Pioneering for You

# Wilo-Para MAXO/-G/-R/-Z

**en** Installation and operating instructions

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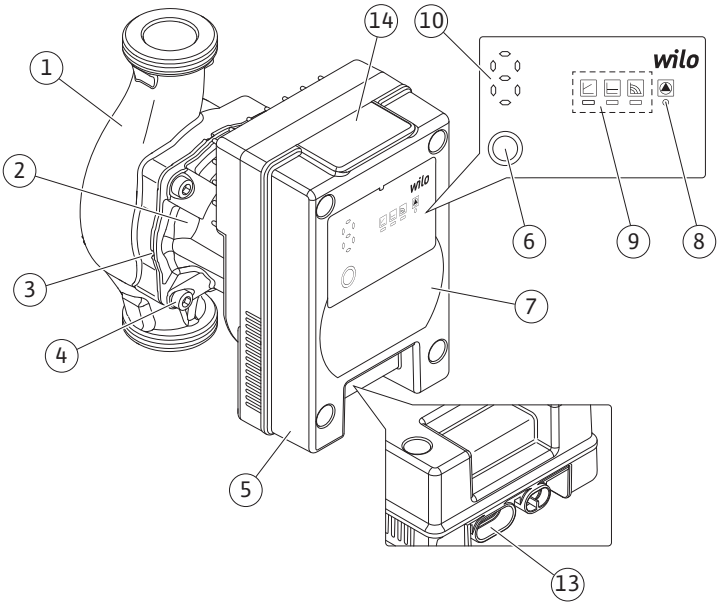
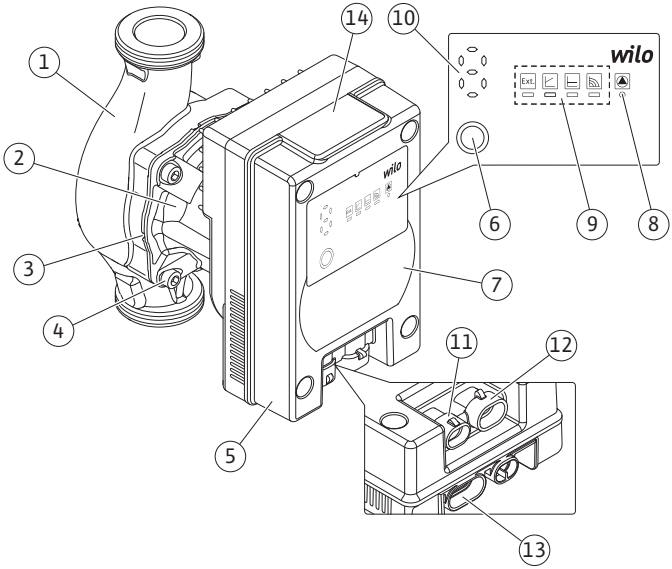
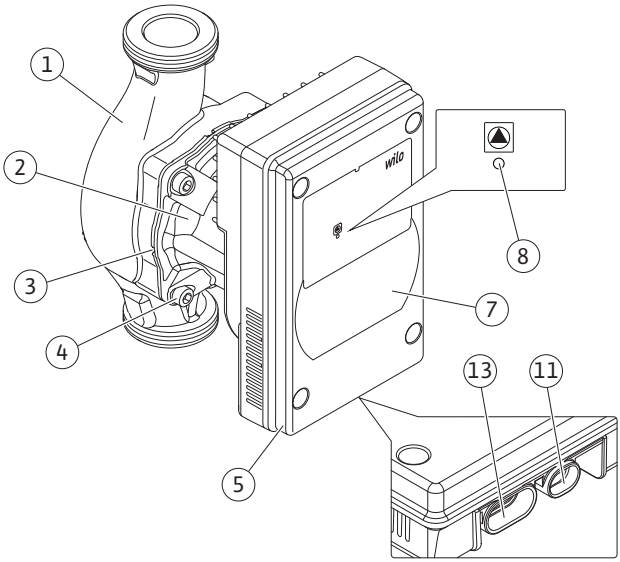
## Fig. I: Para MAXO...-F01




## Para MAXO...-F02



## Para MAXO...-F21/F22/F23/F41




## Para MAXO...-F42

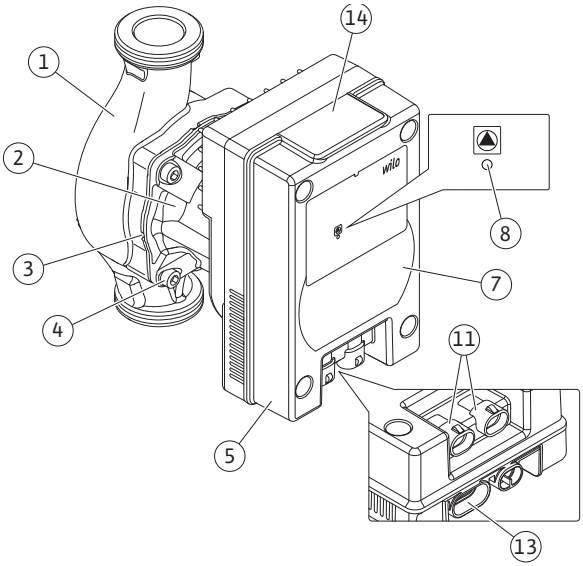
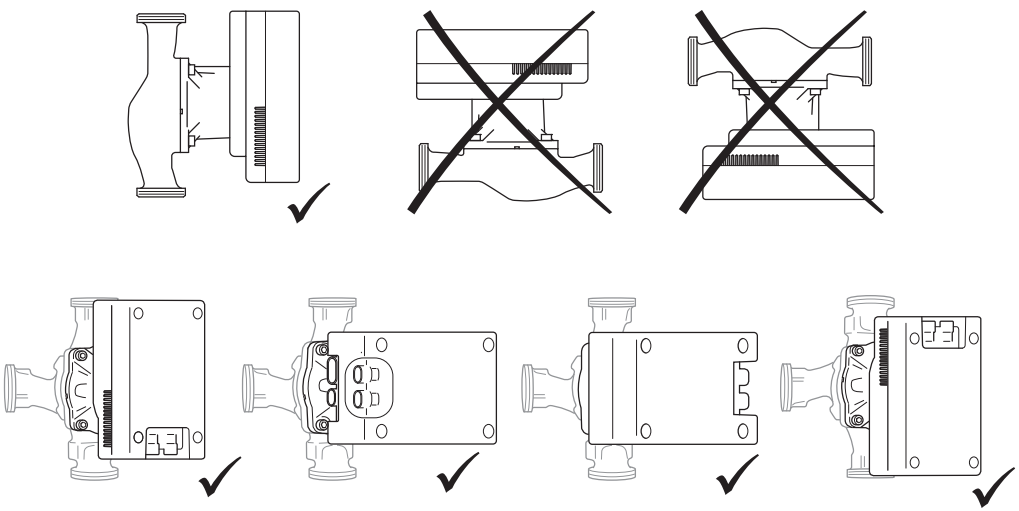


**Fig. II**



## Table of contents

## 1 About these instructions

These instructions are an integral part of the product. Adherence to these instructions is a requirement for the intended use and correct operation of the product:

- Read these instructions before commencing any work and keep them in an accessible place at all times.
- Observe instructions and labelling on the pump.
- Observe local regulations where the pump is installed.
- No liability will be accepted for damage resulting from failure to follow these instructions.

The language of the original operating instructions is German. All other languages of these instructions are translations of the original operating instructions.

## 2 Safety

This chapter contains basic instructions for the individual life cycles of the product. Failure to observe this information carries the following risks:

- Danger to persons from electrical, mechanical and bacteriological effects as well as electromagnetic fields
- Environmental damage from discharge of hazardous substances
- Damage to property
- Failure of important product functions
- Failure of required maintenance and repair procedures

Failure to observe the instructions will result in the loss of any claims for damages.

**The directions and safety instructions in the other sections must also be observed!**

### 2.1 Identification of safety instructions

These installation and operating instructions set out safety instructions for preventing personal injury and damage to property, which are displayed in different ways:

- Safety instructions relating to personal injury start with a signal word and are **preceded by a corresponding symbol**.
- Safety instructions relating to property damage start with a signal word and are displayed **without** a symbol.

**Signal words**

- **DANGER!**
  Failure to follow the instructions will result in serious injury or death!
- **Warning!**
  Failure to follow instructions can lead to (serious) injury!
- **Caution!**
  Failure to follow instructions can lead to property damage and possible total loss.
- **Notice!**
  Useful information on handling the product

**Symbols**

These instructions use the following symbols:


General danger symbol


Danger of electric voltage


Warning of hot surfaces


Warning of magnetic fields


Notices

### 2.2 Personnel qualifications

Staff must:

- be instructed about locally applicable regulations governing accident prevention,
- have read and understood the installation and operating instructions.

Personnel must have the following qualifications:

- Electrical work: a qualified electrician must carry out the electrical work.

- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials.
- The product must be operated by persons who have been instructed on how the complete system functions.
- Maintenance work: The technician must be familiar with the use of operating fluids and their disposal.

**Definition of "qualified electrician"**

A qualified electrician is a person with appropriate technical education, knowledge and experience who can identify **and** prevent electrical hazards.

The operator must confirm and ensure the field of authority, the competence and the monitoring of the personnel. If the personnel do not possess the necessary knowledge, they must be trained and instructed. If required, this can be carried out by the product manufacturer at the operator's request.

## 2.3 Electrical work

- Electrical work must be performed by a qualified electrician.
- Nationally applicable guidelines, standards and regulations as well as specifications issued by the local energy supply companies for connection to the local power supply system must be observed.
- Before commencing work, disconnect the product from the mains and secure it against being switched on again.
- The connection must be secured by means of a residual-current device (RCD).
- The product must be earthed.
- Have defective cables replaced immediately by a qualified electrician.
- Never open the control module and never remove operating elements.

## 2.4 Operator responsibilities

- Provide installation and operating instructions in a language which the personnel can understand.
- Make sure that personnel are suitably trained for the specified work.
- Verify the area of responsibility and individual responsibilities of personnel.
- Provide the necessary protective equipment and make sure that personnel wear it.
- Ensure that safety and information signs mounted on the device are always legible.
- Train personnel with regard to the operating principles of the system.
- Eliminate risks from electrical current.
- Equip hazardous components (extremely cold, extremely hot, rotating, etc.) with a guard to be provided by the customer.
- Remove leakages of hazardous fluids (e.g. explosive, toxic or hot) in such a way that no danger is posed to persons or the environment. Comply with national statutory provisions.
- Keep highly flammable materials at a safe distance from the product.
- Ensure compliance with the regulations for accident prevention.
- Ensure compliance with local directives or general directives [e.g. IEC, VDE, etc.] and instructions from local energy supply companies.

Follow all information that appears on the product and ensure that it remains permanently legible:

- Warning and hazard notices
- Rating plate
- Direction of rotation arrow/symbol for direction of flow
- Labelling of connections

This device can be used by children from 8 years of age as well as people with reduced physical, sensory or mental capacities or lack of experience and knowledge if they are supervised or instructed on the safe use of the device and they understand the dangers that can occur. Children are not allowed to play with the device. Cleaning and user maintenance must not be carried out by children without supervision.

## 2.5 Safety instructions

**Electrical current**

**DANGER**

**Electric shock!**

The pump is operated electrically. An electric shock may be a danger to life!

- Have only qualified electricians carry out work on electrical components.
- Before all work, deactivate the power supply (also SSM if necessary) and safeguard against accidental switch-on. Work on the pump may only be started after 5 minutes have elapsed due to the dangerous residual contact voltage.
- Never open control module and never remove operator controls.
- Only operate the pump with intact components and connection cables.

**Magnetic field**

**DANGER**

**Magnetic field!**

When dismantled, the permanent magnet rotor inside the pump can pose a risk of fatal injury for people with medical implants (e.g. pacemakers).

- Never remove the motor impeller unit.

**Hot components**

**WARNING**

**Hot components!**

Pump housing and glandless motor can get hot and cause burns when touched.

- During operation only touch the control module.
- Allow the pump to cool down before commencing any work.
- Keep highly flammable materials away.

# 3 Transport and temporary storage

## 3.1 Transport inspection

Immediately after receiving the product:

- Check product for transport damage.
- If transport damage is detected, take the necessary steps with the forwarding agent within the respective time limits.

## 3.2 Transport and storage conditions

**CAUTION**

**Risk of material damage!**

Incorrect transport and storage can cause damage to the product.

**WARNING**

**Risk of injury from sodden packaging!**

Packaging that has been sodden loses its strength and can cause injury to persons if the product falls out.

**WARNING**

**Risk of injury from ripped plastic strips!**

Ripped plastic strips on the packaging render transport protection void. Products falling out may cause personal injury.

- The pump and its packaging must be protected against moisture, frost and mechanical damage during transport and temporary storage.
- Permitted temperature range during transport:
  - –40 °C ... +70 °C
- Permitted relative humidity during transport:
  - +5 % ... 95 %
- Store in original packaging.
- Storage of pump with horizontal shaft on a horizontal surface. Observe the packaging icon  (top).
- Storage must not exceed the six-month period.
- Permitted temperature range during storage:
  - –40 °C ... +60 °C
- Permitted relative humidity during storage:
  - +5 % ... 95 %

## 4 Intended use and misuse

**WARNING**

The Wilo-Para MAXO, Wilo-Para MAXO-G, Wilo-Para MAXO-R and Wilo-Para MAXO-Z series do not meet the requirements of the ATEX directive and are not suitable for use in ATEX applications!

### 4.1 Heating fluids

The high-efficiency circulators in the **Wilo-Para MAXO** series are exclusively intended for circulating fluids in hot-water heating systems and similar systems, including solar installations, with constantly changing volume flows.

Permitted fluids:

- Heating water in accordance with VDI 2035 Part 1 and Part 2, within the following limits:
  - Electrical conductivity in the range of 10 µS/cm to 100 µS/cm
  - pH value in the range of 8.2 to 10.0
- Water-glycol mixtures, max. mixing ratio of 1:1. If glycol is added, the pumping data of the pump must be corrected according to the higher viscosity, depending on the mixing ratio percentage.

### 4.2 Use in applications with coolants

The high-efficiency circulators in the **Wilo-Para MAXO-G** and **Wilo-Para MAXO-R** series are additionally suitable for use in cooling and chilled water circuits, including geothermal applications and heat pumps.

The **Wilo-Para MAXO-G** and the **Wilo-Para MAXO-R** can be used in heating or air-conditioning systems designed in accordance with IEC 60335-2-40. The permitted flammable refrigerants are limited to those listed as compatible according to IEC 60335-2-40:2022.

| Coolant<br>Name | Safety class | Para MAXO-G<br>Pictogram on the pump:<br>  | Para MAXO-R<br>Pictogram on the pump:<br>  |
|---|---|---|---|
| R-32 | A2L | **Compatible** | **Compatible** |
| R-50 | A3 | not permitted | **Compatible** |
| R-142b | A2L | not permitted | **Compatible** |
| R-143a | A2L | not permitted | **Compatible** |
| R-152a | A2 | not permitted | **Compatible** |
| R-170 | A3 | not permitted | **Compatible** |
| R-290 | A3 | not permitted | **Compatible** |

| Coolant<br>Name | Safety class | Para MAXO-G<br>Pictogram on the pump:<br>  | Para MAXO-R<br>Pictogram on the pump:<br>  |
|---|---|---|---|
| R-444B | A2L | **Compatible** | **Compatible** |
| R-444A | A2L | **Compatible** | **Compatible** |
| R-447B | A2L | **Compatible** | **Compatible** |
| R-451A | A2L | **Compatible** | **Compatible** |
| R-451B | A2L | **Compatible** | **Compatible** |
| R-452B | A2L | **Compatible** | **Compatible** |
| R-454A | A2L | **Compatible** | **Compatible** |
| R-454B | A2L | **Compatible** | **Compatible** |
| R-454C | A2L | **Compatible** | **Compatible** |
| R-457A | A2L | **Compatible** | **Compatible** |
| R-600a | A3 | not permitted | **Compatible** |
| R-1270 | A3 | not permitted | **Compatible** |
| R-1234yf | A2L | **Compatible** | **Compatible** |
| R-1234ze(E) | A2L | **Compatible** | **Compatible** |

## NOTICE

For the most common refrigerants, there is an additional pictogram on the product rating plate to enable fast identification of the possible use of the product:

- R32: 
- R290: 

### 4.3 Domestic hot water

The high-efficiency circulators in the **Wilo-Para MAXO-Z** series are suitable for use in domestic hot water circulation systems and other drinking water applications. In drinking water applications, the water temperature must not exceed 85 °C.

A list of certificates can be found in the certificate booklet.

Intended use includes compliance with these instructions as well as the information and markings on the pump.
Any use beyond the intended use is considered misuse and will result in the loss of all liability claims.

### 4.4 Misuse

## WARNING

Misuse of the pump can lead to dangerous situations and damage!
Non-permitted substances in the fluid can destroy the pump! Abrasive solids (e.g. sand) increase pump wear.

- Never use non-specified fluids.
- Highly flammable materials/fluids should always be kept at a safe distance from the product.
- Never allow unauthorised persons to carry out work.
- Never operate the pump beyond the specified limits of use.
- Never carry out unauthorised conversions.
- Use exclusively authorised accessories and authorised spare parts.
- Never operate with phase angle control.

# 5 Product information

## 5.1 Type key

| Example: Wilo-Para MAXO-Z 25-180-08-F21 U03-AIS-K01 | |
|---|---|
| Para MAXO | High-efficiency circulator<br>General fields of application, heating, solar application |
| -G<br>-R<br>-Z | Geothermal energy, heating pumps, cooling, flammable gas up to R32<br>Geothermal energy, heating pumps, cooling, flammable gas up to R290<br>Domestic hot water applications |
| 25 | Screwed connection:<br>25 = DN 25 (Rp 1 / G1½)<br>30 = DN 30 (Rp 1¼ / G2) |
| 180 | Port-to-port length in [mm] |
| 08 | Maximum delivery head in [m] at Q = 0 m³/h |
| F21 | Equipment variants (note table “Equipment variants”) |
| U | Direction of flow (none = U06)<br>U = Upwards<br>R = To the right<br>D = Downwards<br>L = To the left |
| 03 | Position of the cable connector (none = U06)<br>03 = cable connection at 3 o’clock<br>06 = cable connection at 6 o’clock<br>09 = cable connection at 9 o’clock<br>12 = cable connection at 12 o’clock |
| AIS | A = Accessories are included in the packaging<br>I = Individual packaging<br>S = Specific factory setting |
| K01 | Electrical accessory set not included in the scope of delivery:<br>K01 = 1x mains cable (1.5 m)<br>K02 = 1x mains cable + 1x signal cable (1.5 m)<br>K03 = 1x mains cable + 1x signal cable + 1x SSM cable (1.5 m)<br>K04 = 1x mains cable adapter Molex SD 5025-03P1<br>C08 = 1x mains cable + 1x signal cable (2 m) |

*Table 1:* Type key

## 5.2 Equipment variants

| Variant | HMI | Internal control function | External control function | Communication | Other functions |
|---|---|---|---|---|---|
| F01 | Operating button | Variable differential pressure Δp-v<br>Constant differential pressure Δp-c<br>Constant speed | | | Venting<br>Deblocking<br>Resetting the factory settings<br>Key lock<br>Pump kick |

| Variant | HMI | Internal control function | External control function | Communication | Other functions |
|---|---|---|---|---|---|
| F02 | Operating button | Variable differential pressure Δp-v<br>Constant differential pressure Δp-c<br>Constant speed | PWM 1<br>PWM 2<br>Analogue 0 ... 10 V with cable break function<br>Analogue 0 ... 10 V without cable break function | SSM (collective fault signal) | Venting<br>Deblocking<br>Resetting the factory settings<br>Key lock<br>Pump kick |
| F21 | Status LED | | PWM 1 | iPWM flow rate calculation | Deblocking<br>Pump kick |
| F22 | Status LED | | PWM 2 | iPWM flow rate calculation | Deblocking<br>Pump kick |
| F23 | Status LED | | PWM 1 | iPWM power calculation | Deblocking<br>Pump kick |
| F41 | Status LED | | LIN (extended) | LIN (extended) | Venting<br>Deblocking<br>Pump kick |
| F42 | Status LED | | Modbus | Modbus | Deblocking<br>Pump kick |

*Table 2:* Equipment variants

## 5.3 Technical data

| Technical data | |
|---|---|
| Connection voltage | 1~230 V +10% / -15%, 50/60 Hz |
| Protection class | IPX4D |
| Insulation class | F |
| Energy efficiency index EEI | See rating plate (Fig. I, Item 7) |
| Permissible fluid temperature | -20 °C to +95 °C (+110 °C with reduced performance) |
| Permissible fluid temperature for domestic hot water | 0 °C to +85 °C |
| Permissible ambient temperature | -20 °C to +45 °C<br>-30 °C to -21 °C (at max. operating pressure 8 bar (800 kPa))<br>+46 °C to +70 °C (with reduced performance) |
| Max. operating pressure | 10 bar (1000 kPa)<br>8 bar (800 kPa) for ambient temperatures of -30°C to -21 °C |
| Emissions sound-pressure level | < 38 dB(A)[1)] |
| Max. installation height | 2000 m above sea level |
| Minimum inlet pressure at +95 °C/ +110 °C | 1.0 bar / 1.6 bar (100 kPa / 160 kPa)[2)] |

*Table 3:* Technical data

[1)] with regard to the best efficiency point within the dimensioning conditions.

[2)]The values apply up to 300 m above sea level, addition for higher locations: 0.01 bar/ 100 m increase in height.

**NOTICE**

See Wilo's technical product catalogue for detailed product features.

### 5.4 Scope of delivery

- High-efficiency circulator
- Installation and operating instructions

### 5.5 Accessories

Accessories must be ordered separately. For a detailed list and description, consult the catalogue.

The following accessories are available:

- Mains connection cable
- Mains connection adapter Molex SD 5025-03P1
- Signal connection cable
- Signal connection adapter Wilo-iPWM/LIN
- Dummy plug for signal cable
- Termination resistor (only for Modbus version)
- SSM connection cable
- SSM adapter for the connection cable
- SSM dummy plug
- Thermal insulation shell for heating systems
- Thermal insulation shell for cooling systems

## 6 Description and function

### 6.1 Description of the pump

The Wilo-Para MAXO high-efficiency circulators (Fig. I) are glandless pumps consisting of highly efficient hydraulics, an electronically commutated motor (ECM) with a permanent magnet rotor and integrated differential pressure control. An electronic control module with an integrated frequency converter is on the motor housing. Control mode and delivery head (differential pressure) are adjustable. The differential pressure is controlled via the pump speed.

**Overview**

1. Pump housing with screwed connections
2. Glandless motor
3. Condensate drain openings (4x around circumference)
4. Housing screws
5. Control module
6. Operating button for pump adjustment
7. Rating plate
8. Status LED
9. Display of selected control mode
10. Display of selected characteristic curve or selected signal type
11. Signal cable connection
12. SSM cable connection
13. Mains connection: 3-pole plug connection
14. Wilo-Connectivity Interface

**Status LED**

The status LED (Fig. I, Item 8) provides a quick overview of the status of the pump:

- LED lights up green in normal operation.
- LED lights up/flashes in case of a fault (see section “Faults, causes and remedies”).

**HMI with operating button**

Wilo-Para MAXO ... F01/F02:

The pump is equipped with indicator lights (LEDs) and an operating button (Fig. I, Item 6).

Pictograms of the control mode (Fig. I, Item 9):

The pictograms show the selected control mode: For further details on control functions, see section “Control and communication functions”


External control (F02 only)

Variable differential pressure (Δp-v)

Constant differential pressure (Δp-c)

Speed constant

7-segment display (Fig. I, Item 10):

While in modes “Variable differential pressure Δp-v”, “Constant differential pressure Δp-c” or “Constant speed”, the number corresponds to the characteristic curve, from 1 (minimum performance) to 9 (maximum performance).

F02 only: While in “External control” mode, the number corresponds to the following signal types:

- 1 = PWM input Type 1
- 2 = PWM input Type 2
- 3 = Analogue 0 ... 10 V with cable break function
- 4 = Analogue 0 ... 10 V without cable break function

Control button (Fig. I, Item 6):

The operating button enables the following actions:

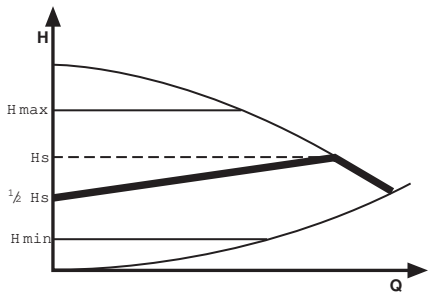
- Press once: Increase characteristic curve by 1 or select next signal type.
- Press operating button for 2 seconds: Select next control mode.
- Press operating button for 4 seconds: Start/stop venting. If the pump displays a fault, start deblocking. (see section “Other functions”).
- Press operating button for 9 seconds: Activation/Deactivation of the key lock (see section “Other functions”).
- Press operating button for 2 seconds while switching off the pump: reset to factory setting (see section “Other functions”).

Factory setting

When activated the first time, the pump starts in the following operating mode:

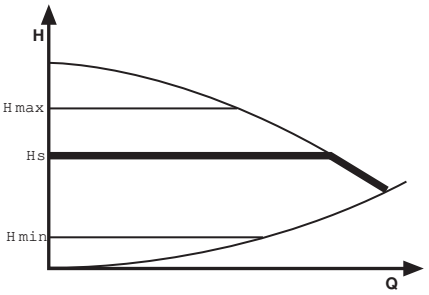
- F01: Constant speed, performance level 9 (maximum speed)
- F02: External control, signal type 3 (analogue 0 ... 10 V with cable break function)

## 6.2 Control and communication functions




### Variable differential pressure Δp-v

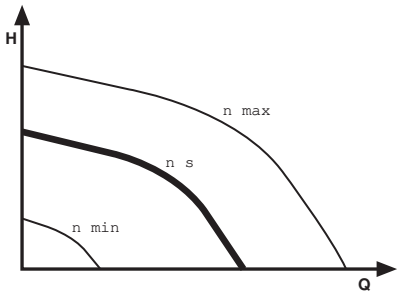
Recommended for two-pipe heating systems with radiators to reduce the flow noise at thermostatic valves. The pump reduces the delivery head to half in the case of decreasing volume flow in the pipe network. Electrical energy saving by adjusting the delivery head to the volume flow requirement and lower flow rates.




**Constant differential pressure Δp-c**

Recommended for underfloor heating or for large-sized pipes or all applications without a variable pipe network curve (e.g. storage charge pumps) as well as single-pipe heating systems with radiators. The control keeps the set delivery head constant irrespective of the pumped volume flow.

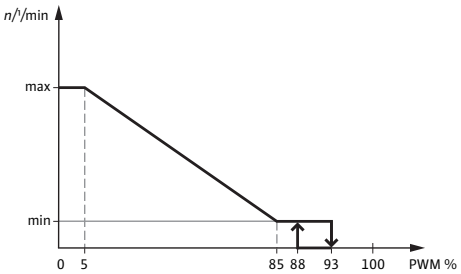
**Constant speed**




Recommended for systems with fixed system resistance requiring a constant volume flow. The control keeps the set speed constant, irrespective of the pumped volume flow.

**PWM 1 mode (profile heating)**

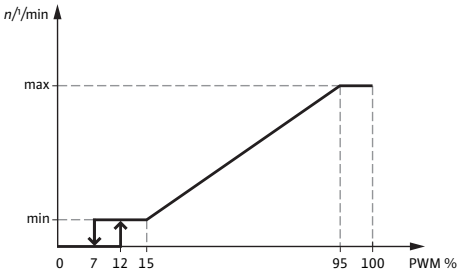
In PWM 1 mode, the pump speed is controlled depending on the PWM input signal. Behaviour when a cable breaks:
If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump accelerates to maximum speed.




| PWM 1 signal input (%) | Pump reaction |
|---|---|
| < 5 | Pump runs at maximum speed. |
| 5 to 85 | The speed of the pump decreases linearly from $n_{max}$ to $n_{min}$. |
| 85 to 93 (operation) | Pump runs at minimum speed (operation). |
| 85 to 88 (starting) | Pump runs at minimum speed (starting). |
| 93 to 100 | Pump stops (standby). |

**PWM 2 mode (profile solar)**

In PWM 2 mode, the pump speed is controlled depending on the PWM input signal. Behaviour when a cable breaks:
If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump stops.




| PWM 2 signal input (%) | Pump reaction |
|---|---|
| < 7 | Pump stops (standby). |
| 7 to 15 (operation) | Pump runs at minimum speed. |
| 12 to 15 (starting) | Pump runs at minimum speed. |
| 15 to 95 | The speed of the pump increases linearly from $n_{min}$ to $n_{max}$. |
| > 95 | Pump runs at maximum speed. |

**PWM signal output (iPWM)**

In iPWM mode, the pump produces a PWM output signal. In normal operation, either the volume flow or the power is calculated. In case of a failure, a specific code is transmitted.

| PWM signal output (%) | Volume flow calculation | Power calculation |
|---|---|---|
| 2 | Pump stopped by user instruction, ready to start. | |
| 5 to 75 | The volume flow of the pump increases linearly from 0 … $Q_{max}$ (m³/h). | The power consumption of the pump increases linearly from 5 … $P1_{max}$ (W). |
| 80 | The pump runs with a warning “Overload” or “Undervoltage”. | |
| 85 | The pump stops with an error “Overload”, “Excessive temperature”, “Overvoltage”, “Undervoltage” or “Turbine operation”. | |
| 90 | The pump stops with an error “Overcurrent” or “Excessive speed”. | |
| 95 | The pump stops with a final error “Blocked rotor”, “Motor defective” or “Winding defective”. | |

The maximum values are defined in the table below:

| Size of the pump | Volume flow calculation | Power calculation |
|---|---|---|
| Para MAXO 08 | $Q_{max}$ = 14 m³/h | $P1_{max}$ = 145 W |
| Para MAXO 10 | $Q_{max}$ = 14 m³/h | $P1_{max}$ = 215 W |
| Para MAXO 11 | $Q_{max}$ = 7 m³/h | $P1_{max}$ = 145 W |
| Para MAXO 15 | $Q_{max}$ = 7 m³/h | $P1_{max}$ = 215 W |

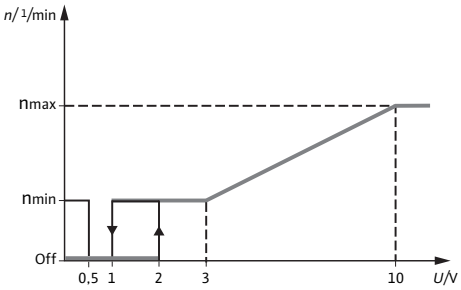
*Table 4:* Maximum of the scale

## NOTICE

The maximum power consumption and the maximum flow rate of the pump are lower than the maximum value indicated here.

**Control input "Analogue In 0 to 10 V" with cable break function**

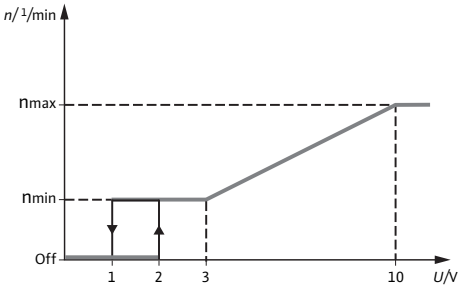
The pump is controlled according to an analogue signal in the range of 0 to 10 V. Behaviour when a cable breaks: If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump reduces to minimum speed.




| Analogue signal input (V) | Pump reaction |
|---|---|
| < 0.5 | Pump runs at minimum speed (emergency operation). |
| 0.5 to 1 | Pump stops. |
| 1 to 3 (operation) | Pump runs at minimum speed. |
| 2 to 3 (starting) | Pump runs at minimum speed. |
| 3 to 10 | The speed of the pump increases linearly from $n_{min}$ to $n_{max}$. |

**Control input "Analogue In 0 to 10 V" without cable break function**

The pump is controlled according to an analogue signal in the range of 0 to 10 V. Behaviour when a cable breaks: If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump stops.




| Analogue signal input (V) | Pump reaction |
|---|---|
| < 1 | Pump stops. |
| 1 to 3 (operation) | Pump runs at minimum speed. |
| 2 to 3 (starting) | Pump runs at minimum speed. |
| 3 to 10 | The speed of the pump increases linearly from $n_{min}$ to $n_{max}$. |

**Collective fault signal SSM**

Faults always result in the activation of the collective fault signal "SSM" via a relay. The contact of the collective fault signal (potential-free normally closed contact) can be connected to the system for the purpose of registering any error messages that may occur.
The internal contact is closed if the pump is without power, if there is no fault or if there is a malfunction of the control module.
The internal contact is open if the pump detects a fault.

The detailed behaviour of the SSM function is described in the section "Faults, causes and remedies".

**LIN Extended**

The pump has an LIN bus interface as specified in VDMA 24226, with the addition of Wilo exclusive features. It allows a bidirectional communication between the pump and the controller.

The pump can be controlled by LIN with the following setpoints:

- Speed constant
- Δp-v
- Δp-c

The pump provides the following information:

- Volume flow (Q)
- Delivery head (H)

- Power consumption (P)
- Current speed (n)
- Energy consumption (E)
- Current operating mode
- Pump status
- Error information (see section “Faults, causes and remedies”)

Behaviour when a cable breaks: If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump activates an alternative fallback mode, which can be configured via LIN.

To find out more about the LIN Extended Bus interface, please contact the Wilo technical support.

**Modbus**

The pump has a Modbus RTU interface. It corresponds to the MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1 and MODBUS SERIAL LINE PROTOCOL V 1.02 in RTU transmission mode, available at www.modbus.org.

The pump can be controlled by the Modbus interface with the following setpoints:

- Speed constant
- Δp-v
- Δp-c

The pump provides the following information:

- Volume flow (Q)
- Delivery head (H)
- Power consumption (P)
- Current speed (n)
- Energy consumption (E)
- Current operating mode
- Pump status
- Error information (see section “Faults, causes and remedies”)

Behaviour when a cable breaks: If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump activates an alternative fallback mode, which can be configured via Modbus.

The pump receives the following parameters by default:

| Parameters | Standard value |
|---|---|
| Address | 101 |
| Baud rate | 19,200 kbps |
| Frame parity | 8E1 |

*Table 5:* Parameters

**NOTICE**

By default, the pump waits for initialisation after being switched on.

To find out more about how to handle the Modbus interface, please contact the Wilo technical support.

## 6.3 Other functions

**Venting**


The pump venting function vents the pump automatically.
The heating system is not vented.

For information on activation, see section “Commissioning”.

**Deblocking**

When the motor is blocked, the pump automatically starts a specific routine with a high torque to remove the blockage.
The routine takes a maximum of around 30 minutes.

See section “Faults, causes and remedies” for the manual activation procedure.

**Factory setting**

This function makes the pump run with the factory settings (delivery condition).
This function is present only on version “F02”.

See section “Commissioning” for the activation procedure.

**Key lock**

Locks the pump’s current settings and protects against undesired or unauthorised adjustment of the pump.
This function is present only on version “F02”.

See section “Commissioning” for the activation procedure.

**Pump kick**

Prevents deposits that can form during a prolonged standstill.
The pump switches itself on for a short time every day during the standstill.
The pump must remain powered all the time to enable this function.

## 7 Installation and electrical connection

**DANGER**

**Risk of fatal electrical shock!**

Exclusively carry out any work on the pump/system after it has been de-energised!

**WARNING**

**Risk of fatal electrical shock!**

The cover of the control module must never be opened.
Opening the control module will invalidate the warranty.

**DANGER**

**Risk of fatal electrical shock! Generator or turbine operation during pump flow!**

Even without the module (without electrical connection), there may be dangerous contact voltage at the motor contacts.

- Avoid flow in the pump during dismantling/installation work!
- Close the existing shut-off devices in front of and behind the pump!
- If no shut-off devices are fitted, drain the system!

**WARNING**

**Danger of injury!**

Only carry out work on the pump/system using suitable tools and once it has come to a standstill.

**WARNING**

**Hot surface!**

The entire pump can become very hot. There is a risk of burns!

- Allow the pump to cool down before commencing any work!

## 7.1 Installation

### 7.1.1 Preparing the installation

May only be installed by qualified installers.

Observe the following points before installation:

**Installation within a building:**

- Install the pump in a dry, well-ventilated, frost-free room.

**Installation outside a building (outdoor installation):**

- Install the pump in a chamber with cover or in a cabinet/housing as weather protection.
- Avoid exposure of the pump to direct sunlight.
- Protect the pump against rain.
- Keep the motor and electronics continually ventilated to avoid overheating.
- The permitted fluid temperatures and ambient temperatures should not be exceeded or undershot.
- Choose an installation point that is easily accessible.
- Observe the pump's permitted installation position (Fig. II).

**CAUTION**

An incorrect installation position may damage the pump!

- Select the installation point in line with the permissible installation positions (Fig. II).
- The motor must always be installed horizontally.
- Install shut-off devices upstream and downstream of the pump to facilitate pump replacement.
- Align the upper shut-off device laterally.

**CAUTION**

Leaking water may damage the control module!

- Align the upper shut-off valve such that leaking water cannot drip onto the control module.
- If the control module is sprayed with liquid, the surface must be dried off.
- When installing in the feed of open systems, the safety supply must branch off upstream of the pump (EN 12828).
- Carry out all welding and soldering work prior to the installation of the pump.
- Flush the pipeline system.

**CAUTION**

Contamination from the pipeline system can destroy the pump during operation!

- Before installing the pump, flush the pipeline system.
- Do not use the pump to flush the pipeline system.

### 7.1.2 Pump installation

**WARNING**

**Risk of fatal injury from magnetic field!**

Risk of fatal injury for people with medical implants (e.g. pacemakers) due to permanent magnets installed in the pump.

- Follow the general behavioural guidelines that apply to handling electrical devices!
- The motor must never be removed!

**NOTICE**

The magnets inside the motor do not pose a danger provided the motor is completely assembled.

**WARNING**

**Incorrect installation can result in personal injury!**

There is a risk of injury due to the pump/motor falling!
There is a risk of crushing!

- If necessary, use suitable lifting gear to secure the pump/motor against falling!
- When the pump needs to be transported, it may be carried only by the motor/pump housing. Never by the control module or cable!

**CAUTION**

**Incorrect installation can result in material damage!**

- Installation is to be carried out by qualified personnel only!
- Observe national and regional regulations!

The following information should be taken into consideration when installing the pump:

- Note the direction arrow on the pump housing.
- Install with glandless motor (Fig. I, Item 2) horizontal, without mechanical tension.
- Place gaskets in the screwed connections.
- Screw on threaded pipe unions.
- Use an open-end wrench to secure the pump against twisting and screw tightly to piping.

### 7.1.3 Insulation of the pump in heating systems

Thermal insulation shells (optional accessories) are only permissible in heating applications with fluid temperatures from +20 °C, since these thermal insulation shells are not diffusion-proof when enclosing the pump housing.
Fix thermal insulation shell before commissioning the pump:

- Fit the two half-shells of the thermal insulation and push them together so that the guide pins engage in the opposing holes.

**WARNING**

**Risk of burns from hot surfaces!**

The entire pump can become very hot. When retrofitting the insulation during ongoing operation, there is a risk of burns!

- Allow the pump to cool down before commencing any work.

**CAUTION**

**Insufficient heat dissipation and condensate may damage the control module and glandless motor!**

- Do not thermally insulate the glandless motor.
- Ensure all condensate drain openings (Fig. I, Item 3) are kept free.

### 7.1.4 Insulation of the pump in cooling systems

The Para MAXO-G and Para MAXO-R series are suitable for use in air-conditioning systems, cooling systems, geothermal systems and similar systems with fluid temperatures down to below 0 °C. Condensate can form on fluid-carrying parts, e.g. pipes and pump housing.

- A diffusion-proof insulation must be provided by the customer for application in such systems (e.g. Wilo Cooling Shell).

**CAUTION**

**Electrical defect!**

Condensate that accumulates in the motor can cause an electrical defect.

- Insulate the pump housing only up to the separating gap to the motor!
- Keep the condensate drain grooves unobstructed to ensure that condensate that develops in the motor can drain off unobstructed!

## 7.2 Electrical connection

- Electrical work: a qualified electrician must carry out the electrical work.

**DANGER**

**Risk of fatal electrical shock!**

Before carrying out any work, switch off the power supply and secure it against being switched on again.
Never open the control module (Fig. I, Item 5) and never remove any operating elements.
Work on the pump may only be started after 5 minutes have elapsed due to the dangerous residual contact voltage.
Check whether all connections (including potential-free contacts) are voltage-free.
Do not operate the pump if the control module/cable is damaged.
If adjustment and operating elements on the control module are removed without authorisation, there is a risk of electric shock if internal electrical components are touched.

**CAUTION**

**Material damage caused by improper electrical connection!**

If the wrong voltage is applied, the control module can be damaged!

- The current type and voltage of the mains connection must correspond to the specifications on the rating plate!
- Control via triacs/semiconductor relay is not permitted!
- When conducting insulation tests with a high voltage generator, the pump must be disconnected from the mains at all poles in the system's switch cabinet.

### 7.2.1 Mains supply

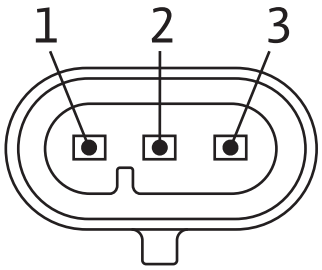
- Only operate the pump with sinusoidal AC voltage.
- A motor protection switch supplied by the customer is not required.
- If a residual-current device (RCD) is used, it is recommended to use an RCD type A (pulse current sensitive). Check that the rules for the coordination of electrical equipment in the electrical installation are observed and, if necessary, adjust the RCD accordingly.

- When dimensioning the residual-current device, consider the number of pumps connected and their rated motor currents.
- Observe leakage current $I_{eff} \leq 3.5$ mA for each pump.
- The following minimum requirements are to be met if shutdown takes place by means of an on-site network relay:
  - Rated current ≥ 8 A
  - Rated voltage: 250 V AC
- Observe the switching frequency:
  - Switching on/off via mains voltage ≤ 100/24 h
  - ≤ 20/h for a switching frequency of 1 min. between switching on/off via mains voltage

### 7.2.2 Mains cable

- The mains cable is intended for the power supply of the pump.
- Mains cables meet the requirements of DIN VDE 0292, DIN VDE 0293-308 and EN 50525-2-11.
  - Minimum cross-section: 0.75 $mm^2$
- The mains connection at the pump interface is designed as an AMP-Superseal 1.5 Series 3P CA (socket) with the following features:
  - EN 61984
  - Mains rated voltage 250 V AC
  - Rated current 2.5 A
  - Rated surge voltage 2.5 kV

Connection socket (outer view of the pump connection)




**Cable assignment**

| Pin | Cable colour | Assignment |
|---|---|---|
| 1 | Brown | Live wire (L) |
| 2 | Yellow/green | Protective earth conductor PE |
| 3 | Blue | Neutral conductor (N) |

Connect cable:

- Check the presence and integrity of the seal on the connector before installation.
- Connect the cable plug to the mains power socket (Fig. I, Item 13) until it snaps into place.
- Ensure that the connecting cable does not contact either the pipes or the pump.

### 7.2.3 Signal properties

**CAUTION**

**Risk of material damage!**

The connection of mains voltage (230 V AC) to the communication pins (iPWM/LIN) will destroy the product.

- Exclusively connect the power supply to 230 V (phase to neutral conductor)!

**PWM and iPWM**

- Signal frequency: 90 Hz – 5000 Hz (1000 Hz nominal value)
- Signal amplitude: Min. 4 V at 3.5 mA to 24.5 V for 10 mA, absorbed by the pump interface
- Signal polarity: yes

**0 ... 10 V signal**

- Electric strength 30 V DC/24 V AC
- Input resistance of the voltage input > 10 kΩ

**LIN bus**

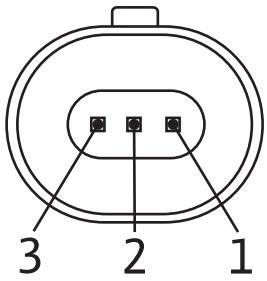
- Bus speed: 19200 bit/s

**Modbus**

The Modbus signal properties set as default are listed in the chapter “Control and communication functions”.

### 7.2.4 Signal cable connection

Connection socket is designed as an AMP Mini Superseal 3P CA (external view of the pump connection)




**Cable assignment**

| PIN | Cable colour | 0 to 10 V Signal | PWM | iPWM | LIN Extended | Modbus |
|---|---|---|---|---|---|---|
| 1 | Brown | 0 to 10 V signal | PWM input | PWM input | Vbus | B (+) |
| 2 | grey or blue | ground (GND) | ground (GND) | ground (GND) | ground (GND) | ground (GND) |
| 3 | Black | not allocated | not allocated | PWM output | LIN signal | A (-) |

The design of the control cable should contain the features of the following table:

| Feature | Recommended value |
|---|---|
| Length | for 0 to 10 V signal: max. 30 m<br>for PWM, iPWM, LIN, Modbus interfaces: max. 3 m |

*Table 6:* Control cable features

Connect cable:

- Check the presence and integrity of the seal on the connector before installation.
- Connect the signal cable plug to the signal connection socket (Fig. I, Item 11) until it snaps into place.
- Ensure that the connecting cable does not contact either the pipes or the pump.

**CAUTION**

**Risk of material damage!**

In case there’s no cable connected, and the cable connection is in the 12 o’clock position, a dummy plug (accessory) shall close the connection in order to ensure IP protection.

### 7.2.5 SSM signal properties

An integrated collective fault signal is applied as a potential-free normally closed contact.

Contact load:

- Permitted minimum: 12 V AC/DC, 10 mA
- Permitted maximum: 250 V AC, 1 A, (AC1 power factor > 0.95). 30 V DC, 1 A

**DANGER**

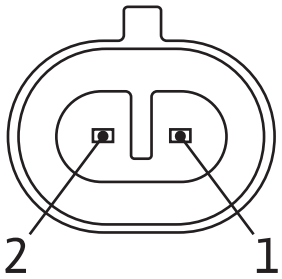
**Risk of fatal electrical shock!**

Improper connection of the collective fault signal (SSM) contact poses a risk of fatal injury due to electric shock!

### 7.2.6 SSM cable

- The SSM cable is intended for the collective fault signal of the pump.
- SSM cables meet the requirements of DIN VDE 0292, DIN VDE 0293-308 and EN 50525-2-11.
- The SSM cable connection at the pump interface is designed as an AMP Superseal 1.5 Series 2P CA (socket) with the following features:
  - EN 61984
  - Mains rated voltage 250 V AC
  - Rated current 2.5 A
  - Rated surge voltage 2.5 kV

Connection socket (outer view of the pump connection)




**Cable assignment**

| Pin | Cable colour | Assignment |
|---|---|---|
| 1 | Brown | SSM |
| 2 | Blue | SSM |

Connect cable:

- Check the presence and integrity of the seal on the connector before installation.
- Connect the SSM cable plug to the signal connection socket (Fig. I, Item 12) until it snaps into place.
- Ensure that the connecting cable does not contact either the pipes or the pump.

**CAUTION**

**Risk of material damage!**

In case there's no cable connected, and the cable connection is in the 12 o'clock position, a dummy plug (accessory) shall close the connection in order to ensure IP protection.

### 7.2.7 Wilo-Connectivity Interface

The Wilo-Connectivity Interface (Fig. I, Item 14) is intended to be used by Wilo only, for production and service purposes.

**WARNING**

**Risk of fatal electrical shock!**

A sealing sticker protects the product from humidity and must not be removed. Removing the sticker will invalidate the warranty!
Never put objects into the plug!

## 8 Commissioning

- Electrical work: a qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials.

- The product must be operated by persons who have been instructed on how the complete system functions.
- Prior to commissioning the pump, check that it has been installed and connected correctly.
- Ensure that the system is filled with a permissible fluid.

**CAUTION**

**A dry run leads to bearing damage!**

Ensure that a dry run of the pump is not possible!

## 8.1 Filling and venting

Fill and vent the system correctly. The pump rotor chamber normally vents automatically after a short time in operation.

**NOTICE**

Incomplete venting will lead to noises being produced in the pump.

**Pump venting function**


See section “Information about the product” to find out if your pump type is equipped with this function.

If the pump does not vent automatically, a pump venting function can be started.

- Activate pump venting function via the operating button: Press and hold for 4 seconds until all the LEDs flash 2 times. Then release the button.
- The function can be stopped at any moment in the same manner as it is activated.

The pump venting function vents the pump automatically.
The heating system is not vented.
The maximum duration is 10 minutes.
The following animation appears during this process:

**NOTICE**

After the venting, the pump activates the previously selected control mode.

## 8.2 Setting the control mode

Wilo-Para MAXO ... F01/F02 only:

**Selecting the control mode:**

- Display of active control mode by LEDs (Fig. I, Item 9).

Change control mode:

- Press and hold the operating button for 2 seconds until the LED of the next control mode lights up, then release it.

Repeat the process until the LED of the desired control mode lights up.

The different control modes are:


External control (F02 only)

Variable differential pressure (Δp-v)

Constant differential pressure (Δp-c)

Speed constant

**Selection of characteristic curve (in mode Δp-v, Δp-c, n-const.)**

- Display of active characteristic curve by 7-segment LED (Fig. I, Item 10):

- The number corresponds to the characteristic curve, from 1 (minimum performance) to 9 (maximum performance).
- Press the operating button for a short time to increase the value by 1.
- Repeat the process until the desired performance level is reached.

**Selection of a signal type (during external control) (F02 only)**

- Display of active signal type by 7-segment LED.

1 = PWM 1
2 = PWM 2
3 =Analogue 0 ... 10 V with cable break function
4 = Analogue 0 ... 10 V without cable break function

- Press the operating button for a short time to increase the value by 1.
- Repeat the process until the desired performance level is reached.

## 8.3 Key lock

Check in section “Information about the product” whether the pump is equipped with this function.

To activate the key lock, press the operating button for 9 seconds until all LEDs flash 3 times, then release it:

- The settings can no longer be changed.
- The LED of the selected control mode (Fig. I, Item 9) flashes constantly every second.

To deactivate the key lock, press the operating button for 9 seconds until all LEDs flash 3 times, then release it.

- The settings can be made again.

## 8.4 Factory setting

Resetting pump settings to the factory setting replaces the current pump settings

To reset the pump to factory settings (delivery condition), proceed as follows:

- Press and hold the operating button for 2 seconds and switch off the pump.
- Let go of the operating button.
- Switch on the pump again.

The pump is reset to the factory setting.

## 8.5 Operation of the pump in the case of external flow

The pump can start and be operated in the case of positive external flow (generator operation) with up to 100 % of its maximum flow rate (e.g. pumps connected in series)

The pump can start and be operated in the case of negative external flow (turbine operation) with up to 20 % of its maximum flow rate.

**NOTICE**

The pump may still be live even in voltage-free state. The driven rotor induces a voltage within the pump. This results in undefined flashing of the LEDs. This behaviour stops as soon as the external flow stops or when the pump is connected to the power supply.

## 9 Maintenance

**WARNING**

**Danger due to strong magnetic field**

Inside the motor, there is always a strong magnetic field that can cause personal injury and material damage in the event of incorrect dismantling!
The magnetic field may cause death to persons with electronic implants (pacemakers, insulin pump etc.)!

**NOTICE**

When it is being disassembled, the entire pump should always be dismantled from the system. It is not permitted to remove the components (control module, motor head etc.)!

### 9.1 Product life cycle

The product is maintenance-free. Regular inspection every 12,000 h is recommended. The intended service life is ten years, depending on the operating conditions and the fulfilment of all the requirements in the installation and operating instructions.

### 9.2 Shutdown

The pump must be shut down before carrying out maintenance, repair or dismantling work.

**DANGER**

**Electric shock!**

There is a risk of fatal injury from electric shock when working on electrical devices!

- Work on electrical components may only be carried out by qualified electricians!
- Switch off the voltage on all-poles of the pump and secure against unauthorised restart!
- Always deactivate the power supply from the pump and if necessary SSM and SBM!
- Due to the presence of dangerous contact voltage, work on the module must not be started until 5 minutes have elapsed!
- Check whether all connections (even potential-free contacts) are voltage-free!
- The pump may still be live even in voltage-free state. The rotor induces a contact voltage, which is also present at the motor contacts. Close the existing shut-off devices in front of and behind the pump!
- If the control module/cable is damaged, do not operate the pump!
- In case of impermissible removal of operating and settings elements on the control module, there is a risk of electrical shock if inner electrical components are touched!

### 9.3 Dismantling/installation

**Before any dismantling/installation operation, make sure that the “Shutdown” section has been taken into consideration!**

**WARNING**

**Risk of burns!**

Incorrect dismantling/installation can result in personal injury and material damage.
Depending on the operating status of the pump and the system (fluid temperature), the entire pump can get very hot.
There is a severe risk of burns from simply touching the pump!

- Allow the system and pump to cool to room temperature!

**WARNING**

**Risk of scalding!**

The fluid is under high pressure and can be very hot.
There is a risk of scalding due to escaping hot fluid!

- Close shut-off devices on both sides of the pump!
- Allow the system and pump to cool to room temperature!
- Drain the shut-off branch of the system!
- If no shut-off devices are fitted, drain the system!
- Follow the manufacturer's instructions and safety data sheets for possible additives in the system!

**WARNING**

**Danger of injury!**

Danger of injury caused by falling motor/pump after loosening the fastening screws.

- Comply with national regulations for accident prevention and also with the operator's internal work, company and safety regulations. If necessary, wear protective clothing and equipment!

**DANGER**

**Risk of fatal injury!**

The permanent magnet rotor inside the pump can be a danger to life for people with medical implants during dismantling.

- The motor impeller unit may only be removed from the motor housing by authorised qualified personnel!
- If the unit consisting of impeller, bearing plate and rotor is pulled out of the motor, persons with medical aids, such as cardiac pacemakers, insulin pumps, hearing aids, implants or similar are at risk. Death, severe injury and damage to property may be the result. For such persons, a professional medical assessment is always necessary!
- There is a crushing hazard! When removing the motor impeller unit from the motor, it can suddenly be pulled back into its original position by the strong magnetic field!
- If the motor impeller unit is outside the motor, magnetic objects may be suddenly attracted. This may cause bodily injury and material damage!
- Electronic devices can be impaired or damaged by the strong magnetic field of the rotor!

When assembled, the rotor's magnetic field is guided in the motor's iron core. However, there is no magnetic field outside the motor that is harmful to health or affects the motor.

**DANGER**

**Risk of fatal electrical shock!**

Even without the module (without electrical connection), there may be dangerous contact voltage at the motor contacts.
It is not permissible to dismantle the module!

## 10 Faults, causes and remedies

### 10.1 Troubleshooting

Troubleshooting must only be carried out by a qualified installer, and work on the electrical connection must only be carried out by a qualified electrician.

| Faults | Causes | Remedies |
|---|---|---|
| Pump is not running with switched-on power supply. | Fuse protection defect. | Check the fuse protection. |

| Faults | Causes | Remedies |
|---|---|---|
| Pump is not running with switched-on power supply. | Pump has no voltage. | Reconnect the voltage. |
| Pump makes noises. | Cavitation due to insufficient suction pressure. | Increase the system pressure within the permissible range. |
| Pump makes noises. | Cavitation due to insufficient suction pressure. | Check the delivery head setting and set it to a lower head if necessary. |
| Building does not get warm. | Heat output of the heating surfaces too low. | Increase setpoint. |
| Building does not get warm. | Heat output of the heating surfaces too low. | Change the control mode from Δp-v to Δp-c. |

**Manual deblocking**

- Version F01 and F02 (equipped with an operating button):

Press and hold the operating button for 4 seconds. The deblocking function is initiated and lasts for a maximum of 30 minutes. The following animation appears during this process:

**NOTICE**

After successful deblocking, the LED display shows the previously set values of the pump.

- All other versions:

Interrupt the power supply and switch it on again.

If a fault cannot be repaired, contact a qualified specialist or the Wilo customer service.

## 10.2 Error messages

| Fault | Causes | Remedies |
|---|---|---|
| Final fault | | |
| Rotor blocked (final).<br>LED: lights up red<br>SSM relay: opened<br>iPWM out: 95%<br>LIN: final fault 03<br>Modbus: final fault 10 | Pump off.<br>Rotor still blocks after deblocking routine. | Activate manual restart or contact customer service. |
| Motor defective<br>LED: lights up red<br>SSM relay: opened<br>iPWM out: 95%<br>LIN: final fault 01<br>Modbus: final fault 23 | Pump off.<br>Motor faulty. | Contact customer service. |
| Motor winding defective<br>LED: lights up red<br>SSM relay: opened<br>iPWM out: 95%<br>LIN: final fault 00<br>Modbus: final fault 25 | Pump off.<br>Connection between motor and inverter interrupted. | Contact customer service. |
| Fault | | |

| Fault | Causes | Remedies |
|---|---|---|
| Overcurrent<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 90%<br>LIN: Error 02<br>Modbus: Error 111 | Pump off due to an internal electronic error. | Contact customer service. |
| Excessive speed<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 90%<br>LIN: Error 08<br>Modbus: Error 112 | Pump off.<br>The pump cannot start due to positive flow through. | Check installation.<br>The pump switches on once the normal state is reached. |
| Overload<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 05<br>Modbus: Error 21 | Pump off.<br>The speed is lower than the permissible tolerance.<br>High friction due to mechanical ageing of particles in the fluid | Clean or replace the fluid.<br>The pump switches on once the normal state is reached. |
| Excessive temperature motor winding<br>LED: all LEDs flash ON/OFF<br>SSM relay: closed<br>iPWM out: –<br>LIN: –<br>Modbus: – – | Pump off.<br>The temperature in the motor winding is too high, or the winding temperature sensor is faulty.<br>The motor protection automatically switches the pump off. | Allow fluid temperature to cool down. |
| Excessive temperature IPM (Intelligent Power Module)<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 15<br>Modbus: Error 31 | Pump off.<br>Temperature of the IPM is too high. | Let the ambient temperature to cool down.<br>The pump switches on once the normal state is reached. |
| Excessive temperature control module<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 14<br>Modbus: Error 30 | Pump off.<br>Temperature of the control module is too high. | Let the ambient temperature to cool down.<br>The pump switches on once the normal state is reached. |
| Overvoltage VDC<br>LED: flashes red<br>SSM relay: open<br>iPWM out: 85%<br>LIN: Error 06<br>Modbus: Error 33 | Pump off.<br>The voltage is too high. | Check power supply.<br>The pump switches on once the normal state is reached. |
| Undervoltage VDC<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 07<br>Modbus: Error 32 | Pump off.<br>The power supply is too low. | Check power supply.<br>The pump switches on once the normal state is reached. |

| Fault | Causes | Remedies |
|---|---|---|
| Undervoltage mains voltage<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 10<br>Modbus: Error 4 | Pump off.<br>Power supply on mains side too low. | Check power supply.<br>The pump switches on once the normal state is reached. |
| Turbine operation<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 85%<br>LIN: Error 09<br>Modbus: Error 119 | Pump does not start.<br>The pump cannot start due to negative flow through. | Check installation.<br>The pump switches on once the normal state is reached. |
| Rotor blocked<br>LED: flashes red<br>SSM relay: opened<br>iPWM out: 5%<br>LIN: Error 20<br>Modbus: Error 10 | Pump off.<br>Rotor blocked. The deblocking routine tries to deblock the pump. | Wait for the deblocking routine. |
| Warning | | |
| Dry run<br>LED: flashes red/ green<br>SSM relay: closed<br>iPWM out: –<br>LIN: Warning 17<br>Modbus: Warning 11 | The pump is on and running, but air has been detected in the pump. | Fill the system or vent the pump. |
| Overload<br>LED: flashes red/ green<br>SSM relay: closed<br>iPWM out: 80%<br>LIN: Warning 18<br>Modbus: Warning 21 | The pump is on and runs at a speed lower than expected.<br>The pump reduces the power (speed) to limit the current consumption of the motor. The pump continues to run.<br>High friction due to mechanical ageing of particles in the fluid | Clean or replace the fluid. |
| Excessive temperature control module<br>LED: flashes red/ green<br>SSM relay: closed<br>iPWM out: –<br>LIN: Warning 19<br>Modbus: Warning 30 | The pump is on.<br>Temperature of the control module is too high. | Let the ambient temperature to cool down. |
| Undervoltage mains voltage<br>LED: flashes red/ green<br>SSM relay: closed<br>iPWM out: 80%<br>LIN: Warning 24<br>Modbus: Warning 4 | The pump is on.<br>Power supply on mains side too low. | Check power supply. |
| No bus communication<br>LED: flashes green<br>SSM relay: closed<br>iPWM out: –<br>LIN: –<br>Modbus: – | The pump is on.<br>Pump is configured via bus communication, but it does not receive a signal. | Check the bus cable. |

| Fault | Causes | Remedies |
|---|---|---|
| Low flow rate<br>LED: flashes green<br>SSM relay: closed<br>iPWM out: 5%<br>LIN: Warning 25<br>Modbus: Warning 19 | The pump is on.<br>This pump operates with a flow rate that is too low due to the high hydraulic resistance. | Check installation. |

## 11 Spare parts

No spare parts are available for the pumps in the Wilo-Para MAXO series.

In the event of damage, the entire pump is to be replaced and returned to the manufacturer of the system in an assembled state.

## 12 Disposal

### 12.1 Information on the collection of used electrical and electronic products

Proper disposal and appropriate recycling of this product prevents damage to the environment and danger to your personal health.

**NOTICE**

**Disposal in domestic waste is prohibited!**

In the European Union this symbol may be included on the product, the packaging or the accompanying documentation. It means that the electrical and electronic products in question must not be disposed of along with domestic waste.

Please note the following points to ensure proper handling, recycling and disposal of the used products in question:

- Hand over these products at designated, certified collection points only.
- Observe the locally applicable regulations!

Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal. See www.wilo-recycling.com for more information about recycling.

**Subject to change without prior notice!**

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Pioneering for You

**Local contact at**
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