CRE, CRIE, CRNE, CRKE, SPKE, MTRE, CME

North America

Grundfos E-pumps with MLE Model H, I frequency-controlled permanent-magnet motors

Installation and operating instructions

GRUNDFOS

CRE, CRIE, CRNE, CRKE, SPKE, MTRE, CME

Original installation and operating instructions

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1. Limited warranty

Products manufactured by Grundfos Pumps Corporation (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges that may arise in connection with a warranty claim. Products which are sold, but not manufactured by Grundfos, are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions and accepted codes of good practice. The warranty does not cover normal wear and tear. To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed. Grundfos will not be liable for any incidental or consequential damages, losses, or expenses arising from installation, use, or any other causes. There are no express or implied warranties, including merchantability or fitness for a particular purpose, which extend beyond those warranties described or referred to above. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction. Products which are repaired or replaced by Grundfos or authorized service center under the provisions of these limited warranty terms will continue to be covered by Grundfos warranty only through the remainder of the original warranty period set forth by the original purchase date.

2. General information

Read this document before you install the product. Installation and operation must comply with local regulations and accepted codes of good practice.

2.1 Related instructions

These installation and operating instructions are a supplement to the installation and operating instructions for the corresponding standard pumps CR, CRI, CRN, CRK, SPK, MTR, and CM. For instructions not mentioned specifically in this manual, see the installation and operating instructions for the standard pump.

Installation and operating instructions

Title	QR code	Publication number	Link
CR, CRI, CRN, CRT (NEMA)		98419736	*http://net.grundfos.com/qr/i/98419736*
MTR, CRK, SPK (NEMA)		L-MTR-TL-03	*http://net.grundfos.com/qr/i/L-MTR-TL-03*
CM (NEMA)		97526969	*https://net.grundfos.com/qr/i/L-CM-TL-001*

2.2 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD

Description of the hazard

Consequence of ignoring the warning

- Action to avoid the hazard.

2.3 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

Observe these instructions for explosion-proof products.

A blue or gray circle with a white graphical symbol indicates that an action must be taken.

A red or gray circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

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

Tips and advice that make the work easier.

2.4 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
FM	Functional module
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 (ground)
PELV	Protective extra-low voltage: a voltage that cannot exceed ELV under normal conditions and under single-fault conditions, except earth (ground) faults in other circuits
SELV	Safety extra-low voltage: a voltage that cannot exceed ELV under normal conditions and under single-fault conditions, including earth (ground) faults in other circuits

3. Product introduction

3.1 Product description

Grundfos E-pumps are mounted with frequency-controlled permanent-magnet MLE motors for three-phase power supply connection. The motors incorporate a PI controller.

You can connect the motors to a signal from an external sensor and a setpoint signal enabling control in closed loop. You can also use the motors for an open-loop system in which the setpoint signal is used as a speed control signal.

The motors incorporate an operating panel which is available in various versions.

Detailed motor settings are made with Grundfos GO Remote. Furthermore, you can read important operating parameters via Grundfos GO Remote.

The motors incorporate a functional module. The functional module is available in various versions with different inputs and outputs.

You can fit the motors with a Grundfos add-on communication interface module (CIM). The module enables data transmission between the motor and an external system, for example a BMS or SCADA system. The module communicates via fieldbus protocols.

You can connect several motors together via radio or bus communication to create a multimotor system.

3.1.1 Pumps without a factory-fitted sensor

The pumps have a built-in PI controller and can be set 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. You can change the control mode with R100, Grundfos GO Remote or HMI 300.

3.1.2 Pumps with a factory-fitted pressure sensor

The pumps have a built-in PI controller and are set for a pressure sensor enabling the control of the outlet pressure.

The pumps are factory-set to constant-pressure control mode. The pumps are typically used for keeping a constant pressure in variable-demand systems.

3.2 Radio communication

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

For use in the USA and Canada, see the appendix on installation in the USA and Canada.

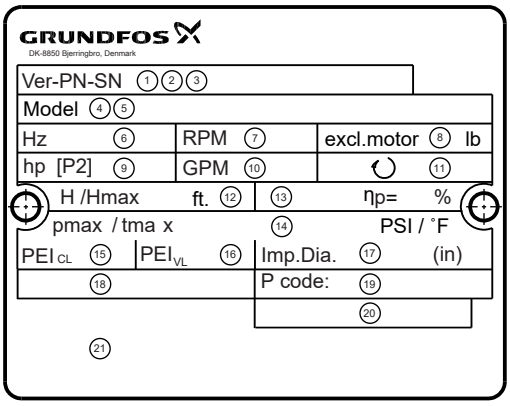
This product can communicate with the Grundfos GO and other products of the same type via the built-in radio module.

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.

3.3 Identification

3.3.1 Identification of the pump model

3.3.1.1 Nameplate



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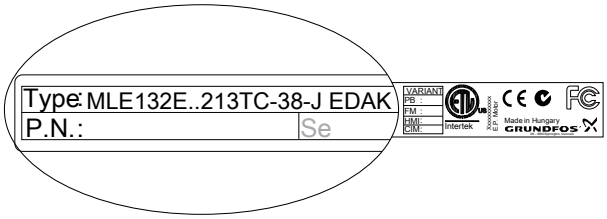
Example of a nameplate

Pos.	Description
1	Version
2	Product number
3	Serial number
4	Model
5	Type designation
6	Frequency
7	Rated speed
8	Weight excluding motor
9	Motor-rated power output
10	Rated flow rate
11	Direction of rotation CCW: Counterclockwise CW: Clockwise
12	Head at rated flow rate or Maximum head
13	Hydraulic efficiency at rated flow rate
14	Maximum system pressure or Maximum liquid temperature. Note that this field may have two sets of data.
15	Pump Energy Index, constant load
16	Pump Energy Index, variable load
17	Impeller diameter
18	External reference (Other Equipment Manufacturer number)
19	Production code
20	Country of origin
21	Approval marks

3.3.2 Identification of the motor model

Identify the motor by the nameplate on the terminal box.



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Model H

Motor [hp]	1 × 200-240 V
	2900 - 4000 rpm 4000-5900 rpm
1/2	•
3/4	•
1	•
1 1/2	•
2	•

Model I

Motor [hp]	3 × 440-480 V	3 × 200-240 V
	2900 - 4000 rpm 4000-5900 rpm	3400-4000 rpm
1	•	-
1 1/2	•	•
2	•	•
3	•	-

3.3.3 Identification of the functional module

You can identify the fitted module via one of the following ways:

Grundfos GO Remote

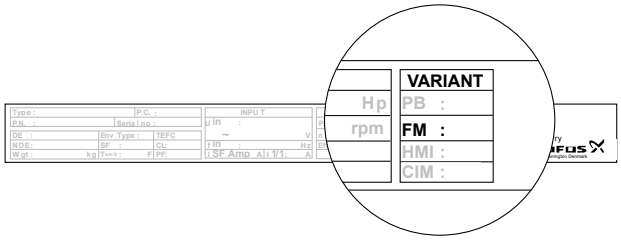
You can identify the functional module in the **Fitted modules** menu under **Status**.

Motor display

For motors fitted with the HMI 300 operating panel, you can identify the functional module in the **Fitted modules** menu under **Status**.

Motor nameplate

You can identify the fitted module by means of the data on the motor nameplate.



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Functional module variants:

- FM 200
- FM 300.

3.3.4 Identification of the operating panel

You can identify the fitted module via one of the following ways:

Grundfos GO Remote

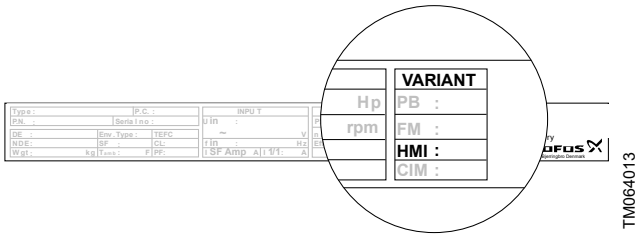
You can identify the operating panel in the **Fitted modules** menu under **Status**.

Motor display

For motors fitted with the HMI 300 operating panel, you can identify the operating panel in the **Fitted modules** menu under **Status**.

Motor nameplate

You can identify the operating panel by the data on the motor nameplate.



Operating panel variants

- HMI 200
- HMI 300.

3.4 Radio module

CAUTION

Radiation

Minor or moderate personal injury

- Locate the product at a minimum distance of 8 inches (20 cm) from any body parts. Human tissue may be heated by RF energy.

Installers and end users must be provided with these installation and operating instructions and operating conditions for satisfying RF exposure compliance.

The product incorporates a class 1 radio module for remote control. You can use the module anywhere in the EU without restrictions.

For installation in the USA and Canada, see the appendix.

Via the built-in radio module, the product can communicate with other MLE motors.

The product contains a class 1 radio. Grundfos will support the product with security updates for at least 2 years from production of the unit.

3.5 Battery

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

WARNING

Intoxication or risk of chemical burn

Death or serious personal injury

- The battery can cause severe or fatal injuries in 2 hours or less if it is swallowed or placed inside any part of the body. In such an event, seek medical attention immediately.

- The replacement or servicing of batteries must be carried out by a qualified person.
- The battery contained within this product, whether new or used, is hazardous and is to be kept away from children.

4. Receiving the product

4.1 Transporting the product

WARNING

Falling objects

Death or serious personal injury

- Secure the product during transportation to prevent it from tilting or falling down.

CAUTION

Crushing of feet

Minor or moderate personal injury

- Wear safety shoes when moving the product.

Motors from 3 hp (2.2 kW): Do not stack more than two motors in their original packaging.

4.2 Inspecting the product

Before installing the product, do the following:

1. Check if the product is as ordered.
2. Check if no visible parts are damaged.
3. If parts are damaged or missing, contact your local Grundfos sales company.

4.3 Lifting the product

WARNING

Falling objects

Death or serious personal injury

- Use lifting equipment rated for the weight of the product.
- Attach lifting equipment to the motor eyebolts to lift the entire product.
- Wear personal protective equipment.
- Keep a safe distance to the product during lifting operations.
- Follow the lifting instructions for the product.

WARNING

Back injury

Death or serious personal injury

- Use lifting equipment and follow local regulations when lifting the product.

Observe local regulations concerning limits for manual lifting or handling. Calculate the total weight of the pump with the motor by adding the weights stated on the pump and motor nameplates.

Do not lift the product by the terminal box.

Note that the center of gravity of the pump is typically close to the motor.

For lifting instructions, see the related installation and operating instructions for the pump.

5. Installation requirements

5.1 Location

Observe the instructions on intended use for your specific product regarding indoor location.

5.2 Indoor installation

The MLE Model H and I enclosure are approved for NEMA type 12 and are suitable for indoor use only. In humid environments, open the drain holes to avoid condensation on the electronic components. We recommend that you enable the built-in standstill heating function.

Related information

5.4.1 Cooling the motor

6.1.1.2 Drain holes

9.21 Standstill heating

5.3 Installing the product in areas with high humidity

WARNING

Fire hazard

Death or serious personal injury

- In high humidity environments where condensation can occur, connect the product permanently to the power supply and activate the standstill heating function.

To maintain the cURus mark, additional requirements apply to the equipment. See the appendix concerning installation in the USA and Canada.

Do not expose the product to UV radiation.

To avoid condensation, the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.

- Open the drain holes in the product.

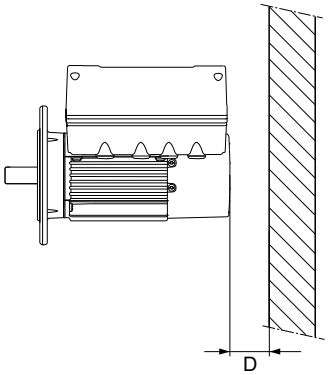
When you open the drain hole, the enclosure class of the motor is lower than standard.

- Connect the product permanently to the power supply. In areas with high humidity, activate the built-in standstill heating function.

5.4 Minimum space

5.4.1 Cooling the motor

- Install the motor allowing a distance of minimum 2 inches (50 mm) (D) between the end of the fan cover and the wall or another fixed object.



TM071139

- Position the product with sufficient space around.
- Make sure that the temperature of the cooling air does not exceed 122 °F (50 °C).
- Keep cooling fins and fan blades clean.

6. Mechanical installation

6.1 Mounting the product

WARNING

Crushing of feet

Death or serious personal injury

- Fasten the pump securely to a solid and even foundation according to the specifications in the installation and operating instructions for the pump.
- Follow the lifting instructions.

CAUTION

Radiation

Minor or moderate personal injury

- Locate the product at a minimum distance of 8 inches (20 cm) from any body parts. Human tissue may be heated by RF energy.

Installation-related work on the product must only be performed by qualified persons.

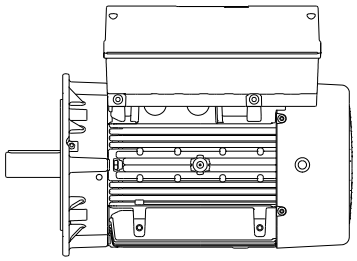
For lifting instructions, see the related installation and operating instructions for the pump.

To maintain the cURus mark, additional requirements apply to the equipment.

6.1.1 Positioning the product

6.1.1.1 Product installation

The drive needs to be installed in one of the following two positions:



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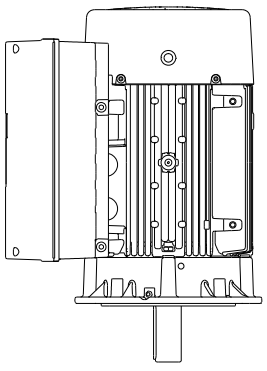
Horizontal orientation



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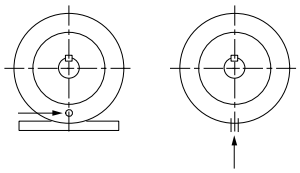
Vertical orientation

6.1.1.2 Drain holes

The motor has a plugged drain hole on the drive side. The drain hole is placed in the flange on the drive side. You can turn the flange 90° to both sides or 180°.

With the drain hole open, the motor becomes self-venting, allowing water and humid air to escape.

When you open the drain hole, the enclosure class of the motor is lower than standard.



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Drain hole positions

The image on the left shows the drain hole position for motors with feet.

The image on the right shows the drain hole position for motors with the following flange sizes: 56C, 182TC, 213TC, 254TC, 256TC, 284TSC, 286TSC.

6.2 Changing the position of the operating panel

DANGER

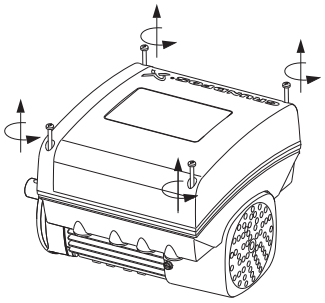
Electric shock

Death or serious personal injury

- Switch off the power supply to the motor and to the signal relays. Wait at least 5 minutes before starting any work on the motor. Make sure that the power supply cannot be switched on accidentally.

You can turn the operating panel 180°. Follow the instructions below.

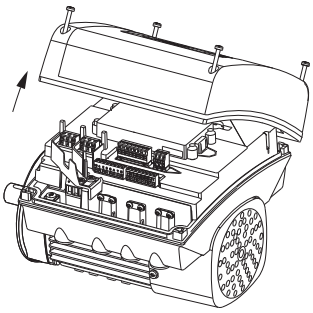
1. Loosen the four screws (TX25) of the terminal box cover.



TM055351

Loosening the screws

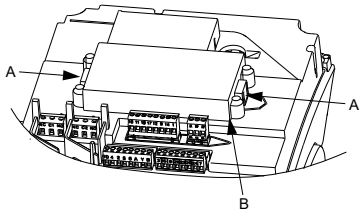
2. Remove the terminal box cover.



TM055352

Removing the terminal box cover

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

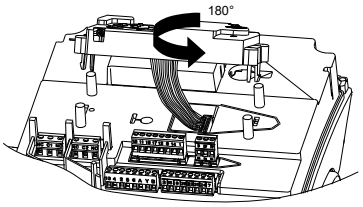


TM055353

Lifting the plastic cover

4. Turn the plastic cover 180°.

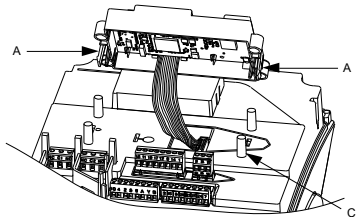
Do not twist the cable more than 90°.



TM055354

Turning the plastic cover

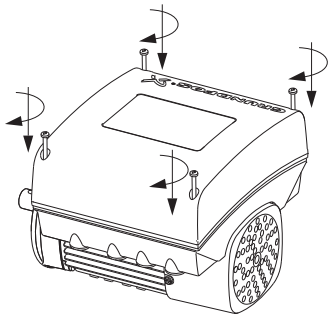
5. Position the plastic cover correctly on the four rubber pins (C). Make sure the locking tabs (A) are placed correctly.



TM055355

Positioning the plastic cover

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



TM055356

Fitting the terminal box cover

7. Electrical installation

DANGER

Electric shock

Death or serious personal injury

- Switch off the power supply to the motor and to the signal relays. Wait at least 5 minutes before you make any connections in the terminal box. Make sure that the power supply cannot be accidentally switched on.

DANGER

Electric shock

Death or serious personal injury

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

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

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

7.1 Power supply

DANGER

Electric shock

- Death or serious personal injury
- Use the recommended fuse size. See the section on supply voltage.

Single-phase supply voltage

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

DANGER

Electric shock

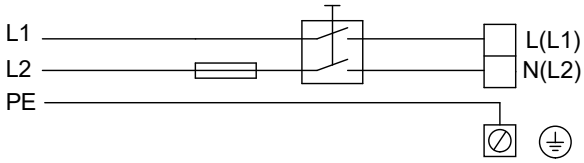
Death or serious personal injury

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

If you want to supply the motor through an IT network, make sure you have a suitable motor variant. If you are in doubt, contact Grundfos.

The wires in the motor terminal box must be as short as possible. The only exception from this is the separated ground 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 the section on supply voltage.



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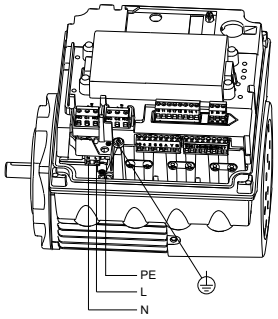
Example of a power supply-connected motor with power supply switch and backup fuse



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Power supply connection, single-phase motors

Terminal L of the motor is the input for L1. Terminal N of the motor is the input of L2.

Three-phase supply voltage

- 3 × 440-480 V -10 % / +10 %, 50/60 Hz, PE
- 3 × 200-240 V -10 % / +10 %, 50/60 Hz, PE.

The wires in the motor terminal box must be as short as possible. The only exception from this is the separated ground 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.

DANGER

Electric shock

Death or serious personal injury

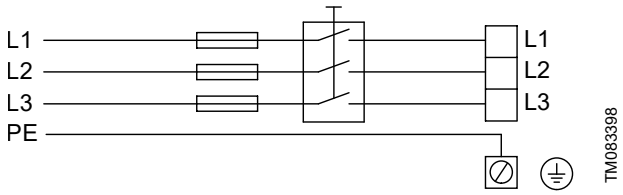
- Confirm that the supply voltage and frequency correspond to the values stated on the nameplate.

In order to avoid loose connections, make sure that you have pressed home the terminal block for L1, L2 and L3 in its socket when you connect the supply cable.

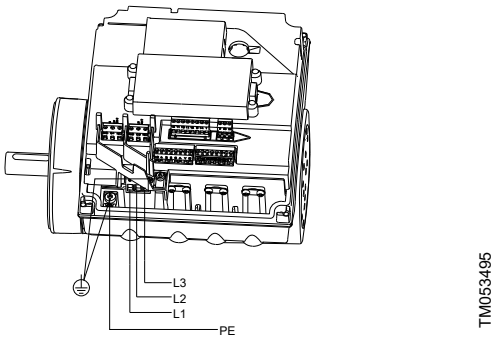
For maximum backup fuse, see the section on supply voltage.

If you want to supply the motor through an IT network, make sure you have a suitable motor variant. If you are in doubt, contact Grundfos.

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



Example of a power supply-connected motor with power supply switch and backup fuses



Power supply connection, three-phase motors

Related information

12.3.1 Supply voltage

12.4.1 Supply voltage

7.2 Protection against electric shock, indirect contact

WARNING

Electric shock

- Death or serious personal injury
- Connect the motor to a protective ground and provide protection against indirect contact in accordance with local regulations.

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

Protection against power supply voltage transients

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

Motor protection

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

7.3 Cable requirements

Cable cross-section

DANGER

Electric shock

Death or serious personal injury

- Always comply with local regulations as to cable cross-sections.

Single-phase supply

Conductor type	Conductor material	Cross section	
		[mm²]	[AWG]
Solid	Copper	0.5 - 2.5	28-12
Stranded		0.5 - 2.5	30-12

Three-phase supply

Conductor type	Conductor material	Cross section	
		[mm²]	[AWG]
Solid	Copper	0.5 - 10	18-8
Stranded		0.5 - 10	18-8

Conductors

Type

Stranded or solid copper conductors.

Temperature rating

Temperature rating for conductor insulation: 140 °F (60 °C).

Temperature rating for outer cable sheath: 167 °F (75 °C).

7.3.1 Cable entries

See the size of the cable entries in the section on other technical data.

Related information

12.6 Other technical data

7.3.2 Cable glands

The number and size of cable glands delivered with the pump depend on the motor size. See the section on other technical data.

Related information

12.6 Other technical data

7.4 Additional protection

The total leakage current of all the electrical equipment in the installation must be taken into account. You can find the leakage current of the motor in the sections on leakage current and leakage current (AC).

This product can cause a direct current in the protective ground conductor.

Overvoltage and undervoltage protection

Overvoltage and undervoltage may occur in case of unstable power supply or a faulty installation. The motor is stopped if the voltage falls outside the permissible voltage range. The motor restarts automatically when the voltage is again within the permissible voltage range. Therefore, no additional protection relay is required.

The motor is protected against transients from the power supply according to EN 61800-3. In areas with high lightning intensity, we recommend external lightning protection.

Overload protection

If the upper load limit is exceeded, the motor automatically compensates for this by reducing the speed and stops if the overload condition persists.

The motor remains stopped for a set period. After this period, the motor automatically attempts to restart. The overload protection prevents damage to the motor. Consequently, no additional motor protection is required.

Overtemperature protection

The electronic unit has a built-in temperature sensor as an additional protection. When the temperature rises above a certain level, the motor automatically compensates for this by reducing the speed and stops if the temperature keeps rising. The motor remains stopped for a set period. After this period, the motor automatically attempts to restart.

Protection against phase unbalance

Three-phase motors 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.

Related information

12.3.2 Leakage current

12.4.2 Leakage current (AC)

7.5 Connection terminals

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

For maximum torques, see the section on torques.

Connection terminals

The 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.

Digital input 1 is factory-set to be start-stop input where open circuit results 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.

DANGER

Electric shock

Death or serious personal injury

- Make sure that the wires to be connected to the connection groups below are separated from each other by reinforced insulation in their entire lengths.

- Inputs and outputs

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

- Start-stop: (Digital input 1) = Terminals DI1 and GRD
- Pressure sensor: (Analog input 1) = Terminals AI1 and 24V
- Pressure switch: (Digital input 3) = Terminals DI3 and GRD
- External analog signal input: (Analog input 2) = Terminals AI2 and GRD
- GENIbus Terminals A, Y and B
- Signal relay outputs
  - Signal relay 1: LIVE: You can connect supply voltages up to 250 VAC. PELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or protective extra-low voltage to the output as desired.
  - Signal relay 2: PELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or protective extra-low voltage to the output as desired.
- Power supply (terminals L1, L2, L3, PE).

* If you use an external supply source, there must be a connection to GND.

Connection terminals, CME pumps manufactured prior to October 1, 2017

This information is optional for CRE, CRIE, CRNE, CME, SPKE and MTRE pumps.

CME pumps manufactured before October 1, 2017 have 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. Connection terminals, optional for CRE, CRIE, CRNE, CRKE, SPKE, MTRE and CME pumps.

Digital input 1 is factory-set to be start-stop input where open circuit results 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.

DANGER

Electric shock

Death or serious personal injury

- Make sure that the wires to be connected to the connection groups below are separated from each other by reinforced insulation in their entire lengths.

- Inputs and outputs

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

- Start-stop: (Digital input 1) = Terminals DI1 and GRD
- Pressure sensor: (Analog input 1) = Terminals AI1 and 24V
- Pressure switch: (Digital input 3) = Terminals DI3 and GRD
- External analog signal input: (Analog input 2) = Terminals AI2 and GRD

GENIbus Terminals A, Y and B

- Signal relay outputs
  - Signal relay 1:

    LIVE:

    You can connect supply voltages up to 250 VAC to the output.

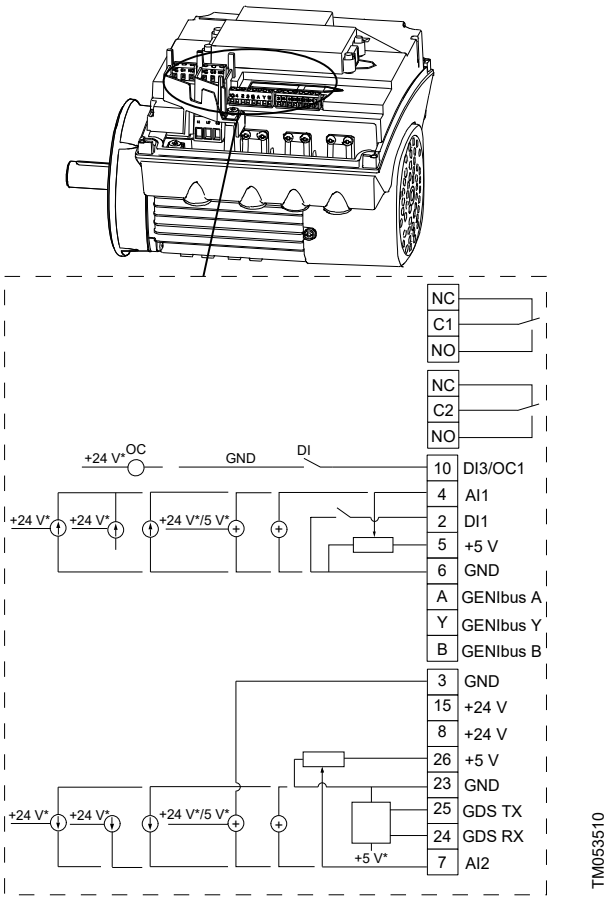
    PELV:

    The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or protective extra-low voltage to the output as desired.
  - Signal relay 2:

PELV:

The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or protective extra-low voltage to the output as desired.

- Power supply (terminals L1, L2, L3, PE).



* If you use an external supply source, there must be a connection to GND.

Connection terminals, optional for CRE, CRIE, CRNE, CRKE, SPKE, MTRE and CME pumps

Terminal	Type	Function
NC	Normally closed contact	Signal relay 1 (LIVE or PELV)
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2 (PELV only)
C2	Common	
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 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

Related information

12.6 Other technical data

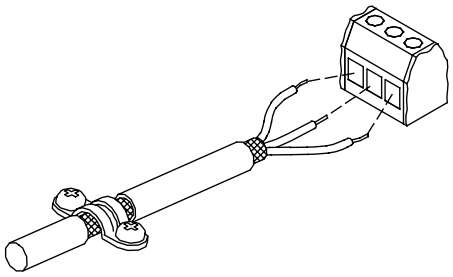
7.6 Signal relays

The pump has two outputs for potential-free signals via two internal relays.
You can set the signal outputs to **Operation**, **Pump running**, **Ready**, **Alarm** and **Warning**.
The functions of the two signal relays appear from the table below:

Description	Grundfos Eye	Contact position of signal relays when activated					Operating mode
		Operation	Pump running	Ready	Alarm	Warning	
The power is off.	 Off						-
The pump runs in **Normal** mode.	 Green, rotating						**Normal**, **Min.** or **Max.**
The pump runs in **Manual** mode.	 Green, rotating						**Manual**
The pump is in operating mode **Stop**.	 Green, steady						**Stop**
Warning, but the pump is running.	 Yellow, rotating						**Normal**, **Min.** or **Max.**
Warning, but the pump runs in **Manual** mode.	 Yellow, rotating						**Manual**
Warning, but the pump was stopped via a **Stop** command.	 Yellow, steady						**Stop**
Alarm, but the pump is running.	 Red, rotating						**Normal**, **Min.** or **Max.**
Alarm, but the pump runs in **Manual** mode.	 Red, rotating						**Manual**
The pump is stopped due to an alarm.	 Red, flashing						**Stop**
The pump is stopped due to **Low-flow stop function.**	 Green, steady						**Normal**

7.7 Signal cables

- Use screened cables with a cross-sectional area of minimum 28 AWG and maximum 16 AWG for the external on/off switch, digital inputs and setpoint signals.
- Connect the screens of the cables to the frame at both ends with good connection. The screens must be as close as possible to the terminals. See the figure below.



TM021325

Stripped cable with screen and wire connections

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

Connection of Danfoss pressure sensor MBS3000 to E-pump

TM051533_2911

MBS3000 pressure sensor

Use screened cables with a cross-sectional area of minimum 28 AWG and maximum 16 AWG.

The blue wire of the pressure sensor is connected to the #4 terminal of the E-pump. The brown wire of the pressure sensor is connected to the #8 terminal of the E-pump.

Connection of Grundfos pressure sensor ISP44 to E-pump

TM083396

ISP44 pressure sensor

Use unscreened cables with a cross-sectional area of minimum 28 AWG and maximum 16 AWG.

The blue wire of the pressure sensor is connected to the #4 terminal of the E-pump. The brown wire of the pressure sensor is connected to the #8 terminal of the E-pump.

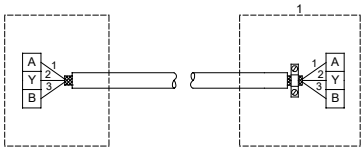
7.8 Bus connection cable

New installations

For the bus connection, use a screened 3-core cable with a cross-sectional area of minimum 28 AWG and maximum 16 AWG.

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 leave the screen unconnected at this end. See the figure below.



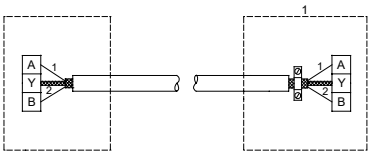
TM053973

Connection with screened 3-core cable

Pos.	Description
1	Motor

Replacing a motor

- If a 2-core cable is used in the installation, connect it as shown in the figure below.



TM054035

Connection with screened 2-core cable

Pos.	Description
1	Motor

- If a screened 3-core cable is used in the installation, follow the instructions in the section on the new installations.

7.9 Bus signal

The pump supports serial communication via an RS-485 input. The communication is carried out according to the Grundfos GENIbus protocol and enables connection to other pumps as well as a building management system or another external control system.

Via a bus signal, you can set pump operating parameters, such as setpoint and operating mode, remotely. At the same time, the pump 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.

If you use a bus signal, the local settings made via the R100, the Grundfos GO Remote or the HMI 300 operating panel are overruled. In case the bus signal fails, the product will run with the local settings made via the R100, the Grundfos GO Remote or the HMI 300 operating panel.

7.10 Installing a communication interface module

DANGER

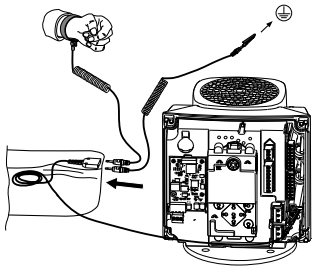
Electric shock

Death or serious personal injury

- Switch off the power supply to the motor and to the signal relays. Wait at least 5 minutes before starting any work on the motor. Make sure that the power supply cannot be accidentally switched on.

Always use an antistatic service kit when handling electronic components. This prevents static electricity from damaging the components.

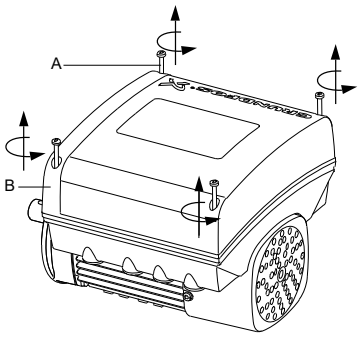
When unprotected, place the component on the antistatic cloth.



TM064462

Antistatic service kit

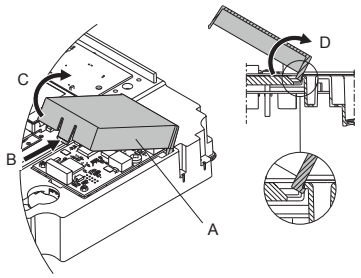
1. Loosen the four screws (figure below, A) and remove the terminal box cover (B).



TM064081

Removing the terminal box cover

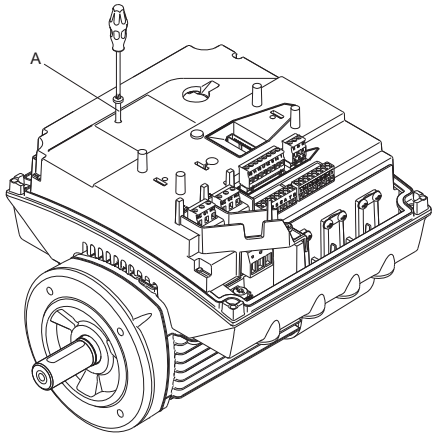
2. Remove the CIM cover (figure below, A) by pressing the locking tab (B) and lifting the end of the cover (C). Then lift the cover off the hooks (D).



TM064084

Removing the CIM cover

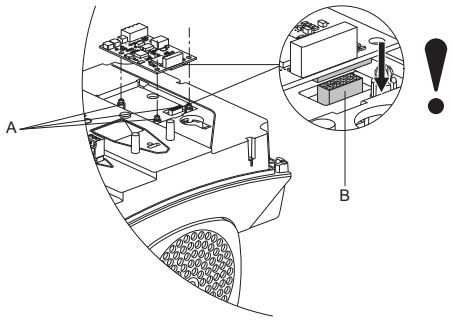
3. Remove the securing screw (figure below, A).



TM064082

Removing the securing screw

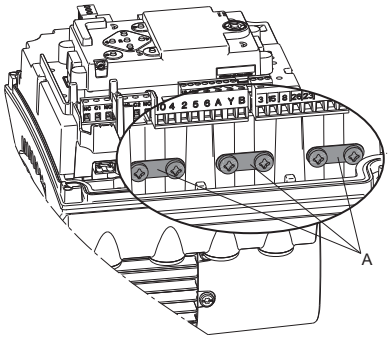
4. Fit the CIM by aligning it with the three plastic holders (figure below, A) and the connecting plug (B). Press the home module using your fingers.



TM064083

Fitting the CIM

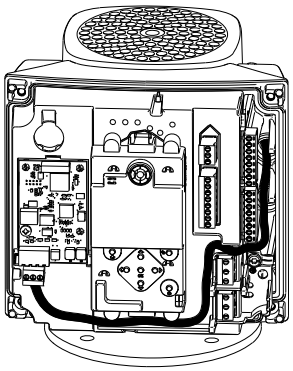
5. Fit and tighten the securing screw (figure Removing the securing screw, A) to 1.3 Nm.
6. Make the electrical connections to the CIM as described in the instructions delivered with the module.
7. Connect the cable screens of the bus cables to ground via one of the ground clamps (figure below, A).



TM064195

Connecting the cable screens to ground

8. Route the wires for the CIM. See the example in the figure below.

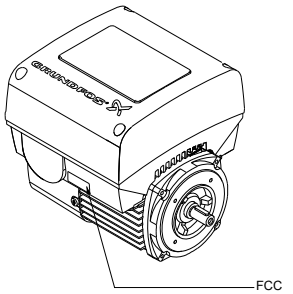


TM064085

Example of wire routing

9. Fit the CIM cover.

10. If the CIM is supplied with an FCC label, then place this on the terminal box. See the figure below.



TM057028

FCC label

11. Fit the terminal box cover (figure Removing the terminal box cover above, B) and cross-tighten the four mounting screws (A) to 6 Nm.

Make sure the terminal box cover is aligned with the operating panel. See the section on changing the position of the operating panel.

Related information

6.2 Changing the position of the operating panel

8. Control functions

8.1 User interfaces

WARNING

Hot surface

Death or serious personal injury

- Touch the buttons on the display only as the product may be very hot.

WARNING

Electric shock

Death or serious personal injury

- If the operating panel is cracked or perforated, replace it immediately. Contact the nearest Grundfos sales company.

You can change the settings by the following user interfaces:

- HMI 200 operating panel
- HMI 300 operating panel
- Grundfos GO Remote
- Grundfos R100 remote control.

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

Related information

8.1.1 HMI 200

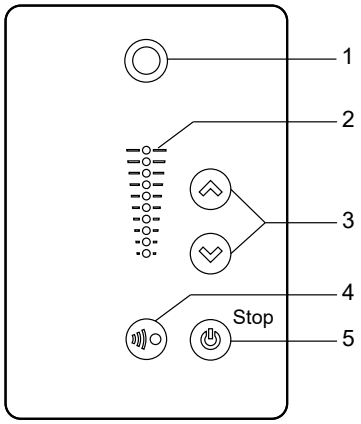
8.1.2 HMI 300

8.1.3 Grundfos GO

8.1.5 R100 remote control

8.1.1 HMI 200

The pumps are fitted with this operating panel as standard.



TM054848

HMI 200 operating panel

Pos.	Symbol	Description
1		**Grundfos Eye:** The indicator light shows the operating status of the product.
2	-	Light fields for indication of setpoint.
3		**Up/Down**: The buttons change the setpoint.
4		**Communication**: It allows radio communication with Grundfos GO Remote and other products of the same type. When you try to establish radio communication between the pump and Grundfos GO Remote or another pump, the green indicator light in Grundfos Eye on the pump flashes continuously. Press on the pump operating panel to allow radio communication with Grundfos GO Remote and other products of the same type.
5		**Start/Stop**:Press the button to make the product ready for operation or to start and stop the product. **Start**:If you press the button when the product is stopped, the product starts if no other functions with higher priority have been enabled. **Stop**: If you press the button when the product is running, the product always stops. When you press the button, the stop icon appears at the bottom of the display.

Related information

6.2 Changing the position of the operating panel

10.1 Priority of settings

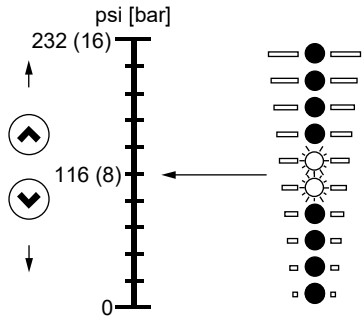
8.1.1.1 Setpoint setting

Set the desired setpoint of the pump by pressing **Up** or **Down**. The green light fields on the operating panel 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, you must set it up manually as the pump does not automatically register a connected sensor. See the section on analog inputs.

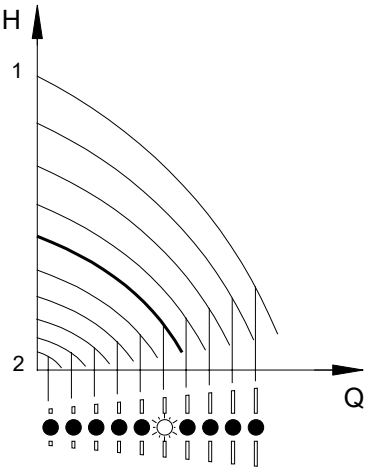
The figure below shows that the light fields 5 and 6 are activated, indicating a desired setpoint of 116 psi (3 bar) with a sensor measuring range from 0 to 232 psi (6 bar). The setting range is equal to the sensor measuring range.



Setpoint set to 116 psi (3 bar), constant pressure control

Pump in constant-curve control mode

In constant-curve control mode, the pump performance lies between the maximum and minimum curve of the pump. See the figure below.



Pump in constant-curve control mode

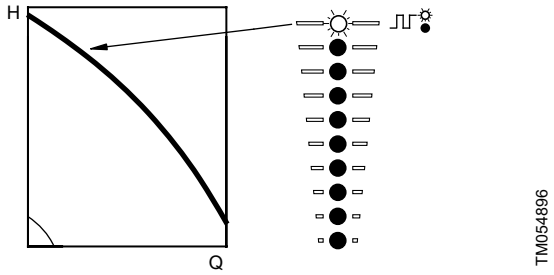
Pos.	Description
1	Max.
2	Min.

Setting to maximum curve:

- Press **Up** continuously to change over to the maximum curve of the pump (top light field flashes). When the top light field is on, press **Up** for 3 seconds until the light field starts flashing.
- To go back, press **Down** continuously until the desired setpoint is indicated.

Example: Pump set to maximum curve.

The figure below shows that the top light field is flashing, indicating the maximum curve.



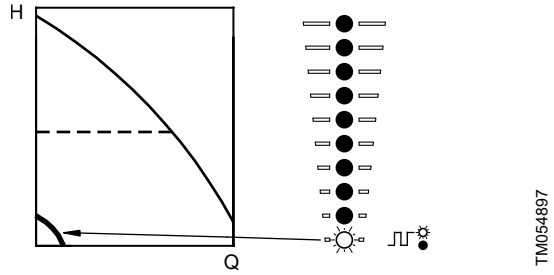
Maximum curve duty

Setting to minimum curve:

- Press **Down** continuously to change over to the minimum curve of the pump (bottom light field flashes). When the bottom light field is on, press **Down** for 3 seconds until the light field starts flashing.
- To go back, press **Up** continuously until the desired setpoint is indicated.

Example: Pump set to minimum curve.

The figure below shows that the bottom light field is flashing, indicating the minimum curve.



Minimum curve duty

Start-stop of pump

If you stop the pump by pressing **Stop** and the **Stop** text on the operating panel is illuminated, you can only give it free to operation by pressing **Stop** again.

If you stop the pump by pressing **Down**, you can restart it by pressing **Up** or by using Grundfos GO Remote.

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

Stop the pump by pressing **Stop**. When the pump is stopped, the **Stop** text next to the button is on. You can also stop the pump by continuously pressing **Down** until none of the light fields are on.

You can also stop the pump with Grundfos GO Remote or via a digital input set to **External stop**. See the section on the description of settings.

Resetting of fault indications

You can reset a fault indication in one of the following ways:

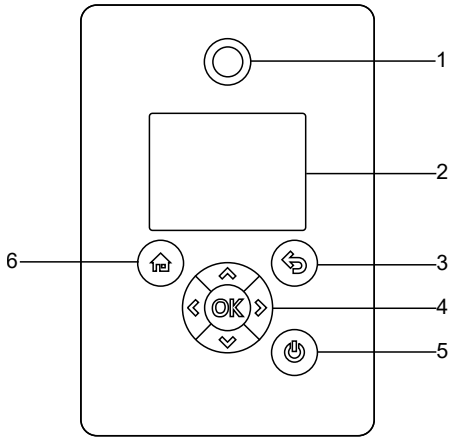
- Via the digital input if you have set it to **Alarm resetting**.
- Briefly press **Up** or **Down** on the pump. This does not change the setting of the pump. You cannot reset a fault indication by pressing **Up** or **Down** if the buttons have been locked.
- Switch off the power supply until the indicator lights are off.
- Switch the external start-stop input off and then on again.
- Use Grundfos GO Remote.

Related information

9.5 Analog inputs
10.1 Priority of settings

8.1.2 HMI 300

The pumps can be fitted with the advanced operating panel as an option.



HMI 300 operating panel

Pos.	Symbol	Description
1		**Grundfos Eye:** The indicator light shows the operating status of the product.
2	-	Graphical color display.
3		**Back**: Press the button to go one step back.
4		**Left**/**Right**: Press the buttons to navigate between main menus, displays and digits. When you change the menu, the display shows the top display of the new menu.
4		**Up**/**Down**: Press the buttons to navigate between submenus or change the value settings. If you have disabled the possibility to make settings with the **Enable/disable settings** function, you can enable it again temporarily by pressing these buttons simultaneously for at least 5 seconds.
4	OK	**OK**: Press the button to do as follows: • save changed values, reset alarms and expand the value field • enable communication with Grundfos GO Remote and other products of the same type. When you try to establish radio communication between the product and Grundfos GO Remote or another product, the green indicator light in Grundfos Eye flashes. In the controller display, a note states that a device wants to connect to the product. Press **OK** on the product operating panel to allow communication with Grundfos GO Remote and other products of the same type.
5		**Start/Stop**:Press the button to make the product ready for operation or to start and stop the product. **Start**:If you press the button when the product is stopped, the product starts if no other functions with higher priority have been enabled. **Stop**:If you press the button when the product is running, the product always stops. When you press the button, the stop icon appears at the bottom of the display.
6		**Home**: Press the button to go to the **Home** menu.

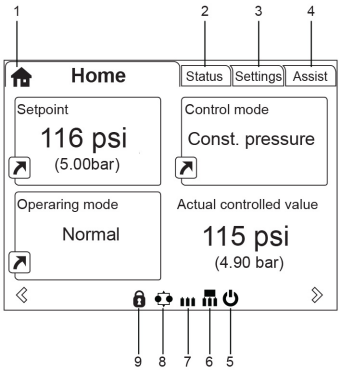
Related information

6.2 Changing the position of the operating panel

9.29 Enable/disable settings

10.1 Priority of settings

8.1.2.1 Home display



Example of Home display

Pos.	Symbol	Description
1		**Home**: This menu shows up to four user-defined parameters. You can access each parameter directly from this menu.
2	-	**Status**: This menu gives access to all setting parameters. The menu also allows you to make detailed settings.
3	-	**Settings**: This menu gives access to all setting parameters. You can make detailed settings of the pump in this menu.
4	-	**Assist**: This menu enables assisted setup, provides a short description of the control modes and offers fault-finding advice.
5		**Start/Stop**: This symbol indicates that the pump has been stopped via the **Start/Stop** button.
6		**Master:** The icon indicates that the product is functioning as the master in a multipump system.
7		**Slave:** The icon indicates that the product is functioning as a slave in a multipump system.
8		**Multioperation:** The icon indicates that the product is operating in a multipump system.
9		**Lock:** The icon indicates that the possibility to make settings has been disabled for protective reasons.

Related information

9.1 Setpoint
9.29 Enable/disable settings
9.40 Assist
9.44 Setup of multi-pump system

8.1.2.2 Startup guide

The function is only available in the HMI 300 operating panels.

The startup guide starts at the first startup and guides you through the settings needed for the product to operate in the given application. When the startup guide has been completed, the main menus appear in the display.

You can always run the startup guide at a later time.

Related information

9.37 Run start-up guide

8.1.2.3 Menu overview for the HMI 300 control panel

Home

Home	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
	●	●	●

Status

Status	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Operating status	●	●	●
Operating mode, from	●	●	●
Control mode	●	●	●
Pump performance	●	●	●
Actual control. value	●	●	●
Resulting setpoint	●	●	●
Speed	●	●	●
Acc. flow and specific energy	●	●	●
Power and energy consumption	●	●	●
Measured values	●	●	●
Analog input 1	●	●	●
Analog input 2	●	●	●
Analog input 3 [1)]	●	●	●
Pt100/1000 input 1 [1)]	●	●	●
Pt100/1000 input 2 [1)]	●	●	●
Analog output	●	●	●
Warning and alarm	●	●	●
Actual warning or alarm	●	●	●
Warning log	●	●	●
Alarm log	●	●	●
Operating log	●	●	●
Operating hours	●	●	●
Module type	●	●	●
Date and time	●	●	●
Product identification	●	●	●
Motor bearing monitoring	●	●	●
Multi-pump system			●
System operating status			●
System performance			●
System input power and energy			●
Pump 1, multi-pump system			●
Pump 2, multi-pump system			●
Pump 3, multi-pump system			●
Pump 4, multi-pump system			●

1) Only available if an advanced functional module, type FM 300, is fitted.

Settings

Settings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Setpoint	●	●	●
Operating mode	●	●	●
Set manual speed	●	●	●
Set user-defined speed	●	●	●
Analog inputs	●	●	●
Analog input 1, setup	●	●	●
Analog input 2, setup	●	●	●
Analog input 3, setup [1)]	●	●	●
Pt100/1000 inputs [1)]	●	●	●
Pt100/1000 input 1, setup [1)]	●	●	●
Pt100/1000 input 2, setup [1)]	●	●	●
Digital inputs	●	●	●
Digital input 1, setup	●	●	●
Digital input 2, setup [1)]	●	●	●
Digital inputs/outputs	●	●	●
Digital input/output 3, setup	●	●	●
Digital input/output 4, setup [1)]	●	●	●
Relay outputs	●	●	●
Relay output 1	●	●	●
Relay output 2	●	●	●
Analog output [1)]	●	●	●
Output signal [1)]	●	●	●
Function of analog output [1)]	●	●	●
Controller settings	●	●	●
Operating range	●	●	●
Setpoint influence	●	●	●
Ext. setpoint infl.	●	●	●
Predefined setpoints [1)]	●	●	●
Monitoring functions	●	●	●
Motor bearing monitoring	●	●	●
Motor bearing maintenance	●	●	●
Limit-exceeded function	●	●	●
LiqTec function	●	●	●
Special functions	●	●	●
Low-flow stop function	●	●	●
Pipe filling function	●	●	●
Pulse flowmeter setup	●	●	●
Ramps	●	●	●
Standstill heating	●	●	●
Communication	●	●	●
Pump number	●	●	●
Enable/disable radio comm.	●	●	●
General settings	●	●	●
Language	●	●	●
Set date and time	●	●	●
Units	●	●	●
Enable/disable settings	●	●	●

Settings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Delete history	●	●	●
Define Home display	●	●	●
Display settings	●	●	●
Store actual settings	●	●	●
Recall stored settings	●	●	●
Run start-up guide	●	●	●

Assist

Assist	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Assisted pump setup	●	●	●
Setup, analog input	●	●	●
Setting of date and time	●	●	●
Setup of multi-pump system	●	●	●
Description of control mode	●	●	●
Assisted fault advice	●	●	●

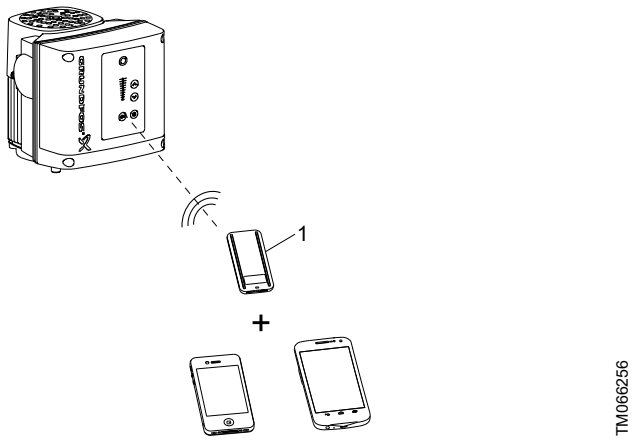
8.1.3 Grundfos GO

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

The Grundfos GO enables you to set functions and gives you access to status overviews, technical product information and current operating parameters.

Use the Grundfos GO together with the following mobile interface:

Grundfos MI 301.



Pos.	Description
1	Grundfos MI 301: It is a separate module enabling radio or infrared communication. Use the module together with an Android or iOS-based smart device via a Bluetooth connection.

8.1.3.1 Communication

When Grundfos GO Remote initiates communication with the pump, the indicator light in the middle of Grundfos Eye flashes green.

On products fitted with the HMI 300 operating panel, the display indicates that a wireless device is trying to connect to the product. Press **OK** on the operating panel to connect the product with Grundfos GO Remote, or press the **Home** button to reject connection.

Establish communication using one of these communication types:

- radio communication
- infrared communication.

Radio communication

Radio communication can take place at distances up to 100 feet (30 meters). The first time Grundfos GO Remote communicates with the pump, you must enable communication by pressing **Communication** or **OK** on the HMI 200 operating panel. Later when communication takes place, the pump is recognized by Grundfos GO Remote.

Infrared communication

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

Related information

6.2 Changing the position of the operating panel

8.1.3.2 Menu overview for Grundfos GO Remote

Dashboard	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
	●	●	●

Status	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
System mode			● [2]
Resulting setpoint	●	●	
Resulting system setpoint			● [2]
Actual controlled value	●	●	● [2]
Motor speed	●	●	
Power consumption	●	●	
Power consumption, system			● [2]
Energy consumption	●	●	
Energy consumption, system			● [2]
Acc. flow, specific energy	●	●	● [2]
Operating hours	●	●	
Operating hours, system			● [2]
Pt100/1000 input 1	●	●	
Pt100/1000 input 2	●	●	
Analog, Output	●	●	
Analog input 1	●	●	
Analog input 2	●	●	
Analog input 3	●	●	
Digital input 1	●	●	
Digital input 2	●	●	
Digital input/output 3	●	●	
Digital input/output 4	●	●	
Fitted modules	●	●	
Pump 1			● [2]
Pump 2			● [2]
Pump 3			● [2]
Pump 4			● [2]

[2] It is only available if Grundfos GO Remote is connected to a multipump system.

Settings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Setpoint	●	●	●
Operating mode	●	●	●
Control mode	●	●	●
Pipe-filling function	●	●	●
Enable/disable settings	●	●	
LiqTec function	●	●	
Low-flow stop function	●	●	●
Controller settings	●	●	●
Operating range	●	●	●
Ramps	●	●	
Pump number	●	●	
Enable/disable radio comm.	●	●	
Analog inputs			
Analog input 1	●	●	
Analog input 2	●	●	
Analog input 3	●	●	
Pt100/1000 inputs			
Pt100/1000 input 1	●	●	
Pt100/1000 input 2	●	●	
Digital inputs			
Digital input 1	●	●	
Digital input 2	●	●	
Digital inputs/outputs			
Digital input/output 3	●	●	
Digital input/output 4	●	●	
Pulse flowmeter setup	●	●	
Predefined setpoints	●	●	●
Analog output	●	●	
External setpoint funct.	●	●	
Relay outputs			
Signal relay 1	●	●	
Signal relay 2	●	●	
Limit-exceeded function			
Limit 1 exceeded	●	●	●
Limit 2 exceeded	●	●	●
Setup of multi-pump system			
Alternating operation, time			● [3]
Time for pump changeover			● [3] + [4]
Standstill heating	●	●	
Motor bearing monitoring	●	●	
Service	●	●	
Set date and time	●	●	
Store actual settings	●	●	
Recall stored settings	●	●	
Undo	●	●	●
Pump name	●	●	●
Connection code	●	●	●
Unit configuration	●	●	

3) It is only available if Grundfos GO Remote is connected to a multipump system.

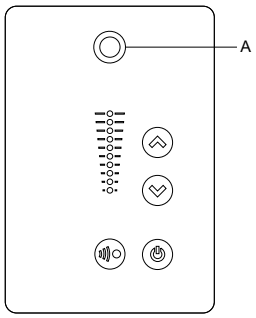
4) It is only available if an advanced functional module, type FM 300, is fitted.

Alarms and warnings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Alarm log	●	●	●
Warning log	●	●	●
Reset alarm	●	●	●

Assist	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Assisted pump setup	●	●	
Assisted fault advice	●	●	●
Setup of multi-pump system	●	●	●

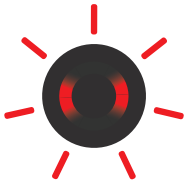
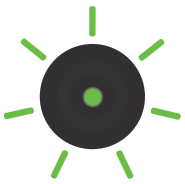
8.1.4 Grundfos Eye

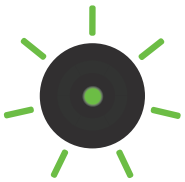
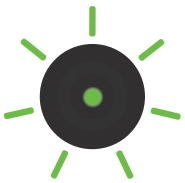
The operating condition of the pump is indicated by the Grundfos Eye on the operating panel.



TM055993

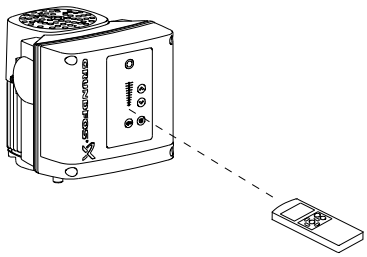
Grundfos Eye indicator light (A)

Indicator light	Indication	Description
	No lights are on.	**Power off** The motor is not running.
	Two opposite green indicator lights are rotating.	**Power on** The motor is running. The indicator lights are rotating in the direction of rotation of the motor when seen from the non-drive end.
	Two opposite green indicator lights are permanently on.	**Power on** The motor is not running.
	One yellow indicator light is rotating.	**Warning** The motor is running. The indicator light is rotating in the direction of rotation of the motor when seen from the non-drive end.
	One yellow indicator light is permanently on.	**Warning** The motor has stopped.
	Two opposite red indicator lights are flashing simultaneously.	**Alarm** The motor has stopped.
	The green indicator light in the middle flashes quickly four times.	The Grundfos Eye flashes four times when you press the Grundfos Eye symbol next to the motor name in the Grundfos GO.

Indicator light	Indication	Description
	The green indicator light in the middle is flashing continuously.	You have selected the motor in the Grundfos GO, and the motor is ready to be connected.
	The green indicator light in the middle flashes quickly for a few seconds.	The motor is controlled by the Grundfos GO or exchanging data with the Grundfos GO.
	The green indicator light in the middle is permanently on.	The motor is connected to the Grundfos GO.

8.1.5 R100 remote control

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



TM053933

R100 communicating with the pump via infrared light

During communication, point R100 at the operating panel. When R100 communicates with the pump, the indicator light in the middle of the Grundfos Eye flashes green.

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.

It may be necessary to update R100 to access the new menus.

Related information

8.1.4 Grundfos Eye

8.1.5.1 Menu overview for R100

8.1.5.1 Menu overview for R100

General	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Switch off R100	●	●	
Return to start	●	●	
Delete all changes	●	●	
Store settings	●	●	
Call up settings	●	●	
Store status data	●	●	
Call up status data	●	●	

Operation	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Setpoint	●	●	
operating mode	●	●	
Set manual speed	●	●	
Alarm	●	●	
Warning	●	●	
Alarm log	●	●	
Warning log	●	●	

Status	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Actual setpoint External setpoint function	●	●	
Operating mode	●	●	
Actual controlled value	●	●	
Analog input 1 Analog input 2 Analog input 3	●	●	
Pt100/1000 input 1 Pt100/1000 input 2	●	●	
Speed	●	●	
Power input Power consumption	●	●	
Operating hours	●	●	
Replace motor bearings	●	●	

Installation	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Control mode	●	●	
Controller settings	●	●	
Relay outputs	●	●	
Enable/disable settings	●	●	
Pump number	●	●	
Digital inputs	●	●	
Digital inputs/outputs			
Digital input/output 3 and 4, State	●	●	
Digital input/output 3 and 4, Function	●	●	
Analog inputs			

Installation	CRE, CRIE, CRNE, CRKE, SPKE, MTRE	CME	Multipump system
Analog input 1, 2 and 3, Function	●	●	
Analog input 1, 2 and 3, Measured parameter	●	●	
Analog input 1, 2 and 3	●	●	
Pt100/1000 inputs			
Pt100/1000 input 1 and 2, Function	●	●	
Pt100/1000 input 1 and 2, Measured parameter	●	●	
LiqTec function	●	●	
Operating range	●	●	
Ramps	●	●	
Motor bearing monitoring	●	●	
Service	●	●	
Standstill heating	●	●	

9. Description of functions

9.1 Setpoint

You can set the setpoint for all control modes when you select the desired control mode.

Related information

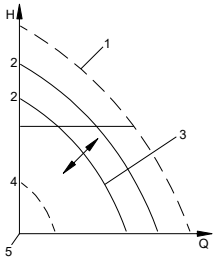
9.4 Control mode
10.2 Factory settings

9.2 Operating mode

Possible operating modes

Normal	The product runs according to the selected control mode.
Stop	The product stops.
Min.	The product runs at minimum speed. You can use the minimum curve mode in periods in which a minimum flow is required. When operating according to the minimum curve, the pump is operating like an uncontrolled pump.
Max.	The product runs at maximum speed. You can use the maximum curve mode in periods in which a maximum flow is required. When operating according to the maximum curve, the pump is operating like an uncontrolled pump.
Manual	The product is operating at a manually set speed, and the setpoint via bus and setpoint influence function are overruled.

All operating modes are illustrated in the figure below.



TM081111

Operating modes

Pos.	Description
1	**Max.**
2	**Normal**
3	**Manual**
4	**Min.**
5	**Stop**

Related information

9.3 Set manual speed
10.2 Factory settings

9.3 Set manual speed

This menu is only available in the HMI 300 operating panel. With Grundfos GO Remote, you set the speed via the **Setpoint** menu.

You can set the pump speed in percentage of the maximum speed. When you set the operating mode to **Manual**, the pump runs at the set speed.

Related information

10.2 Factory settings

9.4 Control mode

You can choose between the following control modes:

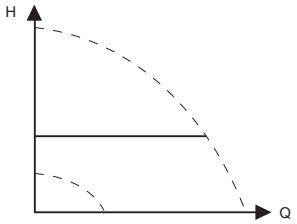
- **Const. pressure** (constant pressure)
- **Const. temp.** (constant temperature)
- **Con. diff. press.** (constant differential pressure)
- **Con. diff. temp.** (constant differential temperature)
- **Const. flow rate** (constant flow rate)
- **Const. level** (constant level)
- **Const. other val.** (constant other value)
- **Const. curve** (constant curve).

Related information

10.2 Factory settings

9.4.1 Constant pressure

We recommend this control mode if the pump is to deliver a constant pressure, independently of the flow in the system.



TM057901

Constant pressure

This control mode uses the factory-fitted pressure sensor, if any, which measures the outlet pressure of the pump.

For pumps without a factory-fitted sensor, you must connect a pressure sensor to one of the analog inputs of the pump. You can set the pressure sensor in the **Assist** menu. See the section on assisted pump setup.

Examples

- One external pressure sensor.

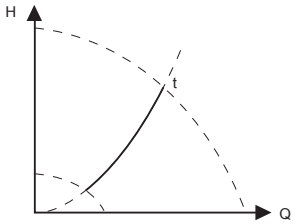
Constant pressure

Related information

9.11 Controller settings
9.41 Assisted pump setup
10.2 Factory settings

9.4.2 Constant temperature

This control mode ensures a constant temperature. Constant temperature is a comfort control mode that you can use in domestic hot-water systems to control the flow to maintain a fixed temperature in the system.



TM057900

Constant temperature

This control mode requires a temperature sensor placed at the location where the temperature is to be controlled. See the examples below:

Examples

Constant temperature

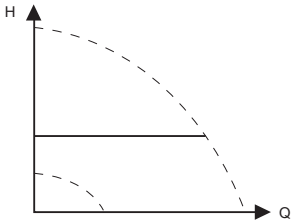
Related information

9.11 Controller settings

10.2 Factory settings

9.4.3 Constant differential pressure

The pump maintains a constant differential pressure, independently of the flow in the system. See the figure below.



TM057901

Constant differential pressure

This control mode requires either a differential-pressure sensor or two external pressure sensors. See the examples below:

Examples

- One differential-pressure sensor:

  The pump uses the input from the sensor to control the differential pressure.

  You can set the sensor manually or via the **Assist** menu. See the section on assisted pump setup.

- Two pressure sensors.

  Constant differential-pressure control is achievable with two pressure sensors. The pump uses the inputs from the two sensors and calculates the differential pressure.

  Both sensors must have the same unit and must be set as feedback sensors. You can set the sensors manually, sensor by sensor, or by using the "Assist" menu. See the section on assisted pump setup.

Constant differential pressure

Related information

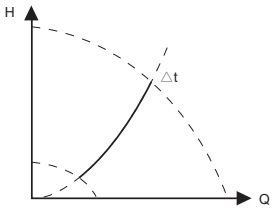
9.11 Controller settings

9.41 Assisted pump setup

10.2 Factory settings

9.4.4 Constant differential temperature

The pump maintains a constant differential temperature in the system and the pump performance is controlled according to this. See the figure below.



TM057954

Constant differential temperature

This control mode requires either two temperature sensors or one differential-temperature sensor. See the examples below. The temperature sensors can either be analog sensors connected to two of the analog inputs or two Pt100/Pt1000 sensors connected to the Pt100/1000 inputs, if these are available on the specific pump.

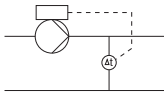
Set the sensor in the **Assist** menu under **Assisted pump setup**. See the section on assisted pump setup.

Examples

- One differential-temperature sensor:

  The pump uses the input from the sensor to control the differential temperature.

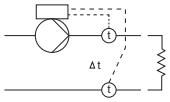
  You can set the sensor manually or via the **Assist** menu. See the section on assisted pump setup.



- Two temperature sensors:

  Constant differential-temperature control is achievable with two temperature sensors. The pump uses the input from the two sensors and calculates the differential temperature.

  Both sensors must have the same unit and must be set as feedback sensors. You can do this manually, sensor by sensor, or via the **Assist** menu. See the section on assisted pump setup.



Constant differential temperature

Related information

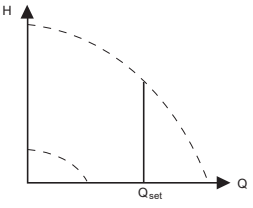
9.11 Controller settings

9.41 Assisted pump setup

10.2 Factory settings

9.4.5 Constant flow rate

The pump maintains a constant flow in the system, independently of the head. See the figure below.

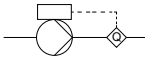


TM057955

Constant flow rate

This control mode requires a flow sensor as shown below:

Example



Constant flow rate

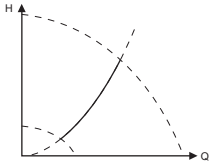
Related information

9.11 Controller settings

10.2 Factory settings

9.4.6 Constant level

The pump maintains a constant level, independently of the flow rate. See the figure below.



TM057941

Constant level

This control mode requires a level sensor.

The pump can control the level in a tank in two ways:

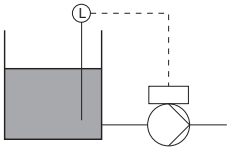
- as an emptying function where the pump draws the liquid from a feed tank
- as a filling function where the pump pumps the liquid into a storage tank.

See the figure below.

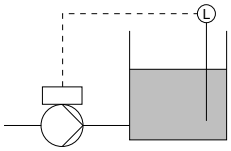
The type of level control function depends on the setting of the built-in controller. See the section on controller settings.

Examples

- One level sensor with an emptying function (feed tank):



- One level sensor with a filling function (storage tank):



Constant level

Related information

9.11 Controller settings

10.2 Factory settings

9.4.7 Constant other value

Any other value is kept constant.

Use this control mode if you want to control a value that is not available in the **Control mode** menu. Connect a sensor measuring the controlled value to one of the analog inputs of the pump. The controlled value is shown in percentage of sensor range.

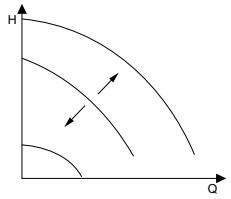
Related information

10.2 Factory settings

9.4.8 Constant curve

You can set the pump to operate according to a constant curve, like an uncontrolled pump. See the figure below.

The desired speed can be set in percentage of the maximum speed in the range from 13 to 100 %.



TM057957

Constant curve

Related information

9.11 Controller settings

10.2 Factory settings

9.5 Analog inputs

Available inputs depend on the functional module fitted in the pump:

Function (terminal)	FM 200 [5]	FM 300 [5]
Analog input 1, setup (4)	●	●
Analog input 2, setup (7)	●	●
Analog input 3, setup (14)	-	●

5) See the section on the identification of a functional module.

If you want to set the analog input for a feedback sensor, we recommend that you do this via the **Assisted pump setup** menu. See the section on assisted pump setup.

If you want to set an analog input for other purposes, you can do that manually.

You can set the analog inputs via the **Setup, analog input** menu. See the section on setting up the analog input.

If you make the manual setting via Grundfos GO Remote, you need to enter the menu for the analog input under the **Settings** menu.

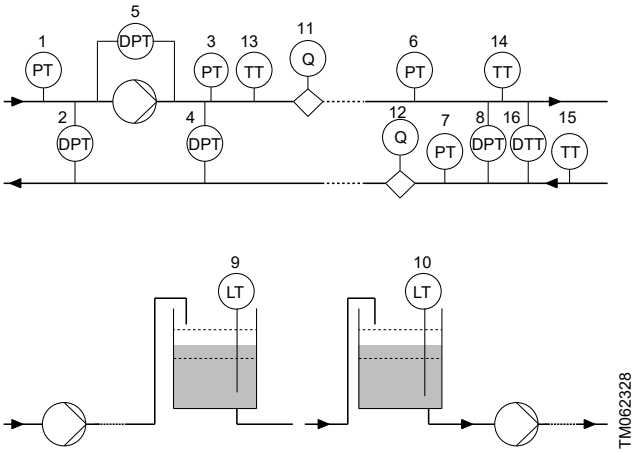
Function

The analog inputs can be set to the following functions:

- **Not active**
- **Feedback sensor**: The sensor is used for the selected control mode.
- **Ext. setpoint infl.**: See the section on the external setpoint function.
- **Other function**.

Measured parameter

Select one of the parameters listed below, such as the parameter to be measured in the system by the sensor connected to the actual analog input. See the figure below.



Overview of sensor locations

Sensor function/measured parameter	Pos.
Inlet pressure	1
Diff. press., inlet	2
Outlet pressure	3
Diff. press.,outlet	4
Diff. press.,pump	5
Press. 1, external	6
Press. 2, external	7
Diff. press., ext.	8
Storage tank level	9
Feed tank level	10
Pump flow	11
Pump flow	12
Liquid temp.	13
Temperature 1	14
Temperature 2	15
Diff. temp., ext.	16
Ambient temp.	Not shown
Other parameter	Not shown

Unit

Parameter	Possible units
Pressure	bar, m, kPa, psi, ft
Level	m, ft, in
Pump flow	m³/h, l/s, yd³/h, gpm
Liquid temperature	°C, °F
Other parameter	%

Electrical signal

Select signal type:

- 0.5-3.5 V
- 0-5 V
- 0-10 V
- 0-20 mA
- 4-20 mA.

Sensor range, minimum value

Set the minimum value of the connected sensor.

Sensor range, maximum value

Set the maximum value of the connected sensor.

Related information

3.3.3 Identification of the functional module
9.13 External setpoint function
9.41 Assisted pump setup
9.42 Setup, analog input
10.2 Factory settings

9.6 Pt100/1000 inputs

Available inputs depend on the functional module fitted in the pump:

Function (terminal)	FM 200 [6]	FM 300 [6]
Pt100/1000 input 1, setup (17 and 18)	-	•
Pt100/1000 input 2, setup (18 and 19)	-	•

6) See the section on the identification of a functional module.

If you want to set the Pt100/1000 input for a feedback sensor, we recommend that you do this via the **Assisted pump setup** menu. See the section on assisted pump setup.

If you want to set a Pt100/1000 input for other purposes, you can do this manually.

You can set the analog inputs via the **Setup, analog input** menu. See the section on setting up the analog input.

If you make the manual setting via Grundfos GO Remote, you need to enter the menu for the Pt100/1000 input under the **Settings** menu.

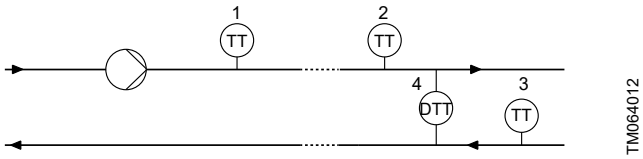
Function

The Pt100/1000 inputs can be set to the following functions:

- **Not active**
- **Feedback sensor**: The sensor is used for the selected control mode.
- **Ext. setpoint infl.**: See the section on the external setpoint function.
- **Other function**.

Measured parameter

Select one of the parameters listed below, such as the parameter to be measured in the system by the PT100/1000 sensor connected to the actual PT100/1000 input. See the figure below.



Overview of PT100/1000 sensor locations

Parameter	Pos.
Liquid temp.	1
Temperature 1	2
Temperature 2	3
Ambient temp.	Not shown

Measuring range

-58 - 400 °F (-50 - 204 °C).

Related information

3.3.3 Identification of the functional module
9.13 External setpoint function
9.41 Assisted pump setup
9.42 Setup, analog input
10.2 Factory settings

9.7 Digital inputs

Available inputs depend on the functional module fitted in the pump:

Function (terminal)	FM 200 [7)]	FM 300 [7)]
Digital input 1, setup (2 and 6)	•	•
Digital input 2, setup (1 and 9)	-	•

7) See the section on the identification of a functional module.

To set a digital input, make the settings below.

Function

Select one of these functions:

- **Not active**: When set to **Not active**, the input has no function.
- **External stop**: When the input is deactivated (open circuit), the pump stops.
- **Min.** (minimum speed): When the input is activated, the pump runs at the set minimum speed.
- **Max.** (maximum speed): When the input is activated, the pump runs at the set maximum speed.
- **External fault**: When the input is activated, a timer is started. If the input is activated for more than 5 seconds, the pump is stopped and a fault is indicated. This function depends on input from external equipment.
- **Alarm resetting**: When the input is activated, a possible fault indication is reset.
- **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 is detected, the pump is 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 inlet side of the pump
  - a float switch installed on the inlet 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 volume of water. See the section on setting up the pulse flowmeter.
- **Predefined setpoint digit 1** (applies only to digital input 2): When digital inputs are set to predefined setpoint, the pump operates according to a setpoint based on the combination of the activated digital inputs. See the section on predefined setpoints.

The priority of the selected functions in relation to each other appears from the section on the description of settings.

A stop command always has the highest priority.

Activation delay

Select the activation delay (T1).

It is the time between the digital signal and the activation of the selected function.

Range: 0-6000 seconds.

Duration timer mode

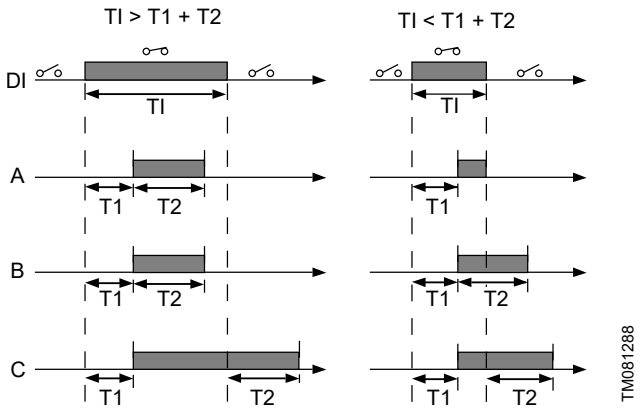
Select one of the following modes:

- not active
- active with interrupt (mode A)
- active without interrupt (mode B)
- active with after-run (mode C).

Select the duration time (T2).

It is the time that, together with the mode, determines how long the selected function is active.

Range: 0 to 15,000 seconds.



Duration timer function of digital inputs

Pos.	Description
TI	T_{input}
DI	Digital input
A, B, C	Modes

Related information

3.3.3 Identification of the functional module
9.14 Predefined setpoints
9.19 Pulse flowmeter setup
10.1 Priority of settings
10.2 Factory settings

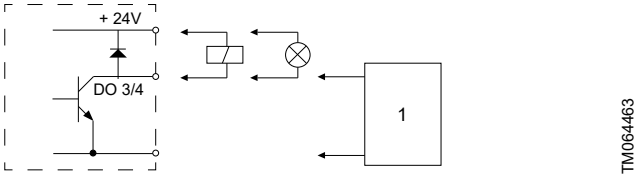
9.8 Digital inputs/outputs

Available inputs/outputs depend on the functional module fitted in the pump:

Function (terminal)	FM 200 [8)]	FM 300 [8)]
Digital input/output 3, setup (6 and 10)	•	•
Digital input/output 4, setup (11 and 18)	-	•

8) See the section on the identification of a functional module.

You can select if the interface is to be used as input or output. The output is an open collector and you can connect it to an external relay or controller such as a PLC.



Example of configurable digital inputs/outputs

Pos.	Description
1	External controller

To set a digital input/output, make the settings below.

Mode

You can set the digital input/output 3 and 4 to act as digital input or digital output:

- **Digital input**
- **Digital output**.

Function

You can set the digital input/output 3 and 4 to the functions stated in the table below:

Possible functions, digital input/output 3

Function if input (See details in the section on digital inputs)	Function if output (See details in the section on relay outputs)
Not active	**Not active**
External stop	**Ready**
Min.	**Alarm**
Max.	**Operation**
External fault	**Pump running**
Alarm resetting	**Warning**
Dry running	**Limit 1 exceeded**
Accumulated flow	**Limit 2 exceeded**
Predefined setpoint digit 2	

Possible functions, digital input/output 4

Function if input (See details in the section on digital inputs)	Function if output (See details in the section on relay outputs)
Not active	**Not active**
External stop	**Ready**
Min.	**Alarm**
Max.	**Operation**
External fault	**Pump running**
Alarm resetting	**Warning**
Dry running	**Limit 1 exceeded**
Accumulated flow	**Limit 2 exceeded**
Predefined setpoint digit 3	

Activation delay (only for input)

Select the activation delay (T1).

It is the time between the digital signal and the activation of the selected function.

Range: 0-6000 seconds.

Duration timer mode (only for input)

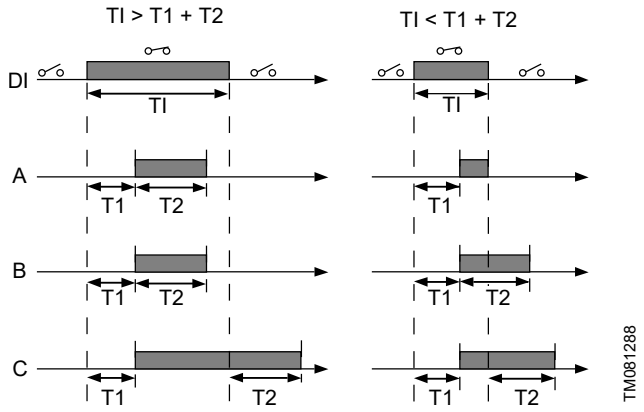
Select one of the duration timer modes:

- Not active
- active with interrupt (mode A)
- active without interrupt (mode B)
- active with after-run (mode C).

Select the duration time (T2).

It is the time that, together with the mode, determines how long the selected function is active.

Range: 0 to 15,000 seconds.



Duration timer function of digital inputs

Pos.	Description
TI	T input
DI	Digital input
A, B, C	Modes

Related information

3.3.3 Identification of the functional module

9.7 Digital inputs

9.9 Relay outputs

10.2 Factory settings

9.9 Relay outputs

The pump incorporates two signal relays for potential-free signalling. For further information, see the section on megging.

Function

You can configure the signal relays to be activated by one of the following incidents:

- **Not active**.
- **Ready**.
  The pump can be running or is ready to run and no alarms are present.
- **Alarm**.
  There is an active alarm and the pump is stopped.
- **Operation**.
  The pump is still in operation when the pump is stopped due to low flow. See the section on low-flow detection.
- **Pump running**.
  The pump is running.
- **Warning**.
  There is an active warning.
- **Limit 1 exceeded**
  When this function is activated, the signal relay is activated. See the section on the limit-exceeded function.
- **Limit 2 exceeded**
  When this function is activated, the signal relay is activated. See the section on the limit-exceeded function.
- **Control of external fan**.
  When you select **Control of external fan**, the relay is activated if the internal temperature of the motor electronics reach a preset limit value.

Related information

9.15 Limit-exceeded function
9.17 Low-flow stop function
10.2 Factory settings
12.2 Megging

9.10 Analog output

Whether the analog output is available or not, depends on the functional module fitted in the pump:

Function (terminal)	FM 200 [9]	FM 300 [9]
Analog output	-	●

9) See the section on the identification of a functional module.

The analog output enables the reading of certain operating data to external control systems.

To set the analog output, make the settings below.

Output signal

- 0-10 V
- 0-20 mA
- 4-20 mA.

Function of analog output

- **Actual speed**

Signal range [V, mA]	Actual speed [%]		
	0	**100**	**200**
0-10 V	0 V	5 V	10 V
0-20 mA	0 mA	10 mA	20 mA
4-20 mA	4 mA	12 mA	20 mA

The reading is a percentage of the rated speed.

- **Actual value**

Signal range [V, mA]	Actual value	
	$Sensor_{min}$	**$Sensor_{max}$**
0-10 V	0 V	10 V
0-20 mA	0 mA	20 mA
4-20 mA	4 mA	20 mA

The reading is a percentage of the range between the minimum and maximum value.

- **Resulting setpoint**

Signal range [V, mA]	Resulting setpoint [%]	
	0	**100**
0-10 V	0 V	10 V
0-20 mA	0 mA	20 mA
4-20 mA	4 mA	20 mA

The reading is a percentage of the external setpoint range.

- **Motor load**

Signal range [V, mA]	Motor load [%]		
	0	**100**	**200**
0-10 V	0 V	5 V	10 V
0-20 mA	0 mA	10 mA	20 mA
4-20 mA	4 mA	12 mA	20 mA

The reading is a percentage of the range between 0 and 200 % of the maximum permissible load at the actual speed.

- **Motor current**

Signal range [V, mA]	Motor current [%]		
	0	**100**	**200**
0-10 V	0 V	5 V	10 V
0-20 mA	0 mA	10 mA	20 mA
4-20 mA	4 mA	12 mA	20 mA

The reading is a percentage of the range between 0 % and 200 % of the rated current.

- **Limit 1 exceeded**, **Limit 2 exceeded**

Signal range [V, mA]	Limit-exceeded function	
	Output not active	**Output active**
0-10 V	0 V	10 V
0-20 mA	0 mA	20 mA
4-20 mA	4 mA	20 mA

This function is typically used for monitoring of secondary parameters in the system. If the limit is exceeded, an output, a warning or an alarm is activated.

- **Flow rate**

Signal range [V, mA]	Flow rate [%]		
	0	**100**	**200**
0-10 V	0 V	5 V	10 V
0-20 mA	0 mA	10 mA	20 mA
4-20 mA	4 mA	12 mA	20 mA

The reading is a percentage of the range between 0 and 200 % of the nominal flow.

Related information

3.3.3 Identification of the functional module
10.2 Factory settings

9.11 Controller settings

The 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, you can change the gain and the integral time:

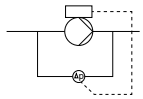
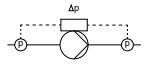
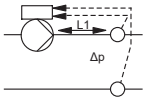
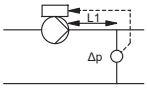
- Set the gain within the range from 0.1 to 20.
- Set the integral-action time within the range from 0.1 to 3600 seconds. If you select 3600 seconds, the controller functions as a P controller.

Furthermore, you can set the controller to inverse control.

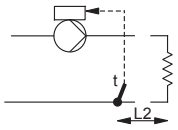
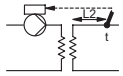
This means that if you increase the setpoint, the speed is reduced. In the case of inverse control, you must set the gain within the range from -0.1 to -20.

Guidelines for setting of PI controller

The tables below show the recommended controller settings:

Constant differential pressure	K_p	T_i
	0.5	0.5
		
	0.5	L1 < 5 m: 0.5 L1 > 5 m: 3 L1 > 10 m: 5
		

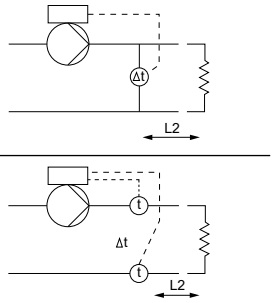
L1: distance in meters between pump and sensor.

Constant temperature	K_p		T_i
	Heating system [10]	Cooling system [11]	
	0.5	-0.5	10 + 5L2
	0.5	-0.5	30 + 5L2

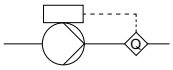
10) In heating systems, an increase in pump performance results in a rise in temperature at the sensor.

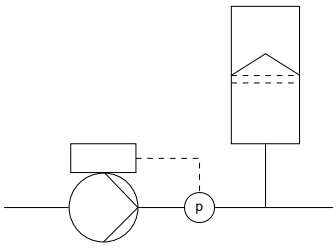
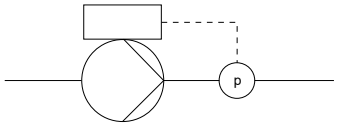
11) In cooling systems, an increase in pump performance results in a drop in temperature at the sensor.

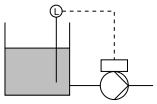
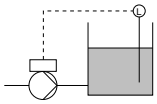
L2: distance in meters between heat exchanger and sensor.

Constant differential temperature	K_p	T_i
	-0.5	10 + 5L2

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

Constant flow rate	K_p	T_i
	0.5	0.5

Constant pressure	K_p	T_i
	0.5	0.5
	0.5	0.5

Constant level	K_p	T_i
	-20	0
	20	0

General rules of thumb:

If the controller is too slow-reacting, increase the gain.

If the controller is hunting or unstable, dampen the system by reducing the gain or increasing the integral time.

Related information

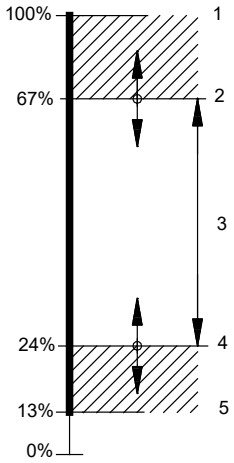
10.2 Factory settings

9.12 Operating range

Set the operating range as follows:

- Set the minimum speed within the range from fixed minimum speed to user-set maximum speed.
- Set the maximum speed within the range from user-set minimum speed to fixed maximum speed.

The range between the user-set minimum and maximum speeds is the operating range. See the figure below.



Example of minimum and maximum settings

Pos.	Description
1	Fixed maximum speed
2	User-set maximum speed
3	Operating range
4	User-set minimum speed
5	Fixed minimum speed

Related information

10.2 Factory settings

9.13 External setpoint function

You can influence the setpoint by an external signal, either via one of the analog inputs or, if an advanced functional module (FM 300) is fitted, via one of the Pt100/1000 inputs.

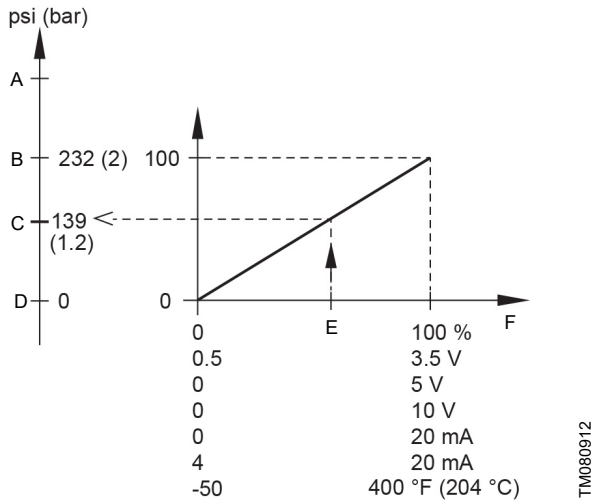
Before you can enable the function, you must set one of the analog inputs or Pt100/1000 inputs to External setpoint function.

See the sections on analog inputs and Pt100/1000 inputs.

Example with constant pressure with linear influence

The actual setpoint is the sum of the actual input signal multiplied by the setpoint minus the sensor minimum, and the sensor minimum. Actual setpoint = actual input signal x (setpoint - sensor min.) + sensor min.

At a sensor minimum of 0 psi, a setpoint of 232 psi and an external setpoint of 60 %, the actual setpoint is 0.60 x (232 - 0) + 0 = 139 psi. See the figure below.



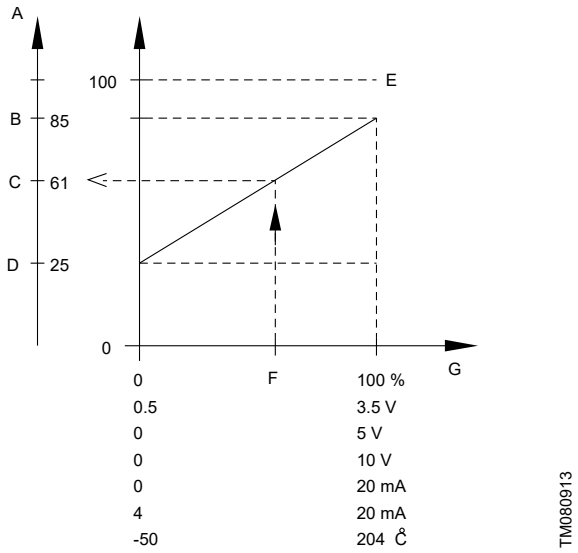
Example of setpoint influence with sensor feed back

Pos.	Description
A	Sensor maximum
B	Setpoint
C	Actual setpoint
D	Sensor minimum
E	Actual input signal (60 %)
F	External setpoint signal

Example with constant curve with linear influence

The actual setpoint is the sum of the actual input signal multiplied by the setpoint minus the user-set minimum speed, and the user-set minimum speed. Actual setpoint: actual input signal × (setpoint - user-set minimum speed) + user-set minimum speed.

At a user-set minimum speed of 25 %, and a setpoint of 85 % and an external setpoint of 60 %, the actual setpoint is 0.60 x (85 - 25) + 25 = 61 %. See the figure below.



Example of setpoint influence with constant curve

Pos.	Description
A	Speed [%]
B	Setpoint
C	Actual setpoint
D	User-set min. speed
E	Fixed maximum speed
F	Actual input signal (60 %)
G	External setpoint signal

Related information

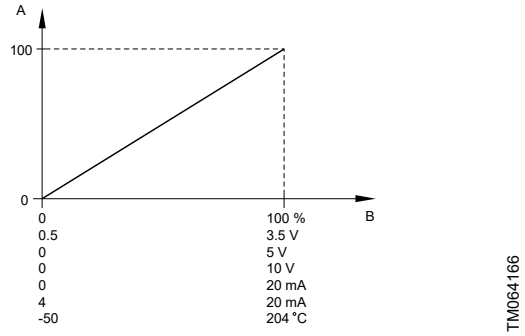
9.5 Analog inputs

9.6 Pt100/1000 inputs

9.13.1 Setpoint influence functions

You can select these functions:

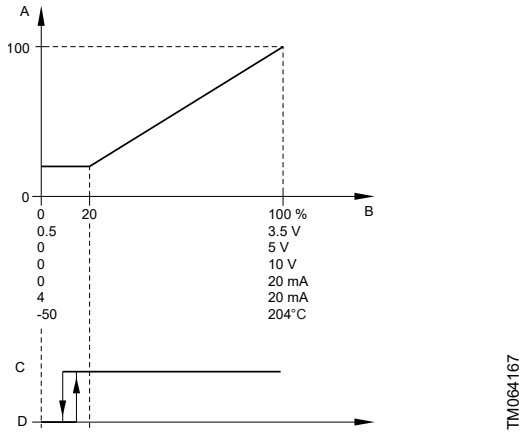
- **Not active**:
  When set to **Not active**, the setpoint is not influenced from any external function.
- **Linear function**:
  The setpoint is influenced linearly from 0 to 100 %. See the figure below.



Linear function

Pos.	Description
A	**Setpoint influence** [%]
B	External input

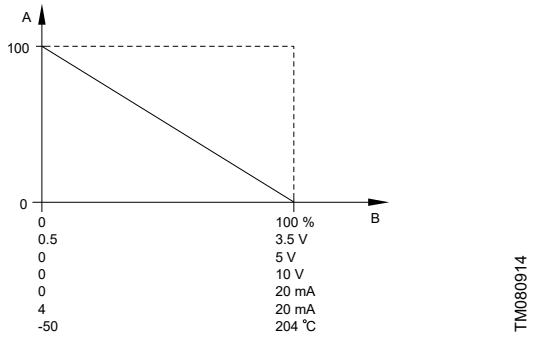
- **Linear with Stop** and **Linear with Min.**:
  - **Linear with Stop**
    In the input signal range from 20 to 100 %, the setpoint is influenced linearly.
    If the input signal is below 10 %, the pump changes to operating mode **Stop**.
    If the input signal is increased above 15 %, the operating mode is changed back to **Normal**.
    See the figure below.
  - **Linear with Min.**:
    In the input signal range from 20 to 100 %, the setpoint is influenced linearly.
    If the input signal is below 10 %, the pump changes to operating mode **Min.**.
    If the input signal is increased above 15 %, the operating mode is changed back to **Normal**.
    See the figure below.



Linear with Stop** and **Linear with Min.

Pos.	Description
A	**Setpoint influence** [%]
B	External input
C	**Normal**
D	**Min.** or **Stop**

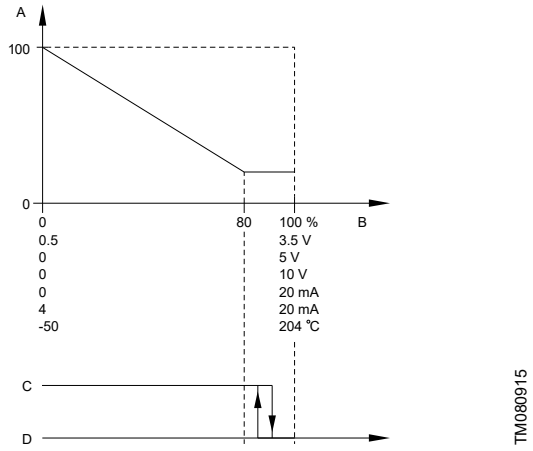
- **Inverse function**. The setpoint is influenced inversely from 0 to 100 %. See the figure below.



Inverse function

Pos.	Description
A	**Setpoint influence** [%]
B	External input

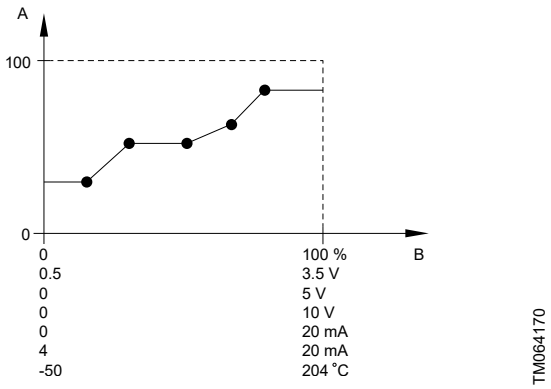
- **Inverse with Stop**; and **Inverse with Min.**.
  - **Inverse with Stop**
    In the input signal range from 0 to 80 %, the setpoint is influenced inversely.
    If the input signal is above 90 %, the pump changes to operating mode **Stop**.
    If the input signal is reduced below 85 %, the operating mode changes back to **Normal**. See the figure below.
  - **Inverse with Min.**.
    In the input signal range from 0 to 80 %, the setpoint is influenced inversely.
    If the input signal is above 90 %, the pump changes to operating mode **Min.**.
    If the input signal is reduced below 85 %, the operating mode changes back to **Normal**.
    See the figure below.



Inverse with Stop** and **Inverse with Min.

Pos.	Description
A	**Setpoint influence** [%]
B	External input
C	**Normal**
D	**Min.** or **Stop**

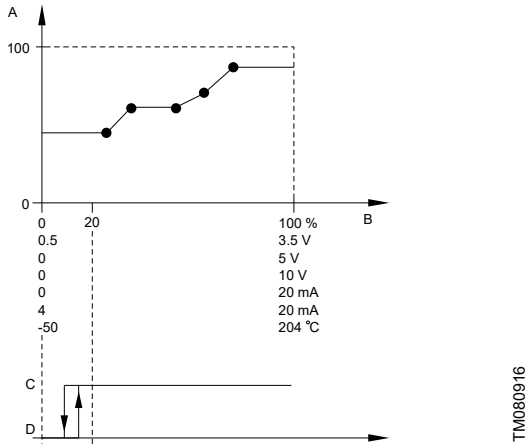
- **Influence table**:
  The setpoint is influenced by a curve made out of two to eight points. There is a straight line between the points and a horizontal line before the first point and after the last point.



Influence table *(example with five points)*

Pos.	Description
A	**Setpoint influence** [%]
B	External input

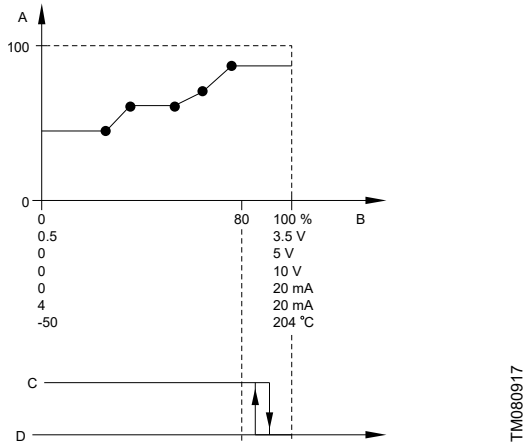
- **Influence table with Stop at Min.**:
  The setpoint is influenced by a curve made out of two to eight points. There is straight line between the points and a horizontal line before the first point and after the last point. If the input signal is below 10 %, the pump changes to operating mode **Stop**. If the input signal is increased above 15 %, the operating mode is changed back to **Normal**. See the figure below.



Influence table with Stop at Min. *(example with five points)*

Pos.	Description
A	**Setpoint influence** [%]
B	External input
C	**Normal**
D	**Min.** or **Stop**

- **Influence table with Stop at Max.**:
  The setpoint is influenced by a curve made out of two to eight points. There is a straight line between the points and a horizontal line before the first point and after the last point. If the input signal is above 90 %, the pump changes to operating mode **Stop**. If the input signal is reduced below 85 %, the operating mode is changed back to **Normal**. See the figure below.



Influence table with Stop at Max. *(example with five points)*

Pos.	Description
A	**Setpoint influence** [%]
B	External input
C	**Normal**
D	**Min.** or **Stop**

Related information

10.2 Factory settings

9.14 Predefined setpoints

You can set and activate seven predefined setpoints by combining the input signals to digital inputs 2, 3 and 4. See the table below.

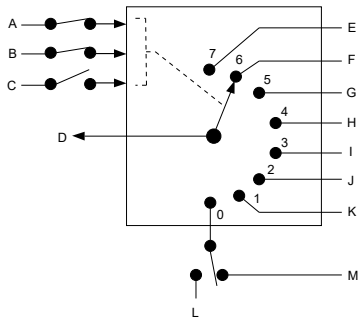
Set the digital inputs 2, 3 and 4 to **Predefined setpoints** if all seven predefined setpoints are to be used. You can also set one or two of the digital inputs to **Predefined setpoints** but this limits the number of predefined setpoints available.

Digital inputs			Setpoint
2	**3**	**4**	
0	0	0	Normal setpoint or stop
1	0	0	**Predefined setpoints**
0	1	0	**Predefined setpoints**
1	1	0	**Predefined setpoints**
0	0	1	**Predefined setpoints**
1	0	1	**Predefined setpoints**
0	1	1	**Predefined setpoints**
1	1	1	**Predefined setpoints**

0: Open contact
1: Closed contact

Example

The figure below shows how you can use the digital inputs to set seven predefined setpoints. Digital input 2 is open and digital inputs 3 and 4 are closed. If you compare with the table above, you can see that **Predefined setpoints** is activated.



Principle sketch showing how predefined setpoints function

Pos.	Description
A	Digital input 4
B	Digital input 3
C	Digital input 2
D	Actual setpoint
E	Setpoint 7
F	Setpoint 6
G	Setpoint 5
H	Setpoint 4
I	Setpoint 3
J	Setpoint 2
K	Setpoint 1
L	Stop
M	Normal setpoint

If all digital inputs are open, the pump stops or runs at the normal setpoint. Set the desired action with Grundfos GO Remote or with the HMI 300 operating panel.

Related information

10.2 Factory settings

9.15 Limit-exceeded function

This function can monitor a measured parameter or one of the internal values such as speed, motor load or motor current. If a set limit is reached, a selected action can take place. You can set two limit-exceeded functions meaning that you can monitor two parameters or two limits of the same parameter simultaneously.

The function requires setting of the following:

Measured

Here you set the measured parameter which is to be monitored.

Limit

Here you set the limit which activates the function.

Hysteresis band

Here you set the hysteresis band.

Limit exceeded when

Here you can set if you want the function to activate when the selected parameter exceeds or drops below the set limit.

- **Above limit**.
  The function is activated if the measured parameter exceeds the set limit.
- **Below limit**.
  The function is activated if the measured parameter drops below the set limit.

Action

If the value exceeds a limit, you can set an action. You can select the following actions:

- **No action**.
  The pump remains in its current state. Use this setting if you only want to have a relay output when the limit is reached. See the section on relay outputs.
- **Warning/alarm**.
  A warning is given.
- **Stop**.
  The pump stops.
- **Min.**.
  The pump reduces speed to minimum.
- **Max.**.
  The pump increases speed to maximum.

Detection delay

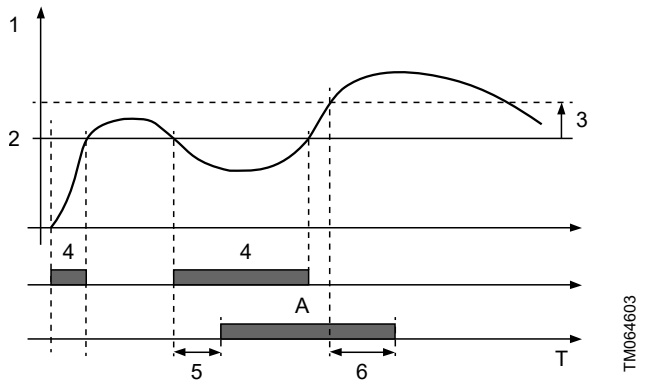
You can set a detection delay which ensures that the monitored parameter stays above or below a set limit in a set time before the function is activated.

Resetting delay

The resetting delay is the time from which the measured parameter differs from the set limit including the set hysteresis band and until the function is reset.

Example:

The function is to monitor the outlet pressure from a CRE pump. If the pressure is below 5 bar for more than 5 seconds, a warning must be given. If the outlet pressure is above 7 bar for more than 8 seconds, reset the limit exceeded warning.



Limit exceeded (example)

Pos.	Setting parameter	Setting
1	**Measured**	Outlet pressure
2	**Limit**	5 bar
3	**Hysteresis band**	2 bar
4	**Limit exceeded when**	Below limit
5	**Detection delay**	5 seconds
6	**Resetting delay**	8 seconds
A	**Limit exceeded function active**	-
-	**Action**	Warning

Related information

9.9 Relay outputs

10.2 Factory settings

9.16 LiqTec function

You can enable the function of the LiqTec sensors in this display. A LiqTec sensor protects the pump against dry running.

The function requires that a LiqTec sensor is fitted and connected to the pump.

When you have enabled the LiqTec function, it stops the pump if dry running occurs. Restart the pump manually if it has been stopped due to dry running.

Dry running detection delay

You can set a detection delay to make sure that the pump is given a chance to start up before the LiqTec function stops the pump due to dry running.

Range: 0-254 seconds.

Related information

10.2 Factory settings

9.17 Low-flow stop function

You can set the **Low-flow stop function** to these values:

- **Not active**
- **Energy-optimal mode**
- **High-comfort mode**
- **Customised operating mode**.

When the low-flow stop function is active, the flow is monitored. If the flow drops below the set minimum flow (Q_{min}), the pump changes from continuous operation at constant pressure to start-stop operation and stops 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 fluctuates between the start and stop pressures.
- The frequent starts/stops of the pump may in some applications cause acoustic noise.

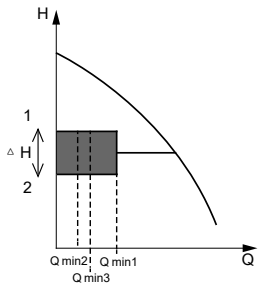
The impact of the above disadvantages very much depends on the setting selected for the stop function.

The **High-comfort mode** setting minimizes pressure fluctuations and acoustic noise.

Select **Energy-optimal mode** if the main priority is to reduce the energy consumption as much as possible.

Possible settings of the stop function:

- **Energy-optimal mode**: The pump automatically adjusts the parameters for the stop function so that the energy consumption during the start-stop operation period is minimized. In this case, the stop function uses the factory-set values of the minimum flow (Q_{min1}) and other internal parameters. See the figure below.
- **High-comfort mode**: The pump automatically adjusts the parameters for the stop function so that the disturbances during the start-stop operation period are minimized. In this case, the stop function uses the factory-set values of the minimum flow (Q_{min2}) and other internal parameters. See the figure below.
- **Customised operating mode**: The pump uses the parameters set for ΔH and minimum flow (Q_{min3}) respectively for the stop function. See the figure below.



Difference between start and stop pressures (ΔH) and minimum flow rate

Pos.	Description
1	Stop pressure
2	Start pressure

In start-stop operation, the pressure varies between the start and stop pressures. See the figure above.

Customised operating 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 changes to start-stop operation if the flow becomes lower than the minimum flow.

The minimum flow is set in % of the nominal flow of the pump (see the pump nameplate).

In **Customised operating mode**, the minimum flow has been factory-set to 10 % of nominal flow.

Low-flow detection

Low flow can be detected in two ways:

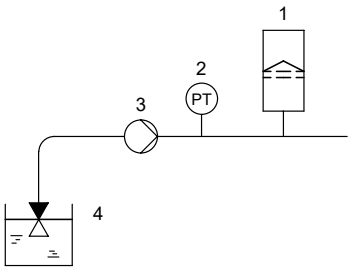
- A built-in low-flow detection function which is active if none of the digital inputs are set for flow switch.
- A flow switch connected to one of the digital inputs.

1. Low-flow detection function: The pump checks the flow regularly by reducing the speed for a short time. If there is no or only a small change in pressure, it means there is low flow. The speed increases until the stop pressure (actual setpoint + 0.5 × ΔH) reaches and the pump stops. When the pressure falls to the start pressure (actual setpoint - 0.5 × ΔH), the pump restarts.
   - If the flow is higher than the set minimum flow, the pump returns to continuous operation at constant pressure.
   - If the flow is still lower than the set minimum flow (Q_{min}), the pump continues 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 rate (Q_{min}), the pump returns to continuous operation.
2. Flow switch: When the digital input is activated for more than 5 seconds because there is low flow, the speed is increased until the stop pressure (actual setpoint + 0.5 × ΔH) is reached, and the pump stops. When the pressure has fallen to start pressure, the pump restarts. If there is still no flow, the pump quickly reaches the stop pressure and stops. If there is flow, the pump continues operating according to the setpoint.

Operating conditions for the low-flow stop function

You can only use the stop function if the system incorporates a pressure sensor, a non-return valve and a diaphragm tank.

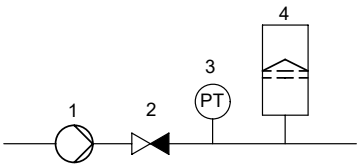
Always install the non-return valve before the pressure sensor.



TM038582

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

Pos.	Description
1	Diaphragm tank
2	Pressure sensor
3	Pump
4	Non-return valve



TM038583

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

Pos.	Description
1	Pump
2	Non-return valve
3	Pressure sensor
4	Diaphragm tank

Set minimum 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.

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, install a larger tank.

Install the tank immediately after the pump. The precharge pressure must be 70 % of the actual setpoint.

Recommended diaphragm tank size:

Rated flow rate of pump [gpm (m^3/h)]	CRE pump	Typical diaphragm tank size [gal (liters)]
0-26 (0 - 5.9)	1s, 1, 3	2 (7.6)
27-105 (6.1 - 23.8)	5, 10, 15	4.4 (16.7)
106-176 (24.2 - 40)	20	14 (53.0)

Related information

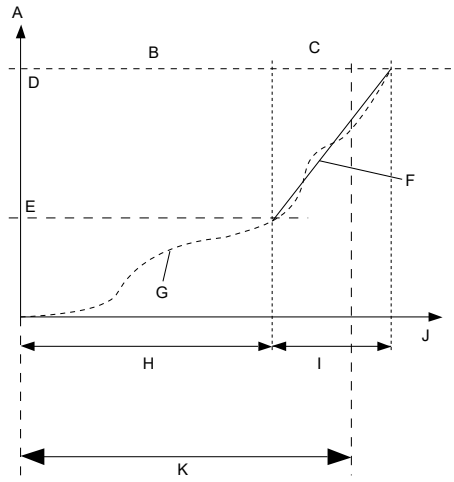
10.2 Factory settings

9.18 Pipe filling function

This function is typically used in pressure-boosting applications and ensures a smooth startup of systems with for instance empty pipes.

Startup takes place in two phases. See the figure below.

1. Filling phase.
   The pipes are slowly filled with water. When the pressure sensor of the system detects that the pipes have been filled, phase two begins.
2. Pressure build-up phase.
   The system pressure is increased until the setpoint is reached. The pressure build-up takes place over a pressure build-up time. If the setpoint is not reached within a given time, a warning or an alarm can be given, and the pumps can be stopped at the same time.



TM080919

Filling and pressure build-up phases

Pos.	Description
A	Pressure
B	Filling phase (constant-curve operation)
C	Pressure build-up phase (constant-pressure operation)
D	Setpoint
E	Filling pressure
F	Setpoint ramp-up
G	Actual value
H	Filling time
I	Pressure build-up time
J	Time [sec]
K	Maximum filling time

Setting range

- **Filling speed**.
  Fixed speed of the pump during the filling phase.
- **filling pressure**.
  The pressure that the pump must reach before the maximum filling time.
- **max. filling time**.
  The time in which the pump must reach the filling pressure.
- **Max. time reaction**.
  Reaction of the pump if the maximum filling time is exceeded:
  - warning
  - alarm (pump stops).
- **Pressure build-up time**.

Ramp time from when the filling pressure is reached until the setpoint must be reached.

When you activate this function, the function always starts when the pump has been in operating mode **Stop** and is changed to **Normal**.

Related information

10.2 Factory settings

9.19 Pulse flowmeter setup

You can connect an external pulse flowmeter to one of the digital inputs in order to register the actual and accumulated flows. Based on this, you can also calculate the specific energy.

To enable a pulse flowmeter, set one of the digital-input functions to **Accumulated flow** and set the pumped volume per pulse. See the section on digital inputs.

Related information

9.7 Digital inputs

10.2 Factory settings

9.20 Ramps

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

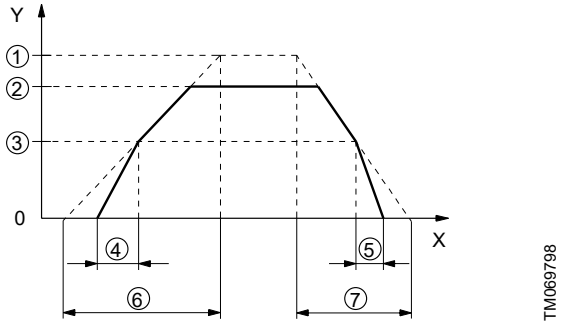
You can set the following:

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

The times apply to the acceleration from 0 rpm to maximum (fixed) speed and the deceleration from maximum (fixed) speed to 0 rpm, 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 only depends on load and inertia.



Ramp-up** and **Ramp-down

Pos.	Description
X	Time
Y	Speed
1	Fixed maximum
2	User-set maximum
3	User-set minimum
4	Fixed initial ramp
5	Fixed final ramp
6	User-set ramp-up
7	User-set ramp-down

Related information

10.2 Factory settings

9.21 Standstill heating

You can use this function to avoid condensation in humid environments. When you set the function to **Active** and the pump is in operating mode **Stop**, a low AC voltage is applied to the motor windings. The voltage is not high enough to make the motor rotate but ensures that sufficient heat is generated to avoid condensation in the motor including the electronic parts in the drive.

Remember to remove the drain plugs and fit a cover over the motor.

Related information

10.2 Factory settings

9.22 Motor bearing monitoring

You can set the motor bearing monitoring function to these values:

- **Active**
- **Not active**.

When the function is set to **Active**, a counter in the controller starts counting the mileage of the bearings.

The counter continues counting even if the function is changed to **Not active**, but a warning will not be given when it is time for replacement or relubrication.

When the function is changed to **Active** again, the accumulated mileage is again used to calculate the replacement or relubrication time.

Related information

10.2 Factory settings

9.23 Service

Motor bearing monitoring must be activated in order for the motor to indicate that the bearings must be replaced or relubricated. See the section on motor bearing monitoring.

For motors of 15 Hp (11 kW) and below, it is not possible to relubricate the bearings.

Motor bearing service

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

Displayable values:

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

Bearing replacements

This display shows the number of bearing replacements that have been done during the lifetime of the motor.

Motor bearing maintenance

When the bearing monitoring function is active, the controller gives a warning when the motor bearings are due to be replaced.

When you have replaced the motor bearings, press **Bearings replaced**.

Related information

9.22 Motor bearing monitoring

9.24 Pump number

You can allocate a unique number to the pump. This makes it possible to distinguish between pumps in connection with GENIbus communication.

Related information

10.2 Factory settings

9.25 Enable/disable radio comm.

You can set the radio communication to either enabled or disabled. You can use this function in areas where radio communication is not allowed.

IR communication remains active.

Related information

10.2 Factory settings

9.26 Language

This menu is only available in the HMI 300 operating panel.

In this menu, you select the desired language. A number of languages is available.

Related information

10.2 Factory settings

9.27 Set date and time

The availability of this menu depends on the functional module fitted in the pump:

Function (terminal)	FM 200 [12] (standard)	FM 300 [12] (advanced)
Date and time	-	•

[12] See the section on the identification of functional module.

You can set date and time as well as how you want them to be viewed in the display:

- **Select date format**:
  YYYY-MM-DD
  DD-MM-YYYY
  MM-DD-YYYY.
- **Select time format**:
  HH:MM 24-hour clock
  HH:MM am/pm 12-hour clock.
- **Set date**
- **Set time**.

Related information

3.3.3 Identification of the functional module

10.2 Factory settings

9.28 Units

In this menu, you can select between SI and US units. The setting can made generally for all parameters or you can customize for each parameter.

Related information

10.2 Factory settings

9.29 Enable/disable settings

In this display, you can disable the possibility of making settings for protective reasons.

Grundfos GO Remote

If you set the buttons to **Not active** the buttons on the HMI 200 operating panel are disabled. If you set the buttons to **Not active** on pumps fitted with an HMI 300 operating panel, see below.

HMI 300 operating panel

If you have disabled the settings, you can still use the buttons to navigate through the menus, but you cannot make changes in the **Settings** menu.

When you have disabled the possibility to make settings, the symbol for **Back** and **Lock** appears in the display.

HMI 300 operating panel:

To unlock the motor and allow settings, press **Down** and **Up** simultaneously for at least 5 seconds.

HMI 200 operating panel:

The **Back** and **Communication** buttons always remain active but you can only unlock all other buttons on the motor with Grundfos GO Remote.

Related information

10.2 Factory settings

9.30 Delete history

This menu is only available in the HMI 300 operating panel.

In this menu, you can delete the following historic data:

- **Delete operating log**.
- **Delete energy consumption**.

9.31 Define Home display

This menu is only available in the HMI 300 operating panel.

In this menu, you can set the **Home** display to show up to four user-defined parameters.

Related information

10.2 Factory settings

9.32 Display settings

This menu is only available in the HMI 300 operating panel.

In this menu, you can adjust the display brightness and set whether or not the display is to turn off if no buttons have been activated for a period of time.

Related information

10.2 Factory settings

9.33 Store actual settings

Grundfos GO Remote

In this menu, you can store the actual settings for later use in the same pump or in other pumps of the same type.

HMI 300 operating panel

In this menu, you can store the actual settings for later use in the same pump.

9.34 Recall stored settings

Grundfos GO Remote

In this menu, you can recall stored settings that the pump then uses.

HMI 300 operating panel

In this menu, you can recall the last stored settings that the pump then uses.

9.34.1 Undo

This menu is only available in Grundfos GO Remote.

In this display, you can undo all settings that have been made with Grundfos GO Remote in the current communication session. Once you have recalled settings, you cannot undo.

9.35 Pump name

This menu is only available in Grundfos GO Remote.

In this display, you can give the pump a name. In this way, you can easily identify the pump when connecting with Grundfos GO Remote.

9.36 Connection code

This menu is only available in Grundfos GO Remote.

You can set a connection code to avoid having to press the connection button each time and to restrict remote access to the product.

Setting the code in the product using Grundfos GO Remote

1. Connect Grundfos GO Remote to the product.
2. In the product dashboard, select **Settings**.
3. Choose **Connection code**.
4. Enter the wanted code and press **OK**. The code must be a character string (ASCII). You can always change the code. The old code is not needed.

Setting the code in Grundfos GO Remote

You can define a default connection code in Grundfos GO Remote so that it automatically attempts to connect to the selected product via this code.

When you select a product with the same connection code in Grundfos GO Remote, Grundfos GO Remote automatically connects to the product and you do not have to press the connection button on the module.

Define the default code in Grundfos GO Remote in this way:

1. In the main menu, under **General**, select **Settings**.
2. Choose **Remote**.
3. Enter the connection code in the field **Preset connection code**. The field now says **Connection code set.**.

You can always change the default connection code by pressing **Delete** and entering a new one.

If Grundfos GO Remote fails to connect and ask you to press the connection button on the product, it means that the product has no connection code or has a different connection code. In this case, you can only establish connection via the connection button.

After setting a connection code, switch off the product until the light in Grundfos Eye turns off before you can use the new connection code.

9.37 Run start-up guide

This menu is only available in the HMI 300 operating panel.

The startup guide automatically starts when you start the pump for the first time.

You can always run the startup guide later via this menu.

The startup guide guides you through the general settings of the pump.

- **Language**. See the section on language.
- **Select date format**. [13)]
- **Set date** [13)].
- **Select time format** [13)].
- **Set time** [13)].
- **Setting of pump**
  - **Go to Home**
  - **Run with Constant curve**/**Run with Constant pressure**. See the section on control mode.
  - Go to **Assisted pump setup** See the section on assisted pump setup.
  - **Return to factory settings**.

13) This function applies only for pumps fitted with FM 300. For further information, see the section on the identification of a functional module.

Related information

3.3.3 Identification of the functional module
9.4 Control mode
9.26 Language
9.27 Set date and time
9.41 Assisted pump setup

9.38 Alarm log

This menu contains a list of logged alarms from the product. The log shows the name of the alarm, when the alarm occurred and when it was reset.

9.39 Warning log

This menu contains a list of logged warnings from the product. The log shows the name of the warning, when the warning occurred and when it was reset.

9.40 Assist

This menu consist of a number of different assist functions which are small guides that take you through the steps needed to set the pump.

9.41 Assisted pump setup

This menu guides you through the following:

Setting of pump

- Selection of control mode. See the section on control mode.
- Configuration of feedback sensors.
- Adjusting the setpoint. See the section on setpoint.
- Controller settings. See the section on controller settings.
- Summary of settings.

Example of how to use the Assisted pump setup for setting up the pump to constant pressure:

Grundfos GO Remote

1. Open the **Assist** menu.
2. Select **Assisted pump setup**.
3. Select control mode **Const. pressure**
4. Read the description for this control mode.
5. Select which analog input to use as sensor input.
6. Select sensor function according to where the sensor is installed in the system. See fig. Overview of sensor locations.
7. Select electrical input signal according to the sensor specifications.
8. Select measuring unit according to the sensor specifications.
9. Set the minimum and maximum sensor range values according to the sensor specifications.
10. Set the desired setpoint.
11. Set the gain and integral time of the controller. See the section on controller settings.
12. Type the desired pump name.
13. Check the summary of settings and confirm them.

HMI 300 operating panel

1. Open the **Assist** menu.
2. Select **Assisted pump setup**.
3. Select control mode **Const. pressure**.
4. Select which analog input to be used as sensor input.
5. Select the measured parameter which is to be controlled. See fig. Overview of sensor locations.
6. Select measuring unit according to the sensor specifications.
7. Set the minimum and maximum sensor range values according to the sensor specifications.

8. Select electrical input signal according to the sensor specifications.
9. Set the desired setpoint.
10. Set the gain and integral time of the controller. See the section on controller settings.
11. Check the summary of settings and confirm them by pressing **OK**.

Related information

9.1 Setpoint
9.4 Control mode
9.5 Analog inputs
9.11 Controller settings

9.42 Setup, analog input

This menu is only available in the HMI 300 operating panel.

This menu guides you through the following:

Setup, analog input

- **Analog inputs** 1 to 3. See the section on analog inputs.
- **Pt100/1000 inputs** 1 and 2. See the section on Pt100/1000 inputs.
- **Adjusting the setpoint**. See the section on setpoint.
- **Summary**.

Related information

9.1 Setpoint
9.5 Analog inputs
9.6 Pt100/1000 inputs

9.43 Setting of date and time

This menu is only available in the HMI 300 operating panel.

Whether this menu is available or not, depends on the functional module fitted in the pump:

Function (terminal)	FM 200 [14)]	FM 300 [14)]
Setting of date and time	-	•

[14)] See the section on the identification of a functional module.

This menu guides you through the following:

- **Select date format**. See the section on setting the date and time.
- **Set date**. See the section on setting the date and time.
- **Select time format**. See the section on setting the date and time.
- **Set time**. See the section on setting the date and time.

Related information

3.3.3 Identification of the functional module
9.27 Set date and time

9.44 Setup of multi-pump system

The multipump function enables the control of two pumps connected in parallel without the use of external controllers. The pumps in a multipump system communicate with each other via the wireless GENIair connection or the wired GENI connection.

You can set a multipump system via the master pump, that is the first selected pump.

If two pumps in the system are configured with an outlet-pressure sensor, they can all function as master pumps and take over the master pump function if the other should fail. This provides additional redundancy in the multipump system.

9.44.1 Alternating operation

Alternating operation functions as a duty/standby operating mode and is possible with two pumps of the same size and type connected in parallel. The main purpose of the function is to ensure an even amount of running hours and to ensure that the standby pump starts if the duty pump stops due to an alarm.

Each pump requires a non-return valve in series with the pump.

You can choose between two alternating operating modes:

- **Alternating operation, time** Change from one pump to the other is based on time.
- **Alternating operation, energy** Change from one pump to the other is based on energy consumption.

If the duty pump fails, the other pump starts.

9.44.2 Backup operation

Backup operation is possible with two pumps of the same size and type connected in parallel. Each pump requires a non-return valve in series with the pump.

One pump is operating continuously. The backup pump is operated for a short time each day to prevent seizing up. If the duty pump stops due to a fault, the backup pump starts.

9.44.3 Cascade operation

Cascade operation is only available in CRE and MTHE, CME pumps on request. Contact Grundfos for further information.

Cascade operation is possible with up to four pumps of the same size and type connected in parallel. Each pump requires a non-return valve in series with the pump.

Up to 4 pumps can be operating continuously depending on consumption. Pumps will be cut in and cut out to ensure a constant controlled value, for example, constant pressure, and to ensure a high system efficiency and an even amount of running hours.

9.44.4 Alternating operation, time

The interval of alternation between the two pumps. The function is only available in alternating operation.

9.44.5 Time for pump changeover

Time of day for a pump changeover to take place. The function is only available in alternating operation.

9.44.6 Sensor to be used

Defines the sensor to be used for controlling the pump system. If a sensor is placed in a way that enables it to measure the output from all pumps in the system, for example, in the manifold, then select **Master pump sensor**.

If a sensor is placed on or across the individual pumps, for example, installed behind non-return valves and not able to measure the output from all pumps, then select **Running pump sensor**.

9.44.7 Setting up a multipump system

You can set a multipump system in the following ways:

- Grundfos GO Remote and wireless pump connection
- Grundfos GO Remote and wired pump connection
- HMI 300 operating panel and wireless pump connection
- HMI 300 operating panel and wired pump connection

Related information

9.24 Pump number
9.35 Pump name
9.41 Assisted pump setup
9.44.1 Alternating operation
9.44.2 Backup operation

9.44.7.1 Grundfos GO Remote and wireless pump connection

1. Power on the pumps.
2. Establish contact to one of the pumps with Grundfos GO Remote.

3. Set the needed analog and digital inputs via Grundfos GO Remote according to the connected equipment and the required functionality. See the section on assisted pump setup.
4. Assign a pump name to the pump using Grundfos GO Remote. See the section on the pump name.
5. Disconnect Grundfos GO Remote from the pump.
6. Establish contact to the next pump.
7. Set the needed analog and digital inputs via Grundfos GO Remote according to the connected equipment and the required functionality. See the section on assisted pump setup.
8. Assign a pump name to the pump using Grundfos GO Remote. See the section on the pump name.
9. Repeat steps 5 to 8 if more pumps are installed in the system.
10. Select the **Assist** menu and choose **Setup of multi-pump system**.
11. Select the desired multipump function. See the sections on alternating operation, backup operation and cascade operation.
12. Press **>** to continue.
13. Set the time for a pump changeover, such as the time at which the alternation between the two pumps is to take place.

    This step applies only if you have selected **Alternating operation, time** and if the motors are fitted with FM 300.

14. Press **>** to continue.
15. Select **Radio** as the communication method to be used between the pumps.
16. Press **>** to continue.
17. Select pump 2.
18. Select the pump from the list.
    - If applicable, select pump 3 (only in cascade)
    - If applicable, select pump 4 (only in cascade)

    Use the **OK** or **Communication** button to identify the pump.

19. Press **>** to continue.
20. Confirm the setting by pressing **Send**.
21. Press **Finish** in the **Setup complete dialog** box.
22. Wait for the green indicator light in the middle of Grundfos Eye to light up.

9.44.7.2 Grundfos GO Remote and wired pump connection

1. Connect the pumps with each other with a 3-core screened cable between the GENIbus terminals A, Y, B.
2. Power on the pumps.
3. Establish contact to one of the pumps with Grundfos GO Remote.
4. Set the needed analog and digital inputs via Grundfos GO Remote according to the connected equipment and the required functionality. See the section on assisted pump setup.
5. Assign a pump name to the pump using Grundfos GO Remote. See the section on the pump name.
6. Assign pump number 1 to the pump. See the section on number.
7. Disconnect Grundfos GO Remote from the pump.
8. Establish contact to the next pump.
9. Set the needed analog and digital inputs via Grundfos GO Remote according to the connected equipment and the required functionality. See the section on assisted pump setup.
10. Assign a pump name to the pump using Grundfos GO Remote. See the section on the pump name.
11. Repeat steps 7 to 10 if more pumps are installed in the system.
12. Select the **Assist** menu and choose **Setup of multi-pump system**.
13. Select the desired multipump function. See the sections on alternating operation, backup operation and cascade operation.
14. Press **>** to continue.
15. Set the time for a pump changeover, such as the time at which the alternation between the two pumps is to take place.

    This step applies only if you have selected **Alternating operation, time** and if the motors are fitted with FM 300.

16. Press **>** to continue.
17. Select **BUS cable** as the communication method to be used between the two pumps.
18. Press **>** to continue.
19. Press **Select pump 2**.
20. Select the pump from the list.

    Use the **OK** or **Communication** button to identify the pump.

21. Press **>** to continue.
22. Confirm the setting by pressing **Send**.
23. Repeat steps 19 to 21 if more than two pumps are installed in the system. See the section on cascade operation.
24. Press **Finish** in the **Setup complete** dialog box.
25. Wait for the green indicator light in the middle of Grundfos Eye to light up.

9.44.7.3 HMI 300 operating panel and wireless pump connection

1. Power on the pumps.
2. On the pumps, set the analog and digital inputs according to the connected equipment and the required functionality. See the section on assisted pump setup.
3. Select the **Assist** menu on one of the pumps, and choose **Setup of multi-pump system**.
4. Press **>** to continue.
5. Select **Wireless** as the communication method to be used between the pumps.
6. Press **>** to continue.
7. Select the desired multipump function. See the sections on alternating operation, backup operation and cascade operation.
8. Press **>** three times to continue.
9. Press **OK** to search for other pumps. The green indicator light in the middle of Grundfos Eye flashes on the other pumps.
10. Press the connect button on the pumps which are to be added to the multipump system.
11. Press **>** to continue.

12. Set the time for a pump changeover, such as the time at which the alternation between the two pumps is to take place.

    This step applies only if you have selected **Alternating operation, time** and if the motors are fitted with FM 300.

13. Press **>** to continue.
14. Press **OK** to confirm the setting. The multipump-function icons appear in the bottom of the operating panels.

9.44.7.4 HMI 300 operating panel and wired pump connection

1. Connect the pumps with each other with a 3-core screened cable between the GENIbus terminals A, Y, B.
2. On the pumps, set the needed analog and digital inputs according to the connected equipment and the required functionality. See the section on assisted pump setup.
3. Assign pump number 1 to the first pump. See the section on number.
4. Assign pump number 2 to the next pump. See the section on number.
5. Assign pump number 3 and 4 if more than two pumps are installed in the system. See the sections on cascade operation and number.
6. Select the **Assist** menu on one of the pumps and choose **Setup of multi-pump system**.
7. Press **>** to continue.
8. Select **Wired GENIbus** as the communication method to be used between the two pumps.
9. Press **>** twice to continue.
10. Select the desired multipump function. See the sections on alternating operation, backup operation and cascade operation.
11. Press **>** to continue.
12. Press **OK** to search for other pumps.
13. Select the pump from the list.
14. Press **>** to continue.
15. Set the time for a pump changeover, such as the time at which the alternation between the two pumps is to take place.

    This step applies only if you have selected **Alternating operation, time** and if the motors are fitted with FM 300.

16. Press **>** to continue.
17. Press **OK** to confirm the setting. The multipump-function icons appear in the bottom of the operating panels.

9.44.7.5 Disabling a multipump system via Grundfos GO Remote

1. Select the **Assist** menu.
2. Select **Setup of multi-pump system**.
3. Select **Disable**.
4. Press **>** to continue.
5. Confirm the setting by pressing **Send**.
6. Press **Finish**.

9.44.7.6 Disabling a multipump system via the HMI 300 operating panel

1. Select the **Assist** menu.
2. Select **Setup of multi-pump system**.
3. Press **>** to continue.
4. Confirm **Disable** by pressing **OK**.
5. Press **>** to continue.
6. Press **OK** to confirm.

9.45 Description of control mode

This menu is only available in the HMI 300 operating panel.

This menu describes each of the possible control modes. See also the section on control mode.

Related information

9.4 Control mode

9.46 Assisted fault advice

This menu gives guidance and corrective actions in case of pump failures.

10. Description of settings

10.1 Priority of settings

You can always set the pump to stop by pressing the **Stop** button on the pump operating panel. When the pump is not in **Stop** mode, you can always set the pump to stop by continuously pressing **Down**. Furthermore, you can set the pump to maximum speed by continuously pressing **Up**. You can always set the pump to operation at maximum speed or to stop with Grundfos GO Remote.

If two or more functions are enabled at the same time, the pump operates according to the function with the highest priority.

Example: If you set the pump to maximum speed via the digital input, the pump operating panel or Grundfos GO Remote can only set the pump to **Manual** or **Stop**.

The priority of the settings is presented in the table below:

Priority	Start-stop button	Grundfos GO Remote or operating panel on pump	Digital input	Bus communication
1	Stop			
2		Stop [15)]		
3		Manual		
4		Max. speed [15)]		
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		

15) If the bus communication is interrupted, the pump resumes its previous operating mode, for example **Stop**, selected with Grundfos GO Remote or the pump operating panel.

10.2 Factory settings

●	The function is enabled.
❍	The function is disabled.
-	The function is not available.

Settings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE		
	With factory-fitted sensor	Without factory-fitted sensor	CME
Setpoint	75 % of sensor range	75 % of sensor range	75 % of sensor range
Operating mode	Normal	Normal	Normal
Control mode	Constant pressure	Constant pressure	Constant pressure
Pipe filling function	Not active	Not active	Not active
Enable/disable settings	Active	Active	Active
Low-flow stop function	Not active	Not active	Not active
Controller settings	●	●	●
Ti	0.5	0.5	0.5
Kp	0.5	0.5	0.5
Operating range	50-100 %	50-100 %	50-100 %
Ramps			
Ramp-up	1 second	1 second	1 second
Ramp-down	3 seconds	3 seconds	3 seconds
Pump number	-	-	-
Enable/disable radio comm.	Active	Active	Active
Analog inputs			
Analog input 1	4-20 mA	Not active	Not active
Analog input 2	Not active	Not active	Not active
Analog input 3	Not active	Not active	Not active
Pt 100/1000 inputs			
Pt100/1000 input 1	Not active	Not active	Not active
Pt100/1000 input 2	Not active	Not active	Not active
Digital inputs			
Digital input 1	External stop	External stop	External stop
Digital input 2	Not active	Not active	Not active
Digital inputs/outputs			
Digital in/output 3	Not active	Not active	Not active
Digital in/output 4	Not active	Not active	Not active
Pulse flowmeter setup	❍	❍	❍
Predefined setpoints	0 psi / 0 bar	0 %	0 %
Analog output	Speed	Speed	Speed
External setpoint function	Not active	Not active	Not active
Relay outputs			
Signal relay 1	Alarm	Alarm	Alarm
Signal relay 2	Running	Running	Running
Limit-exceeded function			
Limit 1 exceeded	Not active	Not active	Not active
Limit 2 exceeded	Not active	Not active	Not active
LiqTec function			
LiqTec	Not active	Not active	Not active
Detection delay time	40 seconds	40 seconds	40 seconds
Standstill heating	Not active	Not active	Not active

Settings	CRE, CRIE, CRNE, CRKE, SPKE, MTRE		
	With factory-fitted sensor	Without factory-fitted sensor	CME
Motor bearing monitoring	Not active	Not active	Not active
Pump name	-	-	-
Connection code	-	-	-
Units	US	US	US

11. Servicing the product

DANGER

Electric shock

Death or serious personal injury

- Switch off the power supply to the motor and the signal relays. Wait at least 5 minutes before starting any work on the motor. Make sure that the power supply cannot be switched on accidentally.

DANGER

Magnetic field

Death or serious personal injury

- Do not handle the motor or rotor if you have a pacemaker.

11.1 Motor

For servicing the product, download the service instructions for the motor by using the following link or QR code.

QR98413121

http://net.grundfos.com/qr/i/98413121

11.2 Pump

Service documentation is available in Grundfos Product Center (http://product-selection.grundfos.com/).

If you have any questions, contact the nearest Grundfos company or service workshop.

11.3 Cleaning the product

WARNING

Electric shock

Death or serious personal injury

- Switch off the power supply to the motor and the signal relays. Confirm that the terminal box cover is intact before spraying water on the product.

To avoid condensation in the motor, let the motor cool down before spraying it with cold water.

12. Technical data

12.1 Operating conditions

12.1.1 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 starts after approximately 5 seconds.

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

When started via an external on or off switch, the pump starts immediately.

12.1.2 Ambient temperature

Ambient temperature during storage and transportation

Minimum: -22 °F (-30 °C)

Maximum: 140 °F (60 °C).

Ambient temperature during operation

1 × 200-240 and 3 × 440-480

Minimum: -4 °F (-20 °C)

Maximum: 122 °F (50 °C).

3 × 200-240

Minimum: -4 °F (-20 °C)

Maximum: 104 °F (40 °C).

The motor can operate with the rated power output (P2) at 122 °F (50 °C), but continuous operation at higher temperatures reduces the expected product life. If the motor is to operate at ambient temperatures between 122 °F (50 °C) and 140 °F (60 °C), select an oversized motor. Contact Grundfos for further information.

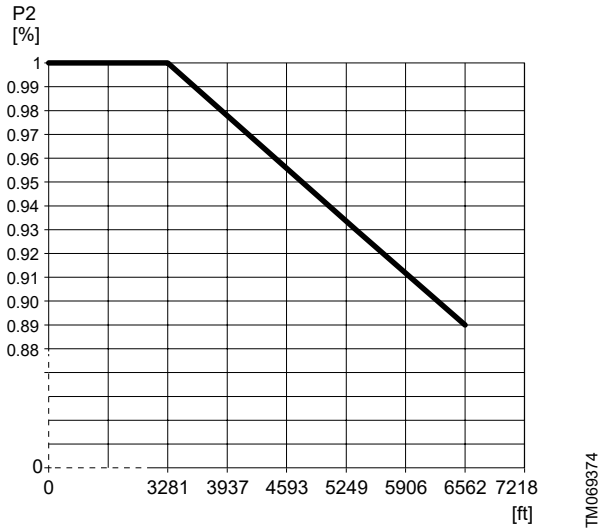
12.1.3 Installation altitude

If the motor is installed above 6560 ft (2000 m), it does not comply with SELV/PELV classification.

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

Motors installed up to 3280 ft (1000 meters) above sea level can be loaded 100 %.

- Motors installed more than 3280 ft (1000 meters) above sea level must not be fully loaded due to the low density and consequent low cooling effect of the air. See the figure below.



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

12.1.4 Humidity

Maximum humidity: 95 %.

If the humidity is constantly high and above 85 %, open the drain holes in the drive-end flange. See the sections on outdoor installation and drain holes.

Related information

5.2 Indoor installation

6.1.1.2 Drain holes

12.1.5 Motor cooling

To ensure cooling of motor and electronics, observe the following:

- Position the motor in such a way that adequate cooling is ensured. See the section on ensuring motor cooling.
- The temperature of the cooling air must not exceed 122°F (50°C).
- Keep cooling fins and fan blades clean.

Related information

5.4.1 Cooling the motor

12.2 Megging

Do not meg an installation incorporating MLE motors, as the built-in electronics may be damaged.

12.3 Technical data, single-phase motors

12.3.1 Supply voltage

- 1 × 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 Hp [kW]	Minimum [A]	Maximum [A]
1/2 - 1 (0.37 - 0.75)	6	10
1 1/2 - 2 (1.1 - 1.5)	10	16

You can use standard as well as quick-blow or slow-blow fuses.

12.3.2 Leakage current

Ground leakage current less than 3.5 mA, AC.

Ground leakage current less than 10 mA, DC.

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

12.4 Technical data, three-phase motors

12.4.1 Supply voltage

- 3 × 440-480 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 [Hp (kW)]	Minimum [A]	Maximum [A]
1 - 1 1/2 (0.75 - 1.1)	6	6
2 (1.5)	6	10
3 (2.2)	6	16

You can use standard as well as quick-blow or slow-blow fuses.

- 3 × 200-240 V, 60 Hz (supply voltage V)

Recommended fuse size

Motor size [Hp (kW)]	Minimum [A]	Maximum [A]
1 1/2 (1.1)	10	20
2 (1.5)	10	20

12.4.2 Leakage current (AC)

Speed [min^{-1}]	Power [Hp (kW)]	Power supply voltage [V]	Leakage current [mA]
2900-4000	1 - 3 (0.75 - 2.2)	≤ 400	< 3.5
		> 400	< 5
4000-5900	1 - 3 (0.75 - 2.2)	≤ 400	< 3.5
		> 400	< 5

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

12.5 Inputs/outputs

Ground reference

All voltages refer to ground. All currents return to ground.

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 less than 25 mADC.

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

Digital inputs, DI

Internal pull-up current greater than 10 mA at V_i equal 0 VDC.

Internal pull-up to 5 VDC (currentless for V_i greater than 5 VDC).

Certain low logic level: V_i less than 1.5 VDC.

Certain high logic level: V_i greater than 3.0 VDC.

Hysteresis: No.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 1640 ft (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: Maximum 1.2 VDC.

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

Overcurrent protection: Yes.

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 1640 ft (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 greater than 100 kΩ 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 is equal 292 Ω.

Current overload protection: Yes. Change to voltage signal.

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

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 500 m excluding potentiometer.

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

Use maximum 10 kΩ.

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 kΩ.
- 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 (maximum-point coverage).

Screened cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 1640 ft (500 m).

Pt100/1000 inputs, Pt

Temperature range:

- Minimum: -22 °F (-30 °C). 88 Ω / 882 Ω.
- Maximum: 356 °F (180 °C). 168 Ω / 1685 Ω.

Measurement tolerance: ± 2.5 °F (± 1.5 °C).

Measurement resolution: < 0.5 °F (0.3 °C).

Automatic range detection, Pt100 or Pt1000: Yes.

Sensor fault alarm: Yes.

Screened cable: 0.5 - 1.5 mm^2, 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 mm^2, 28-16 AWG.

Grundfos Digital Sensor input and output, GDS

Use Grundfos Digital Sensor only.

Power supplies

+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 mm^2, 28-12 AWG.

Maximum cable length: 1640 ft (500 m).

Bus input

Grundfos GENIbus protocol, RS-485.

Screened 3-core cable: 0.5 - 1.5 mm^2, 28-16 AWG.

Maximum cable length: 1640 ft (500 m).

12.6 Other technical data

EMC (electromagnetic compatibility)

Standard used: EN 61800-3.

The table below indicates the emission category of the motor.

C1: Fulfills the requirements for residential areas.

C3: Fulfills the requirements for industrial areas.

Motor Hp (kW)	Emission category
	2900-4000 min^{-1} 4000-5900 min^{-1}
1/2 (0.37)	C1
3/4 (0.55)	C1
1 (0.75)	C1
1 1/2 (1.1)	C1
2 (1.5)	C1
3 (2.2)	C1

Immunity: Fulfills the requirements for industrial areas.

Contact Grundfos for further information.

Enclosure class

Standard: IP55 (IEC 34-5).

Optional: IP66 (IEC 34-5).

Insulation class

F (IEC 85).

Standby power consumption

5-10 W.

Cable entries

Motor Hp (kW)	Supply voltage	Number and size of cable entries
1/2 - 2 (0.37 - 1.5)	1 × 200-240 V, 50/60 Hz 3 × 200-240 V, 60 Hz 3 × 440-480 V, 50/60 Hz	4 × NPT 1/2" 4 × NPT 1/2" 4 × NPT 1/2"
3 (2.2)	3 × 440-480 V, 50/60 Hz	4 × NPT 1/2"

The cable entries are fitted with blind plugs from the factory. Cable glands are not provided.

Torques

Terminal	Thread size	Maximum torque [ft lb (Nm)]
L1, L2, L3, L, N	M4	1.3 (1.8)
NC, C1, C2, NO	M2.5	0.4 (0.5)
1-26 and A, Y, B	M2	0.4 (0.5)

12.6.1 Sound pressure level

Motor [hp]	Maximum speed stated on nameplate [min^{-1}]	Speed [min^{-1}]	Sound pressure level ISO 3743 [dB(A)]	
			1-phase motors	3-phase motors
1/2 - 1	2000	1500	37	37
		2000	43	43
	4000	3000	50	50
		4000	60	60
	5900	4000	58	58
		5900	68	68
1 1/2	2000	1500	-	37
		2000	-	43
	4000	3000	50	50
		4000	60	60
	5900	4000	58	58
		5900	68	68
2	2000	1500	-	42
		2000	-	47
	4000	3000	57	57
		4000	64	64
	5900	4000	58	58
		5900	68	68

Motor [hp]	Maximum speed stated on nameplate [min^{-1}]	Speed [min^{-1}]	Sound pressure level ISO 3743 [dB(A)]	
			1-phase motors	3-phase motors
3	2000	1500	-	48
		2000	-	55
	4000	3000	-	57
		4000	-	64
	5900	4000	-	58
		5900	-	68

13. Disposing of the product

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 crossed-out wheelie bin symbol on a product means that it must be disposed of separately from household waste. When a product marked with this symbol reaches its end of life, take it to a collection point designated by the local waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

See also end-of-life information at *www.grundfos.com/product-recycling*.

14. Document quality feedback

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