pressure control mode

Pump in constant-curve control mode

In constant-curve control mode, the pump performance will lie between the max. and min. curve of the pump. See fig. 19.



TM05 4895 2812

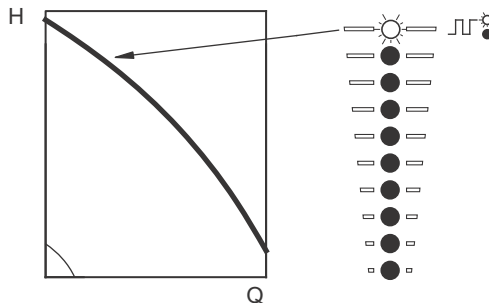
Fig. 19 Pump in constant-curve control mode

Setting to max. curve:

- Press \odot continuously to change over to the max. curve of the pump (top light field flashes). When the top light field is on, press \odot for 3 seconds until the light field starts flashing.
- To change back, press \ominus continuously until the desired setpoint is indicated.

Example: Pump set to max. curve.

Figure 20 shows that the top light field is flashing, indicating max. curve.



TM05 4896 2812

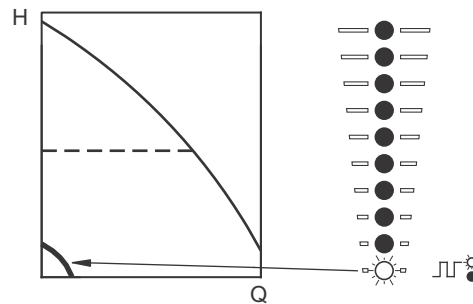
Fig. 20 Max. curve duty

Setting to min. curve:

- Press \ominus continuously to change over to the min. curve of the pump (bottom light field flashes). When the bottom light field is on, press \ominus for 3 seconds until the light field starts flashing.
- To change back, press \odot continuously until the desired setpoint is indicated.

Example: Pump set to min. curve.



Figure 21 shows that the bottom light field is flashing, indicating min. curve.







TM05 4897 2812



Fig. 21 Min. curve duty

9.1.2 Start/stop of pump

Stop the pump by pressing . When the pump is stopped, the "Stop" text next to the button will illuminate. The pump can also be stopped by continuously pressing  until none of the light fields are on.

Start the pump by pressing  or by continuously pressing  until the desired setpoint is indicated.

If the pump has been stopped by pressing , it can only be given free to operation by pressing  again.





If the pump has been stopped by pressing , it can only be restarted by pressing .

The pump can also be stopped with the R100, Grundfos GO Remote or via a digital input set to "External stop".

See section 12. *Priority of settings*.

9.1.3 Resetting of alarms and warnings

A fault indication can be reset in one of the following ways:

- Via the digital input if it has been set to "Alarm resetting".
- Briefly press  or  on the pump. This will not change the setting of the pump.
A fault indication cannot be reset by pressing  or  if the buttons have been locked.
- Switch off the power supply until the indicator lights are off.
- Switch the external start/stop input off and then on again.
- With the R100. See section *Alarm*, page 17.
- With the Grundfos GO Remote.

9.2 Changing the position of the control panel

It is possible to turn the control panel 180°. Follow the instructions below.

1. Loosen the four screws (TX25) holding the terminal box cover.

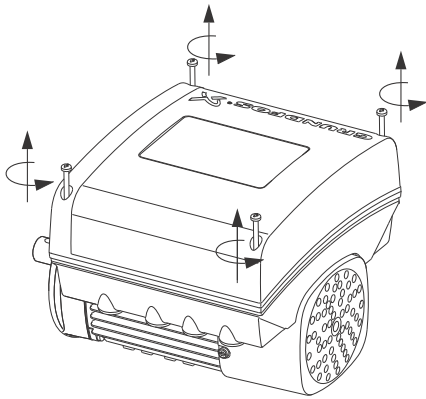


Fig. 22 Loosening the screws

2. Remove the terminal box cover.

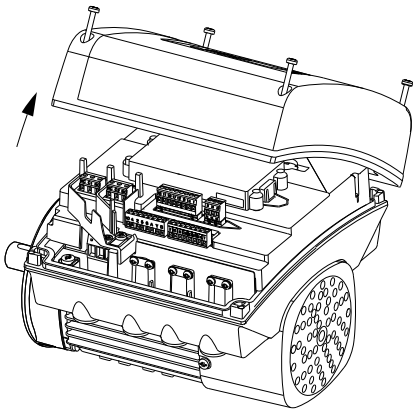


Fig. 23 Removing the terminal box cover

3. Press and hold in the two locking tabs (pos. A) while gently lifting the plastic cover (pos. B).

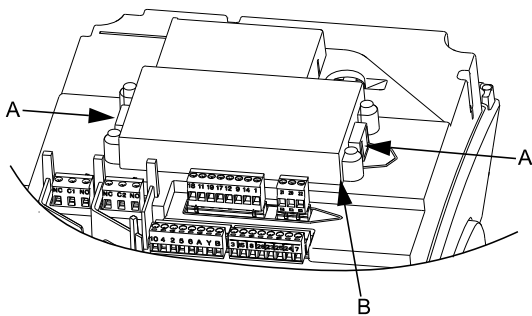


Fig. 24 Lifting the plastic cover

4. Turn the plastic cover 180°.

Note Do not twist the cable more than 90°.

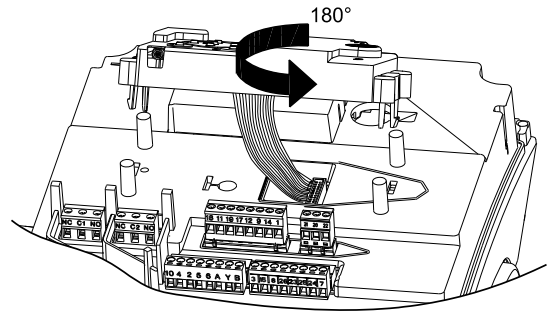


Fig. 25 Turning the plastic cover

5. Re-position the plastic cover correctly on the four rubber pins (pos. C). Make sure that the locking tabs (pos. A) are placed correctly.

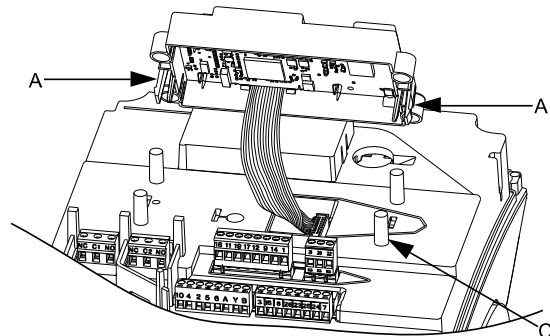


Fig. 26 Re-positioning the plastic cover

6. Fit the terminal box cover, and make sure that it is also turned 180° so that the buttons on the control panel are aligned with the buttons on the plastic cover. Tighten the four screws (TX25) with 5 Nm.

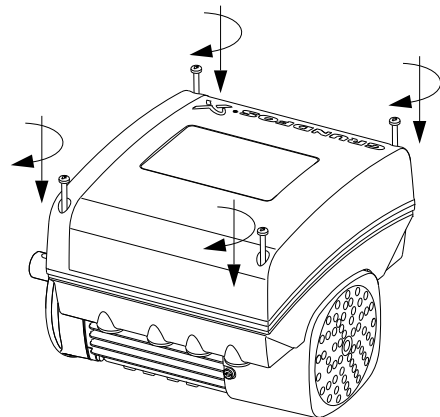


Fig. 27 Fitting the terminal box cover

TM05 5351 3612

TM05 5352 3612

TM05 5353 3612

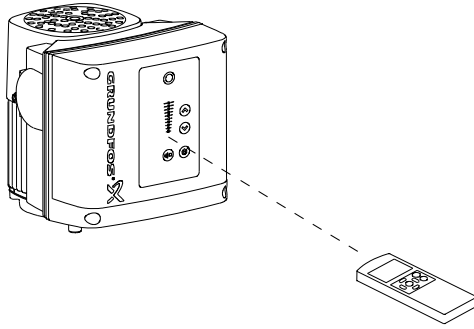
TM05 5354 3612

TM05 5355 3612

TM05 5356 3612

9.3 R100 remote control

The pumps are designed for wireless communication with the Grundfos R100 remote control.



TM05 3933 1712

Fig. 28 R100 communicating with the pump via infrared light

During communication, the R100 must be pointed at the control panel. When the R100 communicates with the pump, the indicator light in the middle of the Grundfos Eye will flash green. See page 31.

The R100 offers additional possibilities of setting and status displays for the pump.

The displays are divided into four parallel menus:

0. GENERAL (see operating instructions for the R100)

1. OPERATION

2. STATUS

3. INSTALLATION.

See section 9.3.1 R100 menu structure.

9.3.1 R100 menu structure

0. GENERAL

- Switch off R100
- Return to start
- Delete all changes
- Store settings
- Call up settings
- Store status data
- Call up status data

1. OPERATION

- *Setpoint*
- *Operating mode*
- *Manual speed*
- *Alarm*
- *Warning*
- *Alarm log 1 to 5*
- *Warning log 1 to 5*

2. STATUS

- *Actual setpoint and external setpoint*
- *Operating mode*
- *Actual controlled value*
- *Analog input 1, 2 and 3*
- *Pt100/1000 input 1 and 2*
- *Speed*
- *Power input and power consumption*
- *Operating hours*
- *Replace motor bearings*

3. INSTALLATION

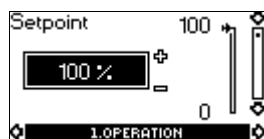
- *Control mode*
- *Controller*
- *Signal relay 1 and 2*
- *Buttons on pump*
- *Number*
- *Digital input 1 and 2, Function*
- *Digital input/output 3 and 4, State*
- *Digital input/output 3 and 4, Function*
- *Low-flow stop function*
- *Analog input 1, 2 and 3, Function*
- *Analog input 1, 2 and 3, Measured parameter*
- *Analog input 1, 2 and 3*
- *Pt100/1000 input 1 and 2, Function*
- *Pt100/1000 input 1 and 2, Measured parameter*
- *LiqTec function*
- *Operating range*
- *Ramps*
- *Motor bearing monitoring*
- *Motor bearings*
- *Standstill heating*

9.3.2 OPERATION menu

When communication between the R100 and the pump has been established, the first display in this menu will appear.

Setpoint

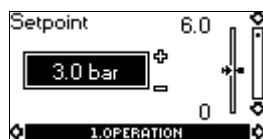
Without sensor



- ▶ Setpoint set
- Actual setpoint
- Actual value

Set the setpoint in %.

With pressure sensor



- ▶ Setpoint set
- Actual setpoint
- Actual value

Set the desired pressure in bar.

In constant-curve control mode, the setpoint is set in % of the maximum performance. The setting range will lie between the min. and max. curves.

In all other control modes, for example constant pressure, the setting range is equal to the sensor measuring range.

If the pump is connected to an external setpoint signal, the value in this display will be the maximum value of the external setpoint signal. See section 10. *External setpoint signal*.

Setpoint and external signal

The setpoint cannot be set if the pump is controlled via external signals (Stop, Min. curve or Max. curve).

The R100 will give this warning: "External".

Check if the pump has been stopped via one of the digital inputs set to "External stop" (open circuit) or it has been set to min. or max. via one of the digital inputs (closed circuit).

See section 12. *Priority of settings*.

Setpoint and bus communication

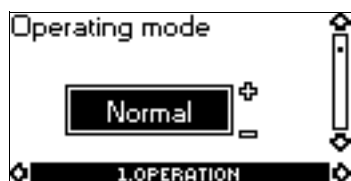
The setpoint cannot be set if the pump is controlled from an external control system via bus communication.

The R100 will give this warning: "Bus".

To override bus communication, disconnect the bus connection.

See section 12. *Priority of settings*.

Operating mode



Select one of the following operating modes:

- Stop
- Min. (min. speed)
- Normal (duty)
- Max. (max. speed)
- Manual (operation).

The operating modes can be selected without changing the setpoint setting.

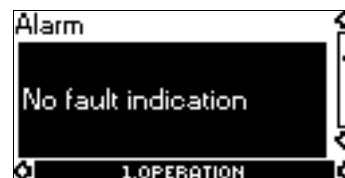
See section 8.2 *Operating mode* for further information.

Manual speed



In this display, the pump speed can be set in %. When the operating mode has been set to "Manual", the pump will run at the set speed.

Alarm



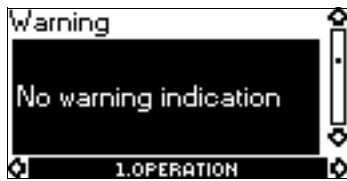
In case of an alarm, the cause will appear in the display together with a fault code.

Possible alarms:

Alarm	Fault code
External fault	3
Too many restarts	4
Forced pumping	29
Overvoltage	32
Undervoltage	40
Overload	49
Blocked pump	51
Dry running	56, 57
Too high motor temperature	65
Electronics temperature too high	66
Internal communication fault	76
Internal fault	83, 85
Sensor signal outside signal range	88
Temperature sensor 1 outside signal range	91
Internal fault	163
LiqTec sensor fault	164
Signal outside range, analog input 1	165
Signal outside range, analog input 2	166
Signal outside range, analog input 3	167
Temperature sensor 2 outside signal range	175
Limit 1 exceeded	190
Limit 2 exceeded	191

An alarm indication can be reset in this display by pressing [OK] if the cause of the fault has disappeared.

Warning



In case of a warning, the cause will appear in this display together with a fault code.

Possible warnings:

Warning	Fault code
No contact to pump	10
Replace motor bearings	30
Too high motor temperature	65
Electronics temperature too high	66
Internal fault	83, 85, 163
Sensor signal outside signal range	88
Temperature sensor 1 outside signal range	91
Sensor supply fault, 5 V	161
Sensor supply fault, 24 V	162
LiqTec sensor fault	164
Signal outside range, analog input 1	165
Signal outside range, analog input 2	166
Signal outside range, analog input 3	167
Temperature sensor 2 outside signal range	175
Limit 1 exceeded	190
Limit 2 exceeded	191

A warning indication will disappear automatically once the fault has been remedied.

Alarm log 1 to 5



In case of "alarm" faults, the last five alarm indications will appear in the alarm log. "Alarm log 1" shows the latest fault, "Alarm log 2" shows the latest fault but one, etc.

The example above gives this information:

- The alarm indication "Other fault".
- The fault code "(73)".
- The period in which the pump has been connected to the power supply after the fault occurred.

Warning log 1 to 5



In case of "warning" faults, the last five warning indications will appear in the warning log. "Warning log 1" shows the latest fault, "Warning log 2" shows the latest fault but one, etc.

The example above gives this information:

- The warning indication "Replace motor bearings".
- The fault code "(30)".
- The period in which the pump has been connected to the power supply after the fault occurred.

9.3.3 STATUS menu

The displays appearing in this menu are status displays only. It is not possible to change or set values.

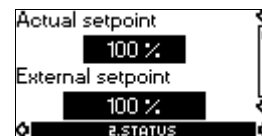
The displayed values are the values that applied when the last communication between the pump and the R100 took place. If a status value is to be updated, point the R100 at the control panel and press [OK].

If a parameter, for example speed, should be called up continuously, press [OK] constantly during the period in which the parameter in question should be monitored.

The tolerance of the displayed value is stated under each display. The tolerances are stated as a guide in % of the maximum values of the parameters.

Actual setpoint and external setpoint

Without sensor



Tolerance: ± 2 %.

With pressure sensor

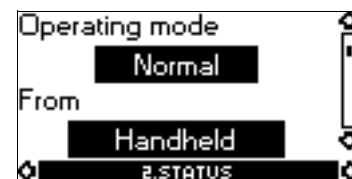


Tolerance: ± 2 %.

This display shows the actual setpoint and the external setpoint in % of the range from minimum value of sensor measuring range to the setpoint set.

At a min. speed of 12 %, a set setpoint of 65 % and an external setpoint of 70 %, the actual setpoint will be $0.70 \times (65 - 12) + 12 = 49 \%$.

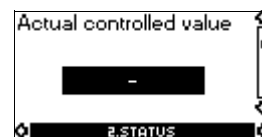
Operating mode



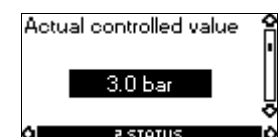
This display shows the actual operating mode (Stop, Min., Normal (duty), Max. or Manual (operation)). Furthermore, it shows where this operating mode was selected (Handheld, Pump, Bus, External or Start/stop button). See section 8. *Operating and control modes* for further information.

Actual controlled value

Without sensor



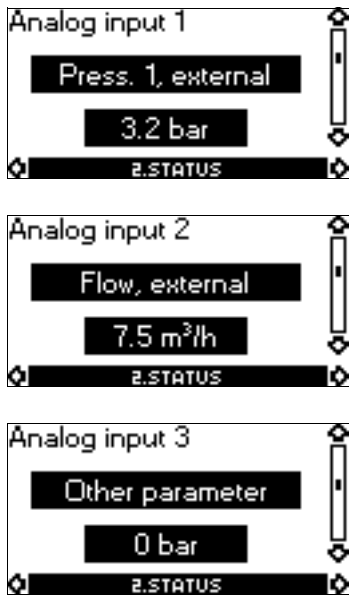
With pressure sensor



The actual controlled value will appear in this display if a sensor has been connected and the function of the analog input has been set to "Feedback sensor".

If two separate sensors are used to measure a differential parameter, the function of two analog inputs must be set to "Feedback sensor". The actual controlled value will be the absolute difference between the two sensor measurements. See section *Analog input 1, 2 and 3, Function*, page 24.

Analog input 1, 2 and 3

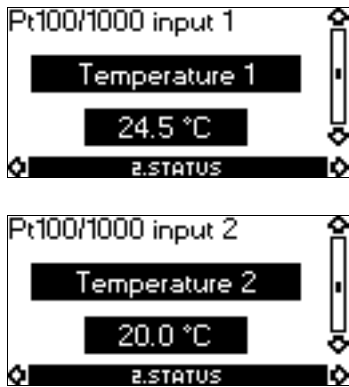


These displays show the measured parameter and the corresponding value.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Analog input 1 (4)	•	•
Analog input 2 (7)	•	•
Analog input 3 (14)	-	•

Pt100/1000 input 1 and 2



These displays show the measured parameter and the corresponding value. The measured temperatures will appear in these displays if Pt100 or Pt1000 sensors have been connected. The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Pt100/1000 input 1 (17)	-	•
Pt100/1000 input 2 (19)	-	•

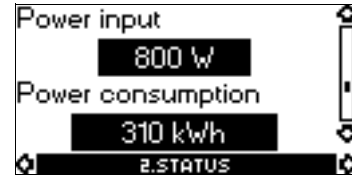
Speed



Tolerance: ± 5 %.

This display shows the actual speed.

Power input and power consumption



Tolerance: ± 10 %.

- "Power input" indicates the actual power consumption.
- "Power consumption" indicates an accumulated value which cannot be reset.

Operating hours



Tolerance: ± 2 %.

The value of operating hours is an accumulated value and cannot be reset.

Replace motor bearings



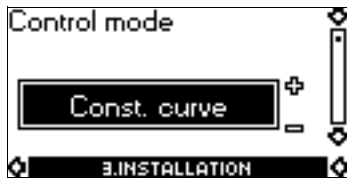
This display shows when to replace the motor bearings. The controller monitors the operating pattern of the motor and calculates the period between bearing replacements.

Displayable values:

- in 2 years
- in 1 year
- in 6 months
- in 3 months
- in 1 month
- in 1 week
- Now!

9.3.4 INSTALLATION menu

Control mode



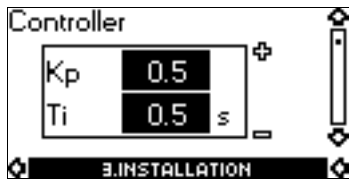
Select one of the following control modes:

- Const. pressure
- Const. diff. press.
- Const. temperature
- Const. diff. temp.
- Const. flow rate
- Const. level
- Const. curve
- Const. other value.

See section 8. *Operating and control modes* for further information.

Note *If the pump is connected to a bus (see section 11. Bus signal), it is not possible to select the control mode via the R100.*

Controller



E-pumps have a factory default setting of gain (K_p) and integral time (T_i). However, if the factory setting is not the optimum setting, the gain and the integral time can be changed in this display:

- Set the gain (K_p) within the range from 0.1 to 20.
- Set the integral-action time (T_i) within the range from 0.1 to 3600 s.
If 3600 s is selected, the controller will function as a P controller.
- Furthermore, the controller can be set to inverse control. This means that if the setpoint is increased, the speed will be reduced. In the case of inverse control, the gain (K_p) must be set within the range from -0.1 to -20.

Guidelines for setting of PI controller

The table below shows the recommended controller settings:

System/application	K_p		T_i
	Heating system ¹⁾	Cooling system ²⁾	
	0.5		0.5
	0.1		0.5
	0.5		0.5
	0.5	-0.5	10 + 5L2
	0.5		10 + 5L2
	0.5	-0.5	30 + 5L2
	0.5		0.5
	0.5		0.5
	0.5		L1 < 5 m: 0.5 L1 > 5 m: 3 L1 > 10 m: 5
	0.5		L1 < 5 m: 0.5 L1 > 5 m: 3 L1 > 10 m: 5

1) Heating systems are systems in which an increase in pump performance will result in a rise in temperature at the sensor.

2) Cooling systems are systems in which an increase in pump performance will result in a drop in temperature at the sensor.

L1 = Distance [m] between pump and sensor.

L2 = Distance [m] between heat exchanger and sensor.

General rules of thumb

- If the controller is too slow-reacting, increase K_p .
- If the controller is hunting or unstable, dampen the system by reducing K_p or increasing T_i .

Signal relay 1 and 2



The signal relays can be configured to be activated by one of the following incidents:

- Ready
- Operation
- Alarm
- Warning
- Limit 2 exceeded
- Limit 1 exceeded
- Running
- Ext. fan control
- Not active.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Signal relay 1 (NC, C1, NO)	•	•
Signal relay 2 (NC, C2, NO)	•	•

Buttons on pump



The buttons on the pump can be set to the following:

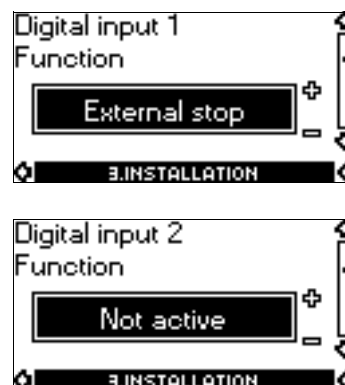
- Active
- Not active.

Number



A number between 1 and 64 can be allocated to the pump. In the case of bus communication, a number must be allocated to each pump.

Digital input 1 and 2, Function



The digital inputs can be set to various functions.

Select one of these functions:

- Not active
When set to "Not active", the input has no function.
- External fault
When the input is activated, a timer will be started. If the input is activated for more than 5 seconds, the pump will be stopped and a fault will be indicated. If the connection is disconnected for more than 5 seconds, the fault condition will cease and the pump will start if automatic restarting has been selected via PC Tool.
- Alarm resetting
When the input is activated, a possible fault indication will be reset.
- External stop
When the input is deactivated (open circuit), the pump will stop.
- Max. (max. speed)
When the input is activated, the pump will run at the set max. speed.
- Min. (min. speed)
When the input is activated, the pump will run at the set min. speed.
- Flow switch
When this function is selected, the stop function will use a flow switch to detect low-flow stop. See section *Low-flow stop function*, page 23.
- Dry running
When this function is selected, lack of inlet pressure or water shortage can be detected. When lack of inlet pressure or water shortage (dry running) is detected, the pump will be stopped. The pump cannot restart as long as the input is activated. This requires the use of an accessory, such as these:
 - a pressure switch installed on the suction side of the pump
 - a float switch installed on the suction side of the pump.
- Accumulated flow
When this function is selected, the accumulated flow can be registered. This requires the use of a flowmeter which can give a feedback signal as a pulse per defined flow of water. Further setting of this function must be made via PC Tool.
- Predef. setp., dig1 (applies only to digital input 2)
When digital inputs are set to predefined setpoint, the pump will operate according to a setpoint based on the combination of the activated digital inputs. Further setting of this function must be made via PC Tool.

The priority of the selected functions in relation to each other appears from section 12. *Priority of settings*.

A stop command will always have the highest priority.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTRE
Digital input 1, Function (2 and 6)	•	•
Digital input 2, Function (1 and 9)	-	•

Digital input/output 3 and 4, State



The digital input/output 3 and 4 can be set to act as digital input or digital output.

Possible settings:

- Digital input
- Digital output.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTRE
Digital input/output 3, State (10 and 6)	•	•
Digital input/output 4, State (11 and 18)	-	•

Digital input/output 3 and 4, Function



The digital input/output 3 and 4 can be set to these functions:

Possible functions, digital input/output 3

Set to digital input	Set to digital output
<ul style="list-style-type: none"> • Not active • Predef. setp., dig2 • External fault • Alarm resetting • External stop • Max. • Min. • Flow switch • Dry running • Accumulated flow 	<ul style="list-style-type: none"> • Ready • Operation • Alarm • Warning • Limit 2 exceeded • Limit 1 exceeded • Running • Not active

Possible functions, digital input/output 4

Set to digital input	Set to digital output
<ul style="list-style-type: none"> • Not active • Predef. setp., dig3 • External fault • Alarm resetting • Reversing • External stop • Max. • Min. • Flow switch • Dry running • Accumulated flow 	<ul style="list-style-type: none"> • Ready • Operation • Alarm • Warning • Limit 2 exceeded • Limit 1 exceeded • Running • Not active

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTRE
Digital input/output 3, Function (10 and 6)	•	•
Digital input/output 4, Function (11 and 18)	-	•

Low-flow stop function



The low-flow stop function can be set to these values:

- Not active
- Energy optimal
- High comfort
- User-defined.

When the low-flow stop function is active, the flow will be monitored. If the flow becomes lower than the set minimum flow (Q_{\min}), the pump will change from continuous operation at constant pressure to start/stop operation and finally be stopped if the flow reaches zero.

The advantages of enabling the low-flow stop function are the following:

- no unnecessary heating of the pumped liquid
- reduced wear of the shaft seals
- reduced noise from operation.

The disadvantages of enabling the low-flow stop function may be the following:

- The delivered pressure is not completely constant as it will fluctuate between the start and stop pressures.
- The frequent starts/stops of the pump may in some applications cause acoustic noise.

The impact of the above disadvantages very much depends on the setting selected for the low-flow stop function.

The "High comfort" setting will minimise pressure fluctuations and acoustic noise.

If "Energy optimal" is selected, the main priority will be to reduce the energy consumption as much as possible.

Possible settings of the low-flow stop function:

- Energy optimal:
The pump will automatically adjust the parameters for the stop function so that the energy consumption during the start/stop operation period is minimised.
In this case, the stop function will use factory-set values of minimum flow (Q_{\min}) and other internal parameters.
- High comfort:
The pump will automatically adjust the parameters for the stop function so that the disturbances during the start/stop operation period are minimised.
In this case, the stop function will use factory-set values of minimum flow (Q_{\min}) and other internal parameters.
- User-defined:
The pump will use the parameters set for ΔH and Q_{\min} respectively for the stop function.

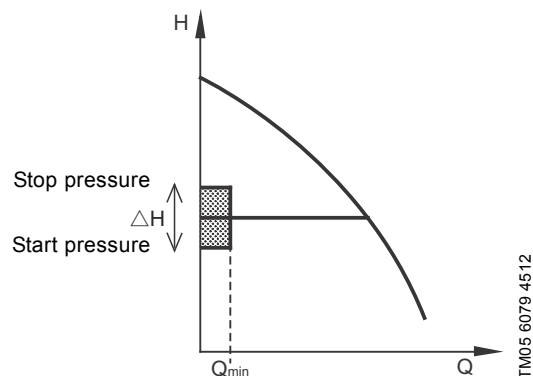


Fig. 29 Difference between start and stop pressures (ΔH) and minimum flow (Q_{\min})

In start/stop operation, the pressure will vary between the start and stop pressures. See fig. 29.

In "User-defined" mode, ΔH has been factory-set to 10 % of the actual setpoint. ΔH can be set within the range from 5 to 30 % of actual setpoint.

The pump will change to start/stop operation if the flow becomes lower than Q_{\min} .

Q_{\min} is set in % of the rated flow of the pump (see pump nameplate).

In "User-defined" mode, Q_{\min} has been factory-set to 10 % of rated flow.

Low-flow detection

Low flow can be detected in two ways:

1. A built-in "low-flow detection function" which is active if none of the digital inputs are set up for flow switch.
2. A flow switch connected to one of the digital inputs.

1. Low-flow detection function:

The pump will check the flow regularly by reducing the speed for a short time. If there is no or only a small change in pressure, this means that there is low flow. The speed will be increased until the stop pressure (actual setpoint + $0.5 \times \Delta H$) is reached and the pump will stop. When the pressure has fallen to the start pressure (actual setpoint - $0.5 \times \Delta H$), the pump will restart.

– If the flow is higher than the set minimum flow (Q_{\min}), the pump will return to continuous operation at constant pressure.

– If the flow is still lower than the set minimum flow (Q_{\min}), the pump will continue in start/stop operation until the flow is higher than the set minimum flow (Q_{\min}). When the flow is higher than the set minimum flow (Q_{\min}), the pump will return to continuous operation.

2. Flow switch:

When the digital input is activated for more than 5 seconds because there is low flow, the speed will be increased until the stop pressure (actual setpoint + $0.5 \times \Delta H$) is reached, and the pump will stop. When the pressure has fallen to start pressure, the pump will restart. If there is still no flow, the pump will quickly reach the stop pressure and stop. If there is flow, the pump will continue operating according to the setpoint.

Operating conditions for the low-flow stop function

It is only possible to use the stop function if the system incorporates a pressure sensor, a non-return valve and a diaphragm tank.

Caution *The non-return valve must always be installed before the pressure sensor. See figs 30 and 31.*

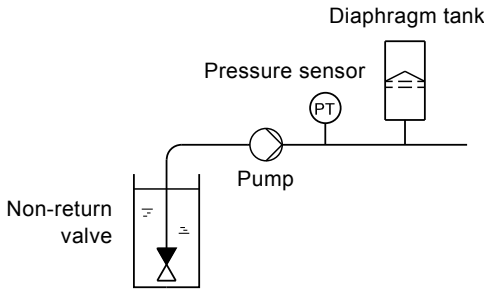


Fig. 30 Position of the non-return valve and pressure sensor in system with suction lift operation

TM03 8582 1907

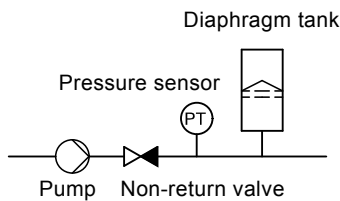
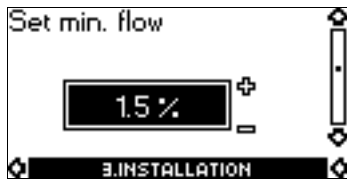


Fig. 31 Position of the non-return valve and pressure sensor in system with a positive inlet pressure

TM03 8583 1907

Set min. flow



Set the minimum flow (Q_{min}) in this display. This setting determines at which flow rate the system is to change from continuous operation at constant pressure to start/stop operation. The setting range is 5 to 30 % of rated flow. Factory setting: 10 %.

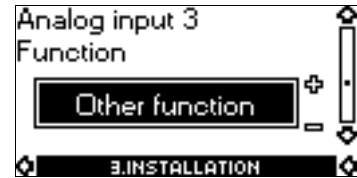
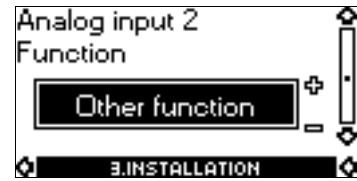
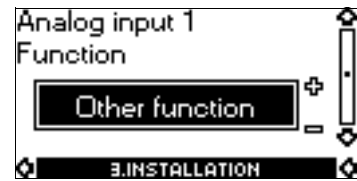
Diaphragm tank volume



The stop function requires a diaphragm tank of a certain minimum size. Set the size of the installed tank in this display. In order to reduce the number of start/stops per hour or to reduce the ΔH , a larger tank can be installed. The tank must be installed immediately after the pump and the precharge pressure must be 0.7 x actual setpoint. Recommended diaphragm tank size:

Rated flow rate of pump [m ³ /h]	CRE pump	Typical diaphragm tank size [litres]
0-6	1s, 1, 3, 5	8
7-24	10, 15, 20	18
25-40	32	50
41-70	45, 64	120
71-100	90	180

Analog input 1, 2 and 3, Function



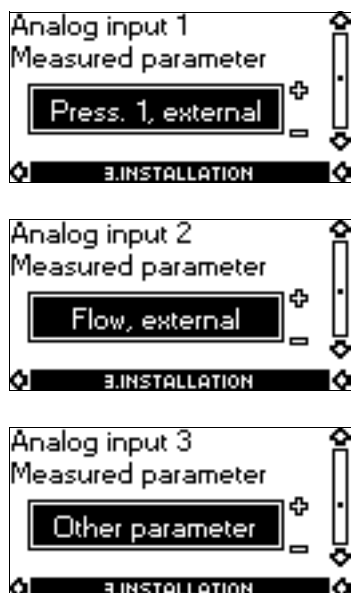
The analog inputs can be set to these functions:

- Not active
- Feedback sensor
- Ext. setpoint infl. See section 10. *External setpoint signal* for further description.
- Other function.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Analog input 1, Function (4)	•	•
Analog input 2, Function (7)	•	•
Analog input 3, Function (14)	-	•

Analog input 1, 2 and 3, Measured parameter



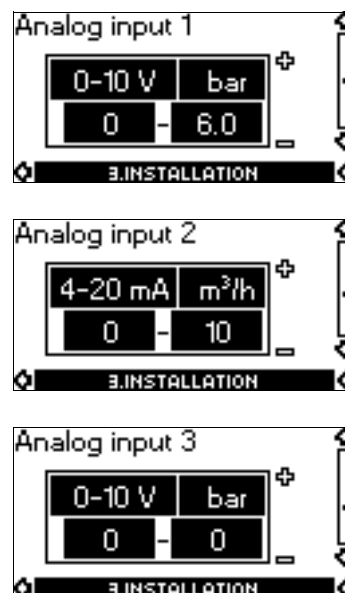
The analog inputs can be set to these parameters:

- Inlet pressure
- Diff. press., inlet
- Discharge press.
- Diff. press., outlet
- Diff. press., pump
- Press. 1, external
- Press. 2, external
- Diff. press., external
- Feed tank level
- Storage tank level
- Flow, pump
- Flow, external
- Liquid temp.
- Diff. temp., external
- Temperature 1
- Temperature 2
- Ambient temp.
- Other parameter.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTRE
Analog input 1, Measured parameter (4)	•	•
Analog input 2, Measured parameter (7)	•	•
Analog input 3, Measured parameter (14)	-	•

Analog input 1, 2 and 3



Select the following:

- Signal type (0.5 - 3.5 V, 0-5 V, 0-10 V, 0-20 mA or 4-20 mA).
- Measuring units for the measured parameters.
Available measuring units:

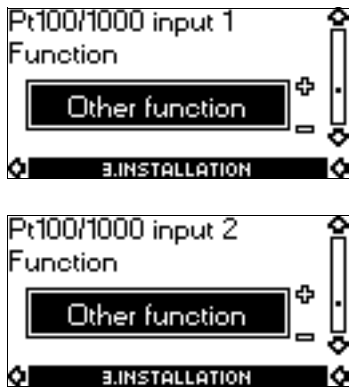
Parameter	Possible units
Pressure	bar, m, kPa, psi, ft
Flow rate	m ³ /h, l/s, yd ³ /h, gpm
Temperature	°C, °F
Other	%

- Sensor measuring range.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTRE
Analog input 1 (4)	•	•
Analog input 2 (7)	•	•
Analog input 3 (14)	-	•

Pt100/1000 input 1 and 2, Function



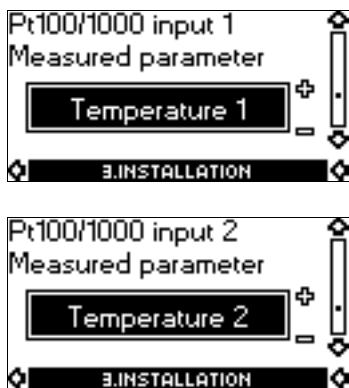
The Pt100/1000 inputs can be set to these functions:

- Not active
- Feedback sensor
- Ext. setpoint infl.
See section 10. *External setpoint signal* for further description.
- Other function.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Pt100/1000 input 1, Function (17 and 18)	-	•
Pt100/1000 input 2, Function (19 and 18)	-	•

Pt100/1000 input 1 and 2, Measured parameter



The Pt100/1000 inputs can be set to these parameters:

- Liquid temp.
- Temperature 1
- Temperature 2
- Ambient temp.
- DE bearing temp.
- NDE bearing temp.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
Pt100/1000 input 1, Measured parameter (17 and 18)	-	•
Pt100/1000 input 2, Measured parameter (19 and 18)	-	•

LiqTec function



The function of LiqTec sensors can be enabled or disabled in this display. A LiqTec sensor protects the pump against dry running and too high liquid temperature ($130 \pm 5 \text{ }^\circ\text{C}$).

When the LiqTec function has been enabled, it will stop the pump if dry running occurs or if the liquid temperature becomes too high. The pump must be restarted manually if it has been stopped due to dry running or too high liquid temperature.

Possible settings:

- Active
- Not active.

The number of available displays depends on the pump type. See below.

Function (terminal)	CME	CRE, CRIE, CRNE, SPKE, MTR
LiqTec function (21 and 22)	-	•

Operating range



Set the operating range as follows:

- Set the min. speed within the range from fixed min. speed to user-set max. speed.
- Set the max. speed within the range from user-set min. speed to fixed max. speed.

The range between the user-set min. and max. speeds is the operating range. See fig. 32.

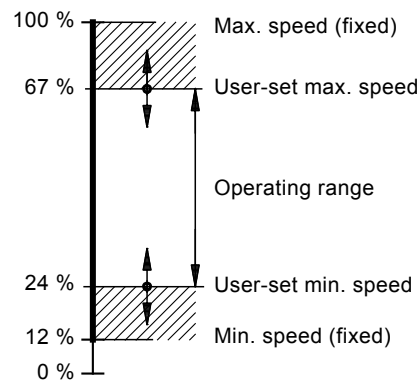
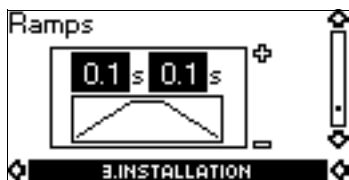


Fig. 32 Example of min. and max. settings

Ramps



The setting of ramps is only relevant in the case of constant-curve operation.

The ramps determine how quickly the pump can accelerate and decelerate, respectively, during start/stop or setpoint changes.

The following can be set:

- acceleration time, 0.1 to 300 s
- deceleration time, 0.1 to 300 s.

The times apply to the acceleration from stop to rated speed and the deceleration from rated speed to stop, respectively.

At short deceleration times, the deceleration of the pump may depend on load and inertia as there is no possibility of actively braking the pump.

If the power supply is switched off, the deceleration of the pump will only depend on load and inertia.

Motor bearing monitoring



The motor bearing monitoring function can be set to these values:

- Active
- Not active.

When the function is set to "Active", the controller will monitor the operating pattern of the motor and calculate when the bearings need to be replaced.

Even if the function is changed to "Not active", the controller will continue to calculate when the bearings need to be replaced, but no warning will be given when it is time for replacement.

Note

When the function is changed back to "Active", the accumulated calculations for bearing wear will be used to calculate the replacement time.

Motor bearings



This function can be set to these values:

- Replaced
- Nothing done.

When the bearing monitoring function is active, the controller will give a warning indication when the motor bearings are due to be replaced. See section *Alarm*, page 17.

When the motor bearings have been replaced, confirm this action in the above display by pressing [OK].

Standstill heating



The standstill heating function can be set to these values:

- Active
- Not active.

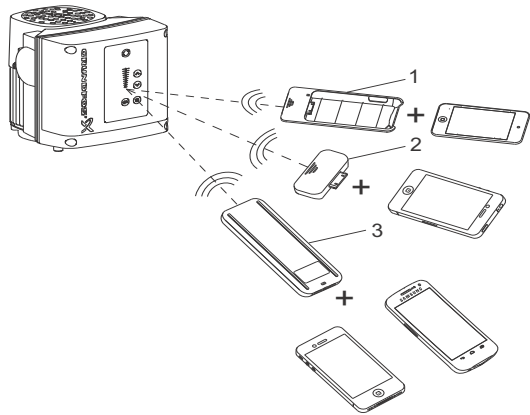
When the function is set to "Active", an AC voltage will be applied to the motor windings. The applied voltage will ensure that sufficient heat is generated to avoid condensation in the motor.

9.4 Grundfos GO Remote

The pump is designed for wireless radio or infrared communication with the Grundfos GO Remote.

The Grundfos GO Remote enables setting of functions and gives access to status overviews, technical product information and actual operating parameters.

The Grundfos GO Remote offers three different mobile interfaces (MI). See fig. 33.



TM05 5383 4312

Fig. 33 Grundfos GO Remote communicating with the pump via radio or infrared light

Pos.	Description
1	Grundfos MI 201: Consists of an Apple iPod touch 4G and a Grundfos cover.
2	Grundfos MI 202: Add-on module which can be used in conjunction with Apple iPod touch 4, iPhone 4G or later.
3	Grundfos MI 301: Separate module enabling radio or infrared communication. The module can be used in conjunction with an Android or iOS-based Smartphone with Bluetooth connection.

9.4.1 Communication

When the Grundfos GO Remote communicates with the pump, the indicator light in the middle of the Grundfos Eye will flash green. See section 13. Grundfos Eye.

Communication must be established using one of these communication types:

- radio communication
- infrared communication.

Radio communication

Radio communication can take place at distances up to 30 metres. It is necessary to enable communication by pressing or on the pump control panel.

Infrared communication

When communicating via infrared light, the Grundfos GO Remote must be pointed at the pump control panel.

9.4.2 Navigation

Navigation can be done from the dashboard. See fig. 34.

Dashboard

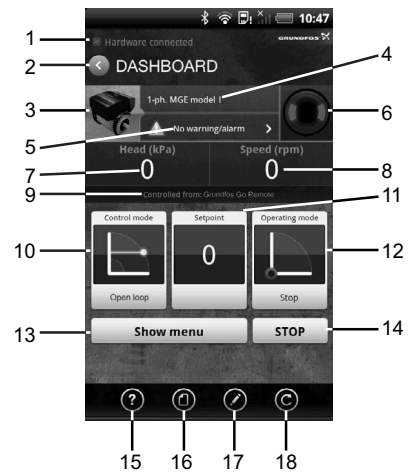


Fig. 34 Example of dashboard

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Pos.	Description	Action
1	Connection indicator	This text appears when the Grundfos GO Remote app has connected to an MI 201, MI 202 or MI 301. If the hardware is not connected, it will not be possible to communicate with a Grundfos product.
2	Back button	Returns to the previous display.
3	Product information	Provides technical information about the product.
4	Product name	Name of the product communicating with the Grundfos GO Remote.
5	Alarms and warnings	Shows alarms and warnings.
6	Grundfos Eye	Shows the operating condition of the product.
7	Primary status value	Shows the primary status value.
8	Secondary status value	Shows the secondary status value.
9	Control source	Shows by which interface the product is controlled.
10	Control mode	Shows the control mode of the product.
11	Actual setpoint value	Shows the actual setpoint value.
12	Operating mode	Shows the operating mode.
13	Show menu	Gives access to other menus.
14	Stop	Stops the product.

Tool bar		
15	Help	The help function describes the menus making it easy for the user to change settings, etc.
16	Documentation	Gives access to installation and operating instructions and quick guides.
17	Report	Enables the creation of user-defined reports.
18	Update	Enables update of the Grundfos GO Remote app.

10. External setpoint signal

It is possible to remote-set the setpoint by connecting an analog signal transmitter to one of the analog inputs setup for external setpoint influence. See section *Analog input 1, 2 and 3, Function*, page 24.

The actual external signal (0.5 - 3.5 V, 0-5 V, 0-10 V, 0-20 mA, 4-20 mA) must be selected with the R100 or Grundfos GO Remote.

If constant-curve operation is selected with the R100 or Grundfos GO Remote, the pump can be controlled by any controller.

10.1 Operation with sensor feedback

If fitted with a sensor, the pump can operate according to the control modes below:

- Constant pressure
- Constant differential pressure
- Constant temperature
- Constant differential temperature
- Constant flow rate
- Constant level
- Constant other value.

If operation with sensor feedback is selected, the setpoint can be set externally within the range from the lower value of the sensor measuring range to the setpoint set on the motor or with the R100 or Grundfos GO Remote. See fig. 35.

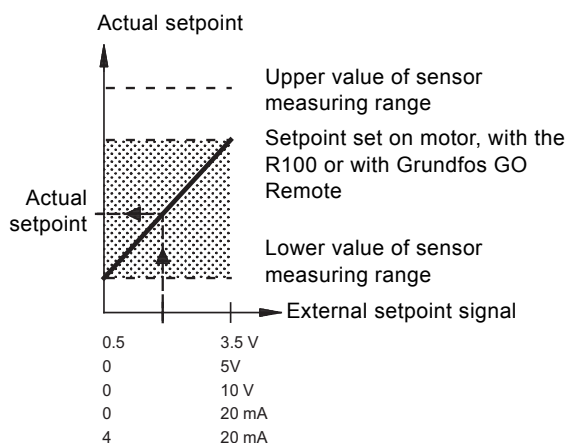


Fig. 35 Relation between the actual setpoint and the external setpoint signal in operation with sensor feedback

Example: At a lower sensor value of 0 bar, a set setpoint of 5 bar and an external setpoint of 70 %, the actual setpoint is $0.70 \times (5 - 0) + 0 = 3.5$ bar.

10.2 Constant-curve operation

If constant-curve operation is selected, the setpoint can be set externally within the range from the min. speed to the setpoint set on the motor or with the R100 or Grundfos GO Remote. See fig. 36.

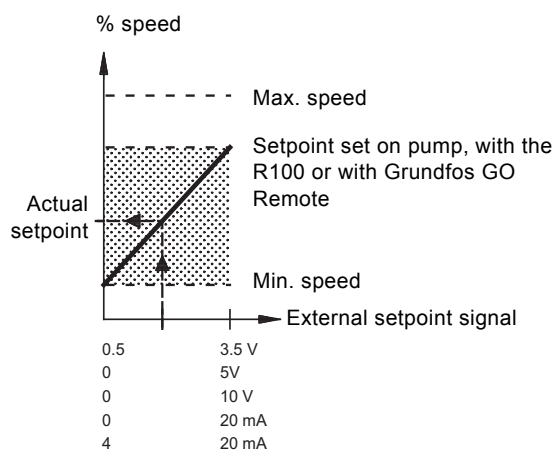


Fig. 36 Relation between the actual setpoint and the external setpoint signal in constant-curve operation

Example: At a set setpoint of 65 % of n_{max} and an external setpoint of 70 %, the actual setpoint is $0.70 \times (65 - 12) + 12 = 49$ %.

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TM05 5278 3512

11. Bus signal

The motor enables serial communication via an RS-485 input. The communication is carried out according to the Grundfos GENiBus protocol and enables connection to a building management system or another external control system.

Via a bus signal, it is possible to remote-set motor operating parameters, such as setpoint and operating mode. At the same time, the motor can, via the bus, provide status information about important parameters, such as actual value of control parameter, input power and fault indications.

Contact Grundfos for further information.

Note

If a bus signal is used, the number of settings available via the R100 or Grundfos GO Remote will be reduced.

12. Priority of settings

The motor can always be set to operation at max. speed or to stop with the R100 or Grundfos GO Remote.

If two or more functions are enabled at the same time, the motor will operate according to the function with the highest priority.

Example: If, via the digital input, the motor has been set to max. speed, the motor control panel, the R100 or Grundfos GO Remote can only set the motor to "Manual" or "Stop".

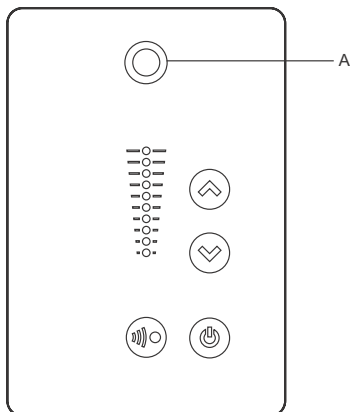
The priority of the settings appears from the table below:

Priority	Start/stop button	R100, Grundfos GO Remote or control panel on motor	Digital input	Bus communication
1	Stop			
2		Stop*		
3		Manual		
4		Max. speed*		
5			Stop	
6				Stop
7				Max. speed
8				Min. speed
9				Start
10			Max. speed	
11		Min. speed		
12			Min. speed	
13			Start	
14		Start		

* If the bus communication is interrupted, the motor will resume its previous operating mode, for example "Stop", selected with the R100, Grundfos GO Remote or on the motor control panel.

13. Grundfos Eye

The operating condition of the motor is indicated by the Grundfos Eye on the motor control panel. See fig. 37, pos. A.



TM05 5993 4312

Fig. 37 Grundfos Eye

Grundfos Eye	Indication	Description
	No lights on.	Power off. Motor not running.
	Two opposite green indicator lights rotating in the direction of rotation of the motor when seen from the non-drive end.	Power on. Motor running.
	Two opposite green indicator lights permanently on.	Power on. Motor not running.
	One yellow indicator light rotating in the direction of rotation of the motor when seen from the non-drive end.	Warning. Motor running.
	One yellow indicator light permanently on.	Warning. Motor stopped.
	Two opposite red indicator lights flashing simultaneously.	Alarm. Motor stopped.
	The green indicator light in the middle flashes quickly four times.	Remote control with the Grundfos GO Remote via radio. The motor is trying to communicate with the Grundfos GO Remote. The motor in question is highlighted in the Grundfos GO Remote display to inform the user of the location of the motor.
	The green indicator light in the middle flashes continuously.	When the motor in question is selected in the Grundfos GO Remote menu, the green indicator light in the middle will flash continuously. Press on the motor control panel to allow remote control and data exchange via the Grundfos GO Remote.
	The green indicator light in the middle is permanently on.	Remote control with the Grundfos GO Remote via radio. The motor is communicating with the Grundfos GO Remote via radio connection.
	The green indicator light in the middle flashes quickly while the R100 or Grundfos Go Remote is exchanging data with the motor. It will take a few seconds.	Remote control with the R100 or Grundfos GO Remote via infrared light. The motor is receiving data from the R100 or Grundfos GO Remote via infrared communication.

14. Signal relays

The motor has two outputs for potential-free signals via two internal relays.

The signal outputs can be set to "Operation", "Running", "Ready", "Alarm" and "Warning".

The functions of the two signal relays appear from the table below:

Description	Grundfos Eye	Contact position for signal relays when activated					Operating mode
		Operation	Running	Ready	Alarm	Warning	
Power off.	 Off						-
Pump running in "Normal" mode	 Green, rotating						Normal, Min. or Max.
Pump running in "Manual" mode.	 Green, rotating						Manual
Pump in operating mode "Stop".	 Green, steady						Stop
Warning, but the pump is running.	 Yellow, rotating						Normal, Min. or Max.
Warning, but the pump is running in "Manual" mode.	 Yellow, rotating						Manual
Warning, but the pump was stopped via "Stop" command.	 Yellow, steady						Stop
Alarm, but the pump is running.	 Red, rotating						Normal, Min. or Max.
Alarm, but the pump is running in "Manual" mode.	 Red, rotating						Manual
Pump stopped due to an alarm.	 Red, flashing						Stop

15. Megging

Caution

Megging of an installation incorporating MGE motors is not allowed, as the built-in electronics may be damaged.

16. Technical data, single-phase motors

16.1 Supply voltage

- 1 x 200-240 V - 10 %/+ 10 %, 50/60 Hz, PE.

Check that the supply voltage and frequency correspond to the values stated on the nameplate.

Recommended fuse size

Motor size [kW]	Min. [A]	Max. [A]
0.25 - 0.75	6	10
1.1 - 1.5	10	16

Standard as well as quick-blow or slow-blow fuses may be used.

16.2 Leakage current

Earth leakage current < 3.5 mA (AC supply).

Earth leakage current < 10 mA (DC supply).

The leakage currents are measured in accordance with EN 61800-5-1:2007.

17. Technical data, three-phase motors

17.1 Supply voltage

- 3 x 380-500 V - 10 %/+ 10 %, 50/60 Hz, PE.

Check that the supply voltage and frequency correspond to the values stated on the nameplate.

Recommended fuse size

Motor size [kW]	Min. [A]	Max. [A]
0.25 - 1.1	6	6
1.5 - 2.2	6	10

Standard as well as quick-blow or slow-blow fuses may be used.

17.2 Leakage current

Motor size [kW]	Leakage current [mA]
0.75 - 2.2 (supply voltage < 400 V)	< 3.5
0.75 - 2.2 (supply voltage > 400 V)	< 5

The leakage currents are measured in accordance with EN 61800-5-1:2007.

18. Inputs/outputs

Ground reference (GND)

All voltages refer to GND.

All currents return to GND.

Absolute maximum voltage and current limits

Exceeding the following electrical limits may result in severely reduced operating reliability and motor life:

Relay 1:

Maximum contact load: 250 VAC, 2 A or 30 VDC, 2 A.

Relay 2:

Maximum contact load: 30 VDC, 2 A.

GENI terminals: -5.5 to 9.0 VDC or < 25 mADC.

Other input/output terminals: -0.5 to 26 VDC or < 15 mADC.

Digital inputs (DI)

Internal pull-up current > 10 mA at $V_i = 0$ VDC.

Internal pull-up to 5 VDC (currentless for $V_i > 5$ VDC).

Certain low logic level: $V_i < 1.5$ VDC.

Certain high logic level: $V_i > 3.0$ VDC.

Hysteresis: No.

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m.

Open-collector digital outputs (OC)

Current sinking capability: 75 mADC, no current sourcing.

Load types: Resistive or/and inductive.

Low-state output voltage at 75 mADC: Max. 1.2 VDC.

Low-state output voltage at 10 mADC: Max. 0.6 VDC.

Overcurrent protection: Yes.

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m.

Analog inputs (AI)

Voltage signal ranges:

- 0.5 - 3.5 VDC, AL AU.
- 0-5 VDC, AU.
- 0-10 VDC, AU.

Voltage signal: $R_i > 100$ k Ω at +25 °C.

Leak currents may occur at high operating temperatures.

Keep the source impedance low.

Current signal ranges:

- 0-20 mADC, AU.
- 4-20 mADC, AL AU.

Current signal: $R_i = 292$ Ω .

Current overload protection: Yes. Change to voltage signal.

Measurement tolerance: - 0/+ 3 % of full scale (max.-point coverage).

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m (excl. potentiometer).

Potentiometer connected to +5 V, GND, any AI:

Use maximum 10 k Ω .

Maximum cable length: 100 m.

Analog output (AO)

Current sourcing capability only.

Voltage signal:

- Range: 0-10 VDC.
- Minimum load between AO and GND: 1 k Ω .
- Short-circuit protection: Yes.

Current signal:

- Ranges: 0-20 and 4-20 mADC.
- Maximum load between AO and GND: 500 Ω .
- Open-circuit protection: Yes.

Tolerance: - 0/+ 4 % of full scale (max-point coverage).

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m.

Pt100/1000 inputs (PT)

Temperature range:

- Minimum -30 °C (88 Ω /882 Ω).
- Maximum +180 °C (168 Ω /1685 Ω).

Measurement tolerance: \pm 1.5 °C.

Measurement resolution: < 0.3 °C.

Automatic range detection (Pt100 or Pt1000): Yes.

Sensor fault alarm: Yes.

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Use Pt100 for short wires.

Use Pt1000 for long wires.

LiqTec sensor inputs

Use Grundfos LiqTec sensor only.

Screened cable: 0.5 - 1.5 mm² / 28-16 AWG.

Grundfos Digital Sensor input and output (GDS)

Use Grundfos Digital Sensor only.

Power supplies (+5 V, +24 V)**+5 V:**

- Output voltage: 5 VDC - 5 %/+ 5 %.
- Maximum current: 50 mADC (sourcing only).
- Overload protection: Yes.

+24 V:

- Output voltage: 24 VDC - 5 %/+ 5 %.
- Maximum current: 60 mADC (sourcing only).
- Overload protection: Yes.

Digital outputs (relays)

Potential-free changeover contacts.

Minimum contact load when in use: 5 VDC, 10 mA.

Screened cable: 0.5 - 2.5 mm² / 28-12 AWG.

Maximum cable length: 500 m.

Bus input

Grundfos GENiBus protocol, RS-485.

Screened 3-core cable: 0.5 - 1.5 mm² / 28-16 AWG.

Maximum cable length: 500 m.

19. Other technical data**EMC (electromagnetic compatibility)**

EN 61800-3.

Residential areas, unlimited distribution, corresponding to CISPR 11, class B, group 1.

Industrial areas, unlimited distribution, corresponding to CISPR 11, class A, group 1.

Contact Grundfos for further information.

Enclosure class

Standard: IP55 (IEC 34-5).

Optional: IP66 (IEC 34-5).

Insulation class

F (IEC 85).

Torques

Terminal	Thread size	Max. torque [Nm]
L1, L2, L3, L, N	M4	1.8
NC, C1, C2, NO	M2.5	0.5
1 to 26 and A, Y, B	M2	0.5

19.1 Sound pressure level

Motor [kW]	Max. speed stated on nameplate [min ⁻¹]	Speed [min ⁻¹]	Sound pressure level ISO 3743 [dB(A)]	
			1-phase motors	3-phase motors
0.25 to 0.75	2000	1500	38	38
		2000	42	42
	4000	3000	53	53
		4000	58	58
	5900	4000	58	58
		5900	68	68
1.1	2000	1500		38
		2000		42
	4000	3000	53	53
		4000	58	58
	5900	4000	58	58
		5900	68	68
1.5	2000	1500		
		2000		
	4000	3000	57	57
		4000	64	64
	5900	4000	58	58
		5900	68	68
2.2	2000	1500		
		2000		
	4000	3000		57
		4000		64
	5900	4000		58
		5900		68

The grey fields indicate that the motor is not yet available in this MGE motor range, but is available in the previous MGE motor range.

20. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

The waste battery should be disposed of through the national collective schemes. If in doubt, contact your local Grundfos company.

Subject to alterations.

1. Installation in the USA and Canada

Note

In order to maintain the cURus approval, follow these additional installation instructions. The UL approval is according to UL 1004-1.

1.1 Electrical codes

For USA

This product complies with the Canadian Electrical Code and the US National Electrical Code.

This product has been tested according to the national standards for Electronically Protected Motors:

CSA 22.2 100.04: 2009 (applies to Canada only).

UL 1004-1: June 2011 (applies to USA only).

Pour le Canada

Codes de l'électricité

Ce produit est conforme au Code canadien de l'électricité et au Code national de l'électricité américain.

Ce produit a été testé selon les normes nationales s'appliquant aux moteurs protégés électroniquement:

CSA 22.2 100.04: 2009 (s'applique au Canada uniquement).

UL 1004-1: Juin 2011 (s'applique aux États-Unis uniquement).

1.2 Radio communication

For USA

This device complies with part 15 of the FCC rules and RSS210 of IC rules.

Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

Pour le Canada

Communication radio

Ce dispositif est conforme à la partie 15 des règles de la FCC et aux normes RSS210 de l'IC.

Son fonctionnement est soumis aux deux conditions suivantes:

- Ce dispositif ne doit pas provoquer de brouillage préjudiciable.
- Il doit accepter tout brouillage reçu, y compris le brouillage pouvant entraîner un mauvais fonctionnement.

1.3 Identification numbers

For USA

Grundfos Holding A/S

Contains FCC ID: OG3-RADIOM01-2G4.

For Canada

Grundfos Holding A/S

Model: RADIOMODULE 2G4

Contains IC: 10447A-RA2G4M01.

Pour le Canada

Numéros d'identification

Grundfos Holding A/S

Modèle: RADIOMODULE 2G4

Contient IC: 10447A-RA2G4M01.

Location of identification numbers

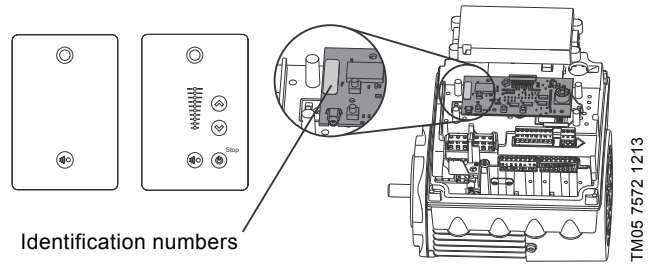


Fig. 1 Identification numbers

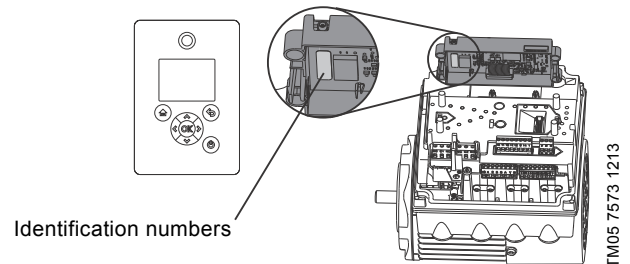


Fig. 2 Identification numbers

1.4 Electrical connection

1.4.1 Conductors

Use 140/167 °F (60/75 °C) copper conductors only.

1.4.2 Torques

Maximum tightening torques for the terminals can be found in section *Torques*, page 34.

1.4.3 Line reactors

Maximum line reactor size must not exceed 1.5 mH.

1.4.4 Fuse size/circuit breaker

If a short-circuit occurs, the pump can be used on a mains supply delivering not more than 5000 RMS symmetrical amperes, 600 V maximum.

Motor size	Fuse size	Circuit breaker type/model
0.25 to 2.2 kW	25 A	25 A / inverse time

Fuses

When the motor is protected by fuses, they must be rated for 480 V. Maximum sizes are stated in the table above.

Motors up to and including 2.2 kW require class K5 UR fuses.

Circuit breaker

When the pump is protected by a circuit breaker, this must be rated for a maximum voltage of 480 V. The circuit breaker must be of the "inverse time" type.

The interrupting rating (RMS symmetrical amperes) must not be less than the values stated in the table above.

1.4.5 Overload protection

Degree of overload protection provided internally by the drive, in percent of full-load current: 102 %.

Subject to alterations.

Declaration of conformity

GB: EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the products CRE, CRIE, CRNE, SPKE, MTRE and CME, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

RU: Декларация о соответствии ЕС

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия CRE, CRIE, CRNE, SPKE, MTRE и CME, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

- Machinery Directive (2006/42/EC).
Standard used: EN 809:1998, A1:2009.
- Low Voltage Directive (2006/95/EC).
Standard used: EN 61800-5-1:2007.
- EMC Directive (2004/108/EC).
Standard used: EN 61800-3:2005.
- R&TTE Directive (1999/5/EC).
Standard used: ETSI EN 300 328 V1.7.1 (2006-10).
- Ecodesign Directive (2009/125/EC).

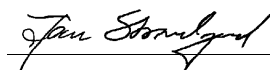
Water pumps:

Commission Regulation No 547/2012.

Applies only to water pumps marked with the minimum efficiency index MEI. See pump nameplate.

This EC declaration of conformity is only valid when published as part of the Grundfos installation and operating instructions (publication number 98358865 0414).

Bjerringbro, 6th March 2013



Jan Strandgaard
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and
empowered to sign the EC declaration of conformity.



Декларация о соответствии на территории РФ

Насосы центробежные вертикальные многоступенчатые CRE, CRIE, CRNE, SPKE, MTRE и CME сертифицированы на соответствие требованиям Технического регламента о безопасности машин и оборудования (Постановление правительства РФ от 15.09.2009 № 753).
Сертификат соответствия:

№ С-РУ.АЯ56.В.04045, срок действия до 11.07.2017г.

№ С-ДК.АЯ56.В.03740, срок действия до 27.05.2017г.

Изделия, произведенные в России, изготавливаются в соответствии с ТУ 3631-001-59379130-2005.

Истра, 10 января 2013г.



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