

## Wilo-Yonos MAXO/-D

- en** Installation and operating instructions
- sv** Monterings- och skötselanvisning
- no** Montasje- og bruksanvisning
- da** Monterings- og driftsvejledning

- fi** Asennus- ja käyttöohje
- lv** Uzstādīšanas un ekspluatācijas instrukcija
- lt** Montavimo ir naudojimo instrukcija

Fig. 1a:

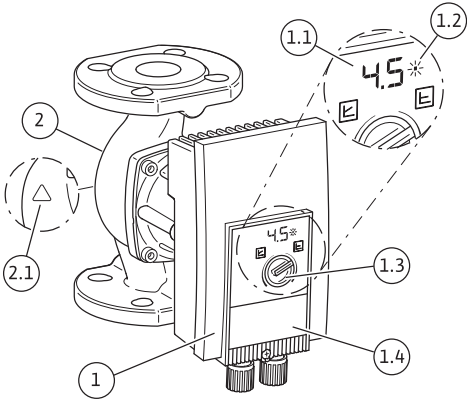


Fig. 1b:

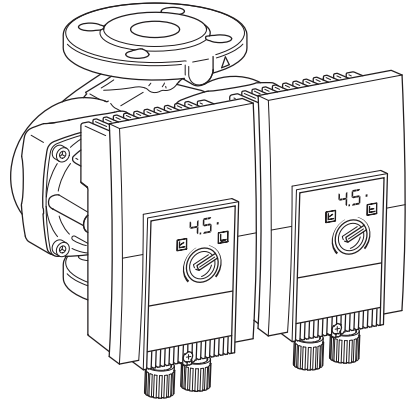


Fig. 2a:

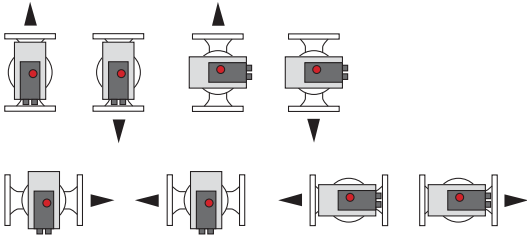


Fig. 2b:

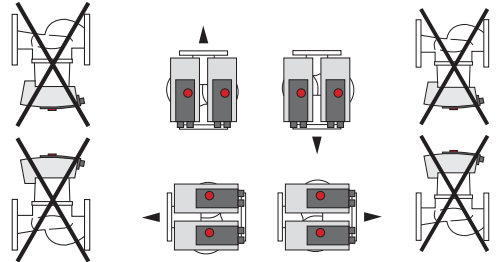


Fig. 3a:

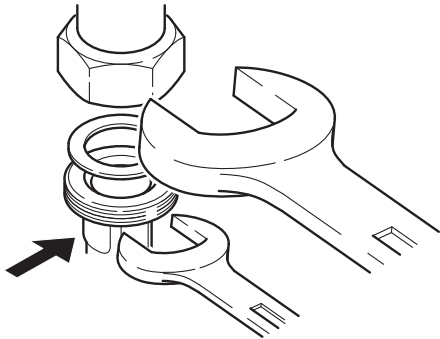


Fig. 3b:

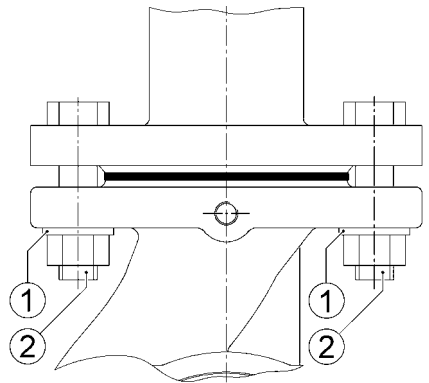


Fig. 4a:

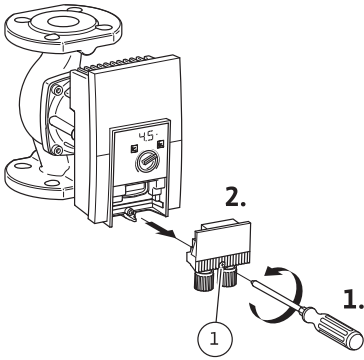


Fig. 4b:

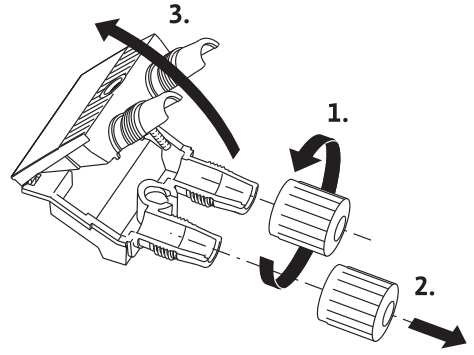


Fig. 4c:

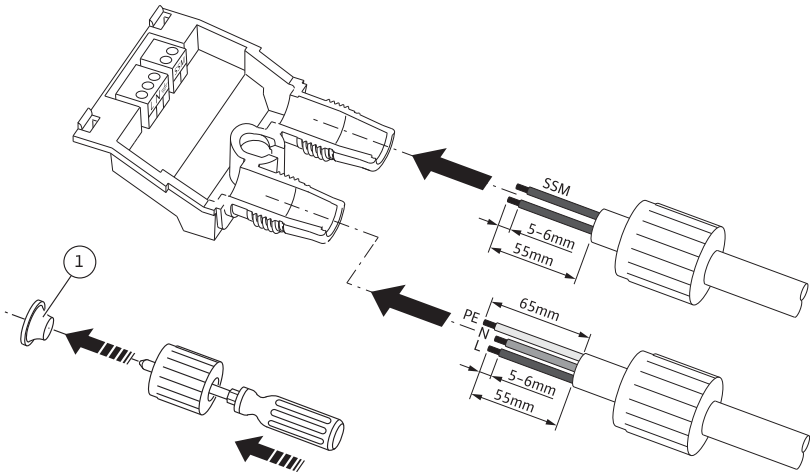


Fig. 4d:

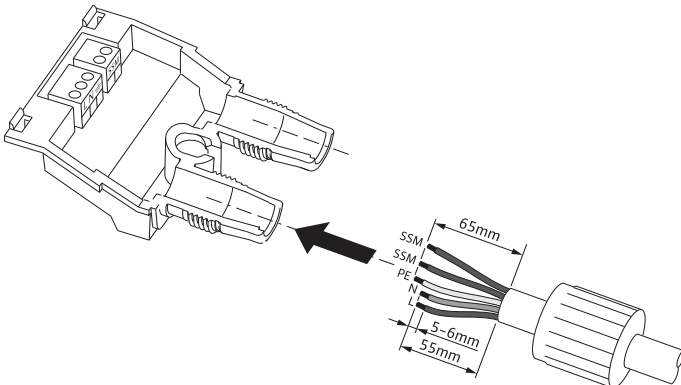


Fig. 4e:

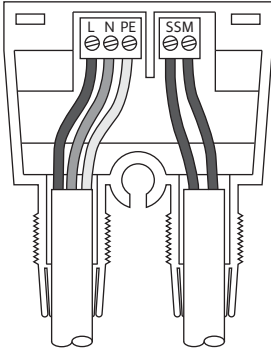


Fig. 4f:

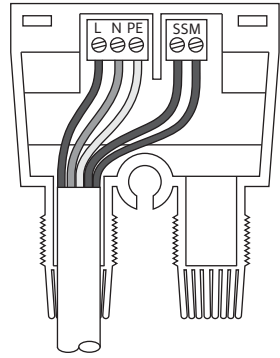


Fig. 4g:

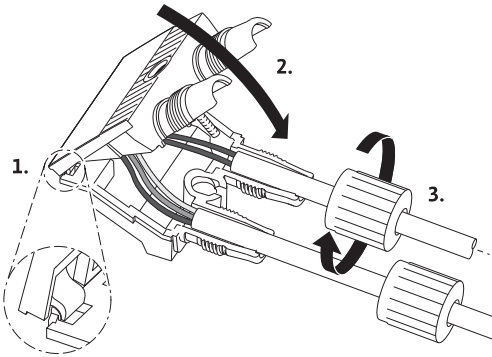


Fig. 4h:

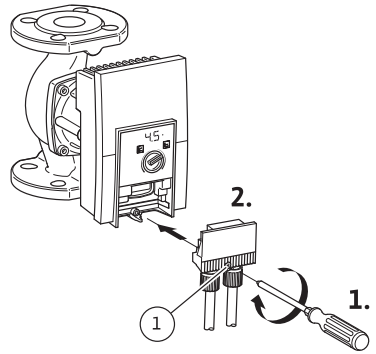


Fig. 5:

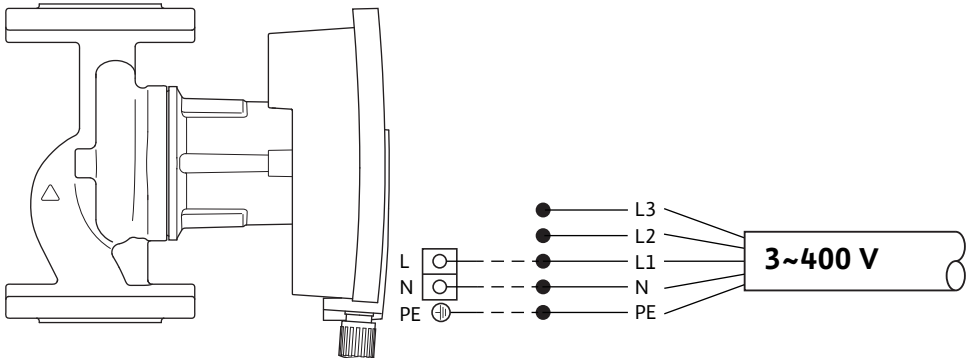


Fig. 6:

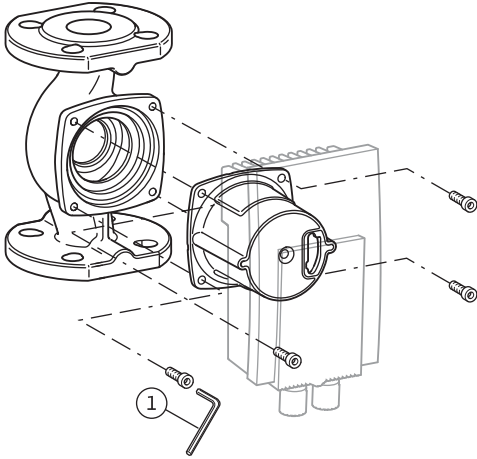


Fig. 7:

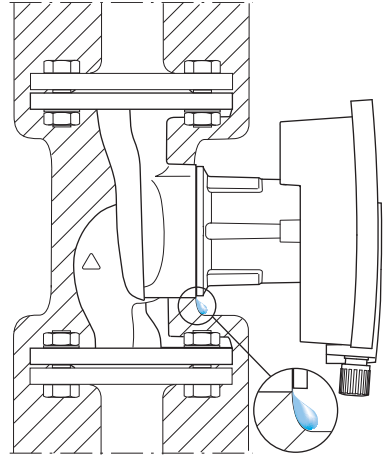


Fig. 8:

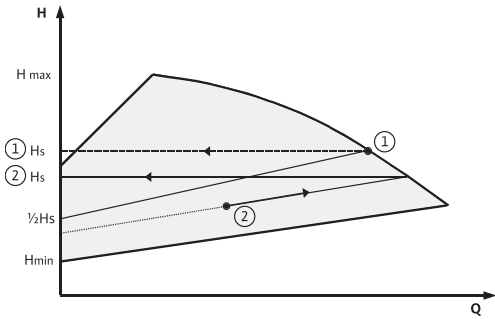
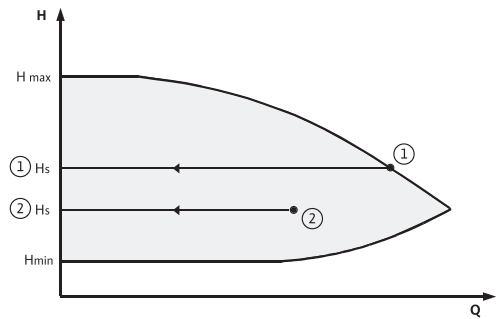


Fig. 9:





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## 1 General

### About this document

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

These installation and operating instructions are an integral part of the product. They must be kept readily available at the place where the product is installed. Strict adherence to these instructions is a precondition for the proper use and correct operation of the product.

These installation and operating instructions correspond to the relevant version of the product and the underlying safety standards valid at the time of going to print.

EC declaration of conformity:

A copy of the EC declaration of conformity is a component of these operating instructions. If a technical modification is made on the designs named there without our agreement, this declaration loses its validity.

## 2 Safety

These operating instructions contain basic information which must be adhered to during installation, operation and maintenance. For this reason, these operating instructions must, without fail, be read by the service technician and the responsible specialist/operator before installation and commissioning.

It is not only the general safety instructions listed under the main point "safety" that must be adhered to but also the special safety instructions with danger symbols included under the following main points.

### 2.1 Indication of instructions in the operating instructions

**Symbols:**

**General danger symbol**



**Danger due to electrical voltage**



**NOTE:**

**Signal words:**

**DANGER!**

**Acutely dangerous situation.**

**Non-observance results in death or the most serious of injuries.**

**WARNING!**

**The user can suffer (serious) injuries. "Warning" implies that (serious) injury to persons is probable if this note is disregarded.**

**CAUTION!**

**There is a risk of damaging the product/unit. "Caution" concerns possible damage to the product that could occur if this note is disregarded.**

**NOTE:**

Useful information on handling the product. It draws attention to possible problems.

Information that appears directly on the product, such as:

- direction of rotation arrow/symbol for direction of flow,
  - identification for connections,
  - rating plate,
  - warning sticker,
- must be strictly complied with and kept in legible condition.



## 2.2 Personnel qualifications

The installation, operating and maintenance personnel must have the appropriate qualifications for this work. Area of responsibility, terms of reference and monitoring of the personnel are to be ensured by the operator. If the personnel are not in possession of the necessary knowledge, they are to be trained and instructed. This can be accomplished if necessary by the manufacturer of the product at the request of the operator.

## 2.3 Danger in the event of non-observance of the safety instructions

Non-observance of the safety instructions can result in risk of injury to persons and damage to the environment and the product/unit. Non-observance of the safety instructions results in the loss of any claims to damages.

In detail, non-observance can, for example, result in the following risks:

- Danger to persons from electrical, mechanical and bacteriological influences
- Damage to the environment due to leakage of hazardous materials
- Property damage
- Failure of important product/unit functions
- Failure of required maintenance and repair procedures.

## 2.4 Safety consciousness on the job

The safety instructions included in these installation and operating instructions, the existing national regulations for accident prevention together with any internal working, operating and safety regulations of the operator are to be complied with.

## 2.5 Safety instructions for the operator

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

- If hot or cold components on the product/the unit lead to hazards, local measures must be taken to guard them against touching.
- Guards protecting against touching moving components (such as the coupling) must not be removed whilst the product is in operation.
- Leakages (e.g. from the shaft seals) of hazardous fluids (which are explosive, toxic or hot) must be led away so that no danger to persons or to the environment arises. National statutory provisions are to be complied with.
- Highly flammable materials are always to be kept at a safe distance from the product.
- Danger from electrical current must be eliminated. Local or general regulations (e.g. IEC, VDE etc.) and those of the local power supply companies must be observed.

## 2.6 Safety instructions for installation and maintenance work

The operator must ensure that all installation and maintenance work is carried out by authorised and qualified personnel, who are sufficiently informed due to their own detailed study of the operating instructions.

Work to the product/unit must only be carried out when at a standstill. It is mandatory that the procedure described in the Installation and operating instructions for shutting down the product/unit be complied with.

Immediately on conclusion of the work, all safety and protective devices must be put back in position and/or recommissioned.

## 2.7 Unauthorised modification and manufacture of spare parts

Unauthorised modification and manufacture of spare parts will impair the safety of the product/personnel and will make void the manufacturer's declarations regarding safety. Modifications to the product are only permissible after consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer ensure safety. The use of other parts will absolve us of liability for consequential events.

## 2.8 Improper use

The operating safety of the supplied product is only guaranteed for conventional use in accordance with Section 4 of the operating instructions. The limit values must on no account fall under or exceed those specified in the catalogue/data sheet.

## 3 Transport and interim storage

On arrival, immediately check the product and its packaging for damage caused during transit. If damage is found, the necessary procedures involving the forwarding agent must be taken within the specified period.

### **CAUTION! Risk of injuries to personnel and property damage!**

**Incorrect transport and interim storage can cause damage to the product and injury to personnel.**

- **The pump and its packaging must be protected against moisture, frost and mechanical damage during transport and interim storage.**
- **Packaging that has become weakened due to moisture may allow the product to fall out, causing injury to personnel.**
- **When the pump needs to be transported, it may be carried only by the motor/pump housing. Never by the control module or cable.**

## 4 Intended use

The high-efficiency pumps of the Wilo-Yonos MAXO/-D series are for the circulation of liquids (no oils or liquids containing oil, no media containing foodstuffs) in

- hot water heating systems
- cooling and cold water circuits
- closed-circuit industrial circulation systems
- solar installations



### **WARNING! Health hazard!**

**Because of the materials used in their construction, pumps of the Wilo-Yonos MAXO/-D series must not be used in applications involving potable water or food-stuffs.**

## 5 Product information

### 5.1 Type key

Example: Yonos MAXO-D 32/0.5-12	
Yonos MAXO	= high-efficiency pump
D	= single pump -D = double pump
32	32 = flange connection nominal diameter of 32 Threaded connection: 25 (Rp 1), 30 (Rp 1½) Flange connection: DN 32, 40, 50, 65, 80, 100 Combination flange (PN 6/10): DN 32, 40, 50, 65
0.5-12	0.5 = smallest adjustable delivery head in [m] 12 = maximum delivery head in [m] for Q = 0 m³/h

### 5.2 Technical data

Max. flow rate	depends on the pump type, see catalogue
Max. delivery head	depends on the pump type, see catalogue
speed	depends on the pump type, see catalogue
Mains voltage	1~230 V ±10% in acc. with DIN IEC 60038
Frequency	50/60 Hz
Rated current	see rating plate
Energy Efficiency Index (EEI)	see rating plate
Insulation class	see rating plate
Protection class	see rating plate
Power consumption P <sub>1</sub>	see rating plate
Nominal diameters	see type key
Connection flanges	see type key
Pump weight	depends on the pump type, see catalogue
Permissible ambient temperature	-20°C to +40°C <sup>1)</sup>
Permissible fluid temperature	-20°C to +110°C <sup>1)</sup>
Temperature class	TF110
Max. rel. humidity	≤ 95%
Max. permissible operating pressure	see rating plate
Approved fluids Wilo-Yonos MAXO/-D	Heating water (in acc. with VDI 2035/VDtÜV Tch 1466) water/glycol mixtures, max. mixing ratio 1:1 (for mixtures with glycol the conveying data of the pump should be corrected to those for the higher viscosity, depending on the percentage mixing ratio) Only use brand-name goods with corrosion protection inhibitors; comply with the manufacturer's specifications and safety data sheets. The pump manufacturer's approval must be obtained for the use of other fluids. Ethylene/propylene glycol with corrosion inhibitors Commercially available oxygen binding agents <sup>2)</sup> Commercially available anti-corrosion agents <sup>2)</sup> Commercially available combination products <sup>2)</sup> Commercially available cooling brines <sup>2)</sup>

5.2 Technical data	
Emission sound–pressure level	< 48 dB(A) (depending on the pump type)
EMC (electromagnetic compatibility)	General EMC: EN 61800-3
Emitted interference	EN 61000-6-3
Interference resistance	EN 61000-6-2
Residual current $\Delta I$	$\leq 3.5$ mA (see also section 7.2)

<sup>1)</sup> The pump is equipped with a power limiting function which provides protection against overload. This can have an effect on the output depending on operation.

<sup>2)</sup> See the following warning



**CAUTION! Risk of injury and damage to property!**

**Non-approved fluids (see chapter 4) can destroy the pump and also cause personal injury.**

**Comply strictly with the relevant safety data sheets and manufacturer specifications.**

- **2) Observe the specifications of the manufacturer regarding the mixing ratios.**
- **2) Add additives to the fluid on the pressure side of the pump.**

Minimum inlet pressure (above atmospheric pressure) at the pump suction port in order to avoid cavitation noises (at fluid temperature  $T_{Med}$ ):

Nominal diameter	$T_{Med}$	$T_{Med}$	$T_{Med}$
	$-20^{\circ}\text{C} \dots +50^{\circ}\text{C}$	$+95^{\circ}\text{C}$	$+110^{\circ}\text{C}$
Rp 1	0.3 bar	1.0 bar	1.6 bar
Rp 1¼	0.3 bar	1.0 bar	1.6 bar
DN 32	0.3 bar	1.0 bar	1.6 bar
DN 40	0.5 bar	1.2 bar	1.8 bar
DN 50	0.5 bar	1.2 bar	1.8 bar
DN 65	0.7 bar	1.5 bar	2.3 bar
DN 80	0.7 bar	1.5 bar	2.3 bar
DN 100	0.7 bar	1.5 bar	2.3 bar

The values apply up to 300 m above sea level; allowance for higher altitudes: 0.01 bar/100 m increase in height.

### 5.3 Scope of delivery

Pump, complete

- 2 seals for threaded connection
- 8 washers, M12  
(for flange screws (M12) for combination flanged version DN 32–DN 65)
- 8 washers, M16  
(for flange screws (M16) for combination flanged version DN 32–DN 65)
- Installation and operating instructions

### 5.4 Accessories

Accessories must be ordered separately. For a detailed list, see the catalogue.

## 6 Description and function

### 6.1 Description of the pump

The Wilo-Yonos MAXO high-efficiency pumps are glandless pumps with a permanent magnet rotor and an integrated differential pressure control. **Single** (fig. 1a) and **double pumps** (fig. 1b) are available.

- 1 Control module
  - 1.1 LED display
  - 1.2 Fault signal LED
  - 1.3 Operating knob
  - 1.4 Connection plug
- 2 Pump housing
  - 2.1 Direction-of-flow symbol

### 6.2 Operation of the pump

There is a **control module** (fig. 1a, item 1) in a vertical design on the motor housing, which controls the differential pressure of the pump to a setpoint within the control range. Depending on the control mode, the differential pressure follows different criteria. In all control modes, however, the pump adapts itself continuously to the changing power requirements of the unit, which is the case especially when thermostatic valves, zone valves or mixers are used.

The main advantages of the electronic control are the following:

- Energy savings and while reducing the operating costs at the same time
- Reduction of flow noises
- Reduction of the number of differential pressure valves required.

The following settings can be made:

#### Nominal delivery head:



The LED display shows the setpoint set on the pump in meters (m). The setpoint can be adjusted or changed by turning the operating knob.

#### Control mode:



#### Variable differential pressure ( $\Delta p-v$ ):

The electronics change the differential pressure setpoint to be maintained by the pump linearly between  $\frac{1}{2}H_5$  and  $H_5$ . The differential pressure setpoint  $H$  decreases or increases with the flow rate.



**Constant differential pressure ( $\Delta p-c$ ):** The electronics keep the differential pressure created by the pump constant above the permitted flow range at the selected differential pressure setpoint  $H_5$  up to the maximum pump curve.

**SSM:** The contact of the collective fault signal (potential-free normally closed contact) can be connected to a building automation system. 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 SSM behaviour is described in sections 10.1 and 10.2.

In the event of a malfunction (depending on the error code, see chapter 10.1), the fault signal LED is continuously illuminated in red (fig. 1a, item 1.2).

### 6.3 Double pump

For a twin-head pump, the two motor impeller units are fitted identically and accommodated in a common pump housing. Each of the two pumps produces the same output.

For an automatic fault-actuated switchover, a corresponding switchgear must be provided on-site.

**NOTE!**

- In the case of a double pump, if both individual pumps have an automatic fault-actuated switchover, the pre-selected control mode and delivery head setpoint of both pumps must be identical.
- Parallel operation for a double pump or two individual pumps is not permissible, since the pumps can interfere with each other's operating behaviour.

## 7 Installation and electrical connection

**DANGER! Risk of fatal accident!**

**Improper installation and electrical connection can result in fatal injury. Danger from electrical current must be eliminated.**

- **Installation and electrical connection may only be carried out by qualified personnel and in accordance with the applicable regulations.**
- **Accident prevention regulations must be observed!**
- **Comply with the regulations of the local power supply company!**
- **Pumps with pre-assembled cable:**
  - **Never pull on the pump cable!**
  - **Do not kink the cable.**
  - **Do not place any objects on the cable.**

### 7.1 Installation

**WARNING! Danger of personal injury!**

**Incorrect installation can result in injuries.**

- **There is a crushing hazard!**
- **There is a risk of injury due to sharp edges/burrs. Wear appropriate protective clothing (e.g. safety gloves)!**
- **There is a risk of injury hazard due to the pump/motor falling.**  
**Use suitable lifting gear to secure the pump/motor against falling.**

**CAUTION! Risk of damage to property!**

**Incorrect installation can result in damage to property.**

- **Only have installation work performed by qualified personnel.**
- **Observe national and regional regulations.**
- **When the pump needs to be transported, it may be carried only by the motor/pump housing. Never by the control module or cable.**
- Installation within a building  
Install the pump in a dry, well-ventilated room. Ambient temperatures below  $-20^{\circ}\text{C}$  are not permissible.
- Installation outside a building (outdoor installation):
  - Install the pump in a sump (e.g. light sump, ring sump) with a cover or in a cabinet/housing as weather protection.
  - Avoid exposure of the pump to direct sunlight.
  - The pump requires protection so that the condensate drain grooves are not contaminated. fig. 7:
  - Protection of the pump against rain. Dripping water from above is permitted provided that the electrical connection has been established in accordance with the installation and operating instructions and properly sealed.

**CAUTION! Risk of damage to property!**

**Ensure sufficient ventilation/heating if the ambient temperature exceeds/falls below the permitted limit values.**

- Carry out all welding and soldering work prior to the installation of the pump.



**CAUTION! Risk of damage to property!**

**Contamination from the pipe system can destroy the pump during operation. Before installing the pump, flush the pipe system.**

- Provide check valves upstream and downstream of the pump.
- Attach piping to the floor, ceiling or wall using appropriate fittings so that the pump does not bear the weight of the piping.
- When installing in the feed of open systems, the safety supply must branch off upstream of the pump (DIN EN 12828).
- Install the pump at an easily accessible point so that it can be easily checked or replaced at a later time.
- Precautions during installation:
  - Perform assembly so that the pump shaft is horizontal and not under strain (see the installation positions shown in fig. 2a/2b).
  - Make sure that the pump is installed in a permissible installation position and with the correct flow direction (compare with fig. 2a/2b). The direction-of-flow symbol on the pump housing (fig. 1a; item 2.1) indicates the direction of flow. If required, turn the motor including control module, see section 9.1.

### 7.1.1 Installation of a threaded pipe union pump

- Install appropriate threaded pipe unions before installing the pump.
- Use the supplied flat gaskets between the suction/pressure ports and threaded pipe unions when installing the pump.
- Screw union nuts onto the threads of the suction/pressure ports and tighten them using an open-end wrench or pipe wrench.



**CAUTION! Risk of damage to property!**

**Do not counter the pump on the motor/module when tightening the screwed connections. Apply the wrench surfaces to the suction/pressure port instead (fig. 3a).**

- Check the threaded pipe unions for leaks.

### 7.1.2 Installation of a flange-end pump

Installation of pumps with combination flange PN6/10 (flange-end pumps DN 32 up to and including DN 65) and flange-end pumps DN 80/DN 100.



**WARNING! Risk of injuries to personnel and property damage!**

**The flange connection can be damaged and develop leaks if the pump is not installed correctly. There is a risk of injury and damage to property due to hot fluid escaping.**

- **Never connect two combination flanges to each other!**
- **Pumps with combination flanges are not suitable for PN16 operating pressures.**
- **The use of securing elements (e.g. spring rings) can result in leaks at the flange connection. They are therefore not permitted. The washers supplied (fig. 3b, item 1) must be inserted between screw/nut heads and the combination flange.**
- **The permissible tightening torques listed in the table below must not be exceeded, even if screws of higher strength ( $\geq 4.6$ ) are used, since otherwise splintering can occur at the edges of the long holes. This causes the screws to lose their pretension and the flange connection can become leaky.**
- **Use screws of sufficient length. The screw thread must protrude at least one thread turn beyond the nut (fig. 3b, item 2).**

DN 32, 40, 50, 65	Nominal pressure PN6	Nominal pressure PN10/16
Screw diameter	M12	M16
Strength class	4.6 or higher	4.6 or higher
Permitted tightening torque	40 Nm	95 Nm
Min. screw length for		
• DN 32/DN 40	55 mm	60 mm
• DN 50/DN 65	60 mm	65 mm
DN 80, 100	Nominal pressure PN6	Nominal pressure PN10/16
Screw diameter	M16	M16
Strength class	4.6 or higher	4.6 or higher
Permitted tightening torque	95 Nm	95 Nm
Min. screw length for		
• DN 80	65 mm	65 mm
• DN 100	70 mm	70 mm

- Install appropriate flat gaskets between pump and counter flanges.
- Tighten the flange bolts crosswise in two steps to the prescribed tightening torque (see Table 7.1.2).
  - Step 1: 0.5 x permissible tightening torque
  - Step 2: 1.0 x permissible tightening torque
- Check the flange connections for leaks.

### 7.1.3 Pump insulation in heating, refrigeration and air-conditioning systems

- Thermal insulation shells (optional accessories) are only permissible in heating applications with fluid temperatures starting from +20°C, since these thermal insulation shells are not diffusion-proof when enclosing the pump housing. Install a thermal insulation shell before commissioning the pump.
- For refrigeration system and air-conditioner applications, use commercially available diffusion-proof insulation materials.



#### **CAUTION! Risk of damage to property!**

**If the diffusion-proof insulation is fitted at the site, the pump housing may only be insulated up to the motor's separation joint. The condensate drain grooves must remain unobstructed to ensure that condensate that develops in the motor can drain without problems (fig. 7). Condensate that accumulates in the motor can cause an electrical defect.**

## 7.2 Electrical connection



#### **DANGER! Risk of fatal accident!**

**Improper electrical connections pose a risk of fatal injury due to electric shock.**

- **Only allow the electrical connection to be made by an electrician approved by the local power supply company and in accordance with the local regulations in force.**
- **Before working on the pump, all poles of the power supply must be disconnected. Work on the pump/control module may only be started after 5 minutes have elapsed due to the dangerous residual contact voltage.**
- **Check to ensure that all connections (including potential-free contacts) on the plug are voltage-free. To do this, the plug must be opened.**
- **If the control module/plug is damaged, the pump must not be put into operation.**



- If setting and operating elements are improperly removed, there is a danger of electric shock if interior electrical components are touched.



**CAUTION! Risk of damage to property!**

An incorrect electrical connection can cause damage to property.

- If the wrong voltage is applied, the motor can be damaged!
- Control via triacs/semi-conductor relays must be checked on a case-by-base basis, since the electronics can be damaged or the EMC (electromagnetic compatibility) might be negatively affected.
- When the pump is switched on/off by external control devices, the mains voltage pulsing (e.g. by a pulse packet control) must be deactivated to prevent damage to the electronics.

- The current type and voltage of the mains connection must correspond to the specifications on the rating plate.
- The electrical connection must be established via a fixed power cable (3 x 1.5 mm<sup>2</sup> minimum cross-section), equipped with a plug and socket connector or an all-pole switch with a minimum contact opening width of 3 mm.
- The following minimum requirements are to be met if shutdown takes place by means of an on-site network relay: Rated current  $\geq 10$  A, rated voltage 250 VAC
- Fuse protection: 10/16 A, slow-blow or automatic fuse with C characteristic
  - **Double pumps:** Provide a separate power cable and a separate fuse on the mains side for both motors of the double pump.
- A motor protection switch supplied by the customer is not required. Nevertheless, if such a protection switch is available in the installation, it must be bypassed or set to the highest possible current.
- It is recommended to safeguard the pump with a residual-current-operated protection switch.

Labelling: FI –  or  

When dimensioning the residual-current-operated protection switch, take the number of pumps connected and their nominal motor currents into account.

- Leakage current per pump  $I_{\text{eff}} \leq 3.5$  mA (in acc. with EN 60335)
- A heat-resistant connecting cable must be used when using the pump in systems with water temperatures of above 90°C.
- Under no circumstances may any connecting cables touch the pipeline or the pump or motor housing.
- In order to ensure drip protection, including strain relief, cables with a sufficient outer diameter (see Table 7.2) must be used and the threaded cable connection must be screwed sufficiently tightly. In addition, the cables near the screwed connection are to be bent to form a drainage loop, to drain any accumulated drips.
- Earth the pump/unit according to regulations.
- **L, N,  $\text{\textcircled{N}}$** : mains connection voltage: 1~230 VAC, 50/60 Hz, DIN IEC 60038, alternatively, the mains connection between the 2 phases of a three-phase network grounded at the star point is possible with a delta voltage of 3~230 VAC, 50/60 Hz.
- **SSM:** An integrated collective fault signal is applied at the SSM terminals as potential-free normally closed contact. Contact load:
  - Minimum permissible: 12 V DC, 10 mA
  - Maximum permissible: 250 V AC, 1 A
- **Switching frequency:**
  - On/off switching operations via mains voltage  $\leq 100/24$  h
  - $\leq 20/h$  for a switching frequency of 1 min. between switching on/off via mains voltage.

### 7.2.1 Plug connection



#### **CAUTION! Risk of damage to property!**

**Improperly connecting the plug can lead to contact problems and electrical damage.**

- **The plug must be screwed into its end position via the fastening screw so that the module and plug surface are flush.**
- **To avoid damage due to water ingress in the electronics, the sealing elements must not be pressed out of the unused threaded cable connections.**

For the electrical connection, the plug must be disconnected from the control module (fig. 4a).

- Loosen the fastening screw of the plug using a Torx or slotted screwdriver (fig. 4a, item 1). The plug moves itself out of its holding position. Carefully pull out the plug.
- Screw off both threaded cable connections (fig. 4b) and carefully remove the top part of the plug.
- Press the sealing elements of the threaded cable connection out using a screwdriver (fig. 4c, item 1).



NOTE: A sealing element which has been removed by mistake must be pressed back into the threaded cable connection!

- Prepare a cable (provided on-site) for the mains and SSM connection in acc. with fig. 4c/4d.
- Establish the mains and, if applicable, SSM connection according to the terminal designations and place the cable in the bottom section of the plug (fig. 4e/4f).
- Engage the top section of the plug, hinge bars first, into the hinge openings of the bottom section and fold shut (fig. 4g). Screw on threaded cable connections.
- Place the plug at the plug-in position of the control module and screw on using a Torx or slotted screwdriver (fig. 4h, item 1). The plug is joined in its end position as it is screwed into place.



NOTE: The module and plug surfaces must be flush.  
The maximum contact load is achieved when the plug is in its end position.

### 7.2.2 Allocation of the threaded cable connections

The following table shows the possible combinations of electric circuits in a cable for assigning the individual threaded cable connections. DIN EN 60204-1 (VDE 0113, sheet 1) must be complied with:

- Clause 14.1.3 as follows: Conductors of different electric circuits may belong to the same multi-conductor cable if the highest voltage which may occur in the cable is insulated sufficiently.
- Clause 4.4.2 as follows: Signal lines with low levels should be separated from power lines if there is a potential risk of functional interference due to EMC.

Screwed connection:		M20 (left connection)	M20 (right connection)
Cable cross-section:		8...10 mm	8...10 mm
1.	Function	Mains line	SSM
	Cable type	min. 3x1.5 mm <sup>2</sup> max. 3x2.5 mm <sup>2</sup>	min. 2x0.5 mm <sup>2</sup> max. 2x1.5 mm <sup>2</sup>
2.	Function	Mains cable and SSM	
	Cable type	max. 5x1.5 mm <sup>2</sup>	

Table 7.2.2

**DANGER! Life-threatening danger posed by electric shock**

**If the mains and SSM cores are both in the same 5-wire cable (Tab. 7.2.2, version 2), the SSM core may not be operated with protective low voltage, otherwise there could be voltage transmission.**



NOTE: Prepare a 5-wire cable (provided on-site) for mains and SSM connection in acc. with fig. 4d and connect according to fig. 4f.

**7.2.3 Connect the AC pump to an existing three phase net****Mains connection 3~230 V:**

L1, L2, L3 and PE available. No neutral conductor N.  
The voltage between any two phases must be 230 V.



NOTE: Make sure that 230 V is applied between the phases (L1-L2, L1-L3 or L2-L3).

Two phases (L1-L2, L1-L3 or L2-L3) are to be applied at the terminals L and N of the plug.

**Mains connection 3~400 V:**

- L1, L2, L3, PE and neutral conductor N available (fig. 5).  
The voltage between the neutral conductor (N) and any phase (L1, L2 or L3) must be 230 V.
- L1, L2, L3 and PE available. No neutral conductor N.  
The pump must have a mains transformer (accessory) connected upstream for providing the connection 1~230 V (L/N/PE).

**8 Commissioning****Do not fail to observe the danger information and warnings in chapters 7, 8.5 and 9!**

Prior to commissioning the pump, check that it was installed and connected correctly.

**8.1 Filling and bleeding**

NOTE: Incomplete bleeding will result in noises in the pump and unit.

Properly fill and bleed the system. The pump rotor compartment is vented automatically after a short operating period. Dry running for short periods will not harm the pump.



**WARNING! Risk of injury and damage to property!**

It is not permitted to remove the motor head or the flange connection / threaded pipe union for the purpose of bleeding the system!

- There is a risk of scalding!  
Escaping fluid can lead to injuries and damage to property.
- Touching the pump can cause burns!  
Depending on the operating status of the pump or unit (fluid temperature), the entire pump can become very hot.

## 8.2 Operation



**WARNING! Risk of burns!**

Depending on the operating status of the system, the entire pump can become very hot. There is a risk of burns if metallic surfaces are touched (e.g. cooling fins, motor housing, pump housing). The setting can be made on the control module during normal operation by pressing the red button. Do not touch any hot surfaces when doing this.

The pump is operated via the operating knob (fig. 1a, item 1.3).

### 8.2.1 Setting the control mode and delivery head

The control mode is selected and the desired delivery head set by turning the operating knob.

#### Setting the control mode



**Variable differential pressure ( $\Delta p-v$ ): fig. 8**

The pump for the control mode  $\Delta p-v$  is set at the left of the middle position.



**Constant differential pressure ( $\Delta p-c$ ): fig. 9**

The pump for the control mode  $\Delta p-c$  is set at the right of the middle position.



#### Setting the delivery head

The LED display shows the setpoint set on the pump.

If the operating knob is turned to the left or right from the middle position, the set setpoint increases for the respective control mode. If the operating knob is turned back again to the middle position, the set setpoint is reduced.

Adjustment is done in steps of 0.5 m (up to the delivery head setpoint of 10 m) or in steps of 1 m (> 10 m delivery head setpoint). Intermediate steps are possible, but are not shown.

#### Factory setting

The pumps are delivered in control mode  $\Delta p-v$ . Here, the delivery head setpoint is preset to between  $\frac{1}{2}$  and  $\frac{3}{4}$  of the max. delivery head setpoint, depending on the pump type (see pump data in the catalogue). The required pump output is to be adjusted, depending on the system requirements.



NOTE: In the event of a power interruption, the delivery head setpoint is retained.

## 8.2.2 Control mode selection

System type	System conditions	Recommended control mode
Heating/ventilation/air-conditioning systems with resistance in the transfer section (room radiator + thermostatic valve) $\leq 25\%$ of the total resistance	<ol style="list-style-type: none"> <li>Two-pipe systems with thermostatic/zone valves and low valve authority <ul style="list-style-type: none"> <li><math>H_N &gt; 4</math> m</li> <li>Very long distribution lines</li> <li>Strongly throttled shut-off valves for pipe sections</li> <li>Sectional differential pressure control</li> <li>High pressure losses in the system parts through which the entire volume flows (boiler/refrigerating machine, heat exchanger possibly, distribution pipeline up to the first branch)</li> </ul> </li> <li>Primary circuits with high pressure losses</li> </ol>	$\Delta p-v$
Heating/ventilation/air-conditioning systems with resistance in the generator/distribution circuit $\leq 25\%$ of the resistance in the transfer section (room radiator + thermostatic valve)	<ol style="list-style-type: none"> <li>Two-pipe systems with thermostatic/zone valves and high valve authority <ul style="list-style-type: none"> <li><math>H_N \leq 2</math> m</li> <li>Converted gravity heating systems</li> <li>Conversion to large temperature spread (e.g. district heating)</li> <li>High pressure losses in the system parts through which the entire volume flows (boiler/refrigerating machine, heat exchanger possibly, distribution pipeline up to the first branch)</li> </ul> </li> <li>Primary circuits with low pressure losses</li> <li>Floor heating systems with thermostatic or zone valves</li> <li>One-pipe systems with thermostatic or line shutoff valves</li> </ol>	$\Delta p-c$

## 8.2.3 Setting the pump output

During planning, the unit is designed for a specific duty point (hydraulic full-load point for maximum heating power requirement calculated). During commissioning, the pump output (delivery head) is set according to the duty point of the system.



NOTE: The factory setting does not comply with the pump capacity required for the system. It is determined with the help of the pump curve diagram for the selected pump type (from catalogue/data sheet). See also Figs. 8 and 9.

**Control modes  $\Delta p$ -c,  $\Delta p$ -v:**

	$\Delta p$ -c (fig. 9)	$\Delta p$ -v (fig. 8)
Duty point on maximum pump curve	Draw from duty point towards the left. Read off setpoint $H_5$ and set the pump to this value.	
Duty point within the control range	Draw from duty point towards the left. Read off setpoint $H_5$ and set the pump to this value.	Move to max. pump curve along control curve, then horizontally to the left, read off setpoint $H_5$ and set the pump to this value.

**8.3 Operation****Faults of electronic devices due to electromagnetic fields**

Electromagnetic fields are created during the operation of pumps with frequency converter. Interference of electronic devices may be the result. The result may be a device malfunction, which can result in damage to the health or even death, e.g. of persons with implanted active or passive medical devices. Therefore, during operation the presence of any persons e.g. with cardiac pacemakers in the vicinity of the unit/pump should be prohibited. With magnetic or electronic data media, the loss of data is possible.

**8.4 Shutdown**

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

**DANGER! Risk of fatal accident!**

**Deadly electric shock may occur when working on electrical equipment.**

- **Have work on the electrical part of the pump carried out only by a qualified electrician as a basic principle.**
- **Before starting any maintenance and repair work, disconnect the pump from the power supply, and make sure it cannot be switched back on by unauthorised persons.**
- **Work on the control module may only be started after 5 minutes have elapsed, due to the dangerous residual contact voltage.**
- **Check to ensure that all connections (including potential-free contacts) are voltage-free.**
- **The pump may still be live even in voltage-free state. The drive rotor induces a dangerous contact voltage at the motor contacts.**
- **Close the check valves in front of and behind the pump.**
- **If the control module/plug is damaged, the pump must not be put into operation.**

**WARNING! Risk of burns!**

**Touching the pump can cause burns!**

**Depending on the operating status of the pump or unit (fluid temperature), the entire pump can become very hot.**

**Allow the system and pump to cool down to room temperature.**

**9 Maintenance**

Before carrying out maintenance /cleaning and repair work, observe sections 8.3 "Operation", 8.4 "Shutdown" and 9.1 "Dismantling/installation".

The safety instructions in section 2.6 and chapter 7 must be complied with.

After completing maintenance and repair work, install and connect the pump according to chapter 7 "Installation and electrical connection". Switch on the pump according to chapter 8 "Commissioning".

## 9.1 Dismantling / installation



**WARNING! Risk of injury and damage to property!**

**Incorrect dismantling/installation can lead to injuries and damage to property.**

- **Touching the pump can cause burns!**  
Depending on the operating status of the pump or unit (fluid temperature), the entire pump can become very hot.
- **At high fluid temperatures and system pressures there is risk of scalding due to escaping hot fluid.**

Before dismantling the motor, close the existing check valves on both sides of the pump, allow the pump to cool down to room temperature, and drain the isolated branch of the system. If no check valves are fitted, drain the entire system.

- **Observe the manufacturer specifications and safety data sheets on possible additives in the unit.**
- **Risk of injury due to the motor/pump falling when the fastening screws have been undone.**

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



**WARNING! Danger due to strong magnetic field!**

Inside the machine there is always a strong magnetic field that can cause injury and damage to property in the event of incorrect dismantling.

- **It is only permitted to have the rotor removed from the motor housing by qualified personnel.**
- **There is a crushing hazard! When pulling the rotor out of the motor, it may be suddenly pulled back into its initial position by the strong magnetic field.**
- **If the unit, consisting of impeller, bearing shield and rotor, is pulled out of the motor, persons with medical aids, such as cardiac pacemakers, insulin pumps, hearing aids, implants, etc. are at risk. Death, severe injury and damage to property may be the result. For such persons, a professional medical assessment is always necessary.**
- **Electronic devices may be impaired functionally or damaged by the strong magnetic field of the rotor.**
- **If the rotor is outside the motor, magnetic objects may be attracted very suddenly. That can result in injury and damage to property.**

In assembled condition, the rotor's magnetic field is guided in the motor's iron core. There is therefore no harmful magnetic field outside the machine.



**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!**

The motor does not have to be completely removed from the pump housing if only the control module is to be repositioned. The motor can be turned to the desired position while still attached to the pump housing (see permissible installation positions as per fig. 2a and fig. 2b).



NOTE: Generally, turn the motor head before the system is filled.

**CAUTION! Risk of damage to property!**

If, for maintenance or repair work, the motor head is detached from the pump housing, the O-ring located between the motor head and pump housing must be replaced with a new one. When installing the motor head, check that the O-ring is correctly seated.

- To disconnect the motor, unscrew the 4 internal hexagon screws (fig. 6, item 1).

**CAUTION! Risk of damage to property!**

Do not damage the O-ring located between the motor head and the pump housing. The O-ring must lie, untwisted, in the bearing plate chamfer facing the impeller.

- After installation, retighten the 4 internal hexagon screws crosswise.
- For the commissioning of the pump, see chapter 8.

## 10 Faults, causes and remedies

Faults, causes and remedies **tables 10, 10.1, 10.2.**

**Only have faults remedied by qualified personnel. Follow the safety instructions in chapter 9 .**

Faults	Causes	Remedy
Pump is not running although the power supply is switched on. Black display	Electrical fuse defective.	Check fuses.
	Pump has no voltage.	Restore power after interruption.
Pump is making noises.	Cavitation due to insufficient suction pressure.	Increase the system suction pressure within the permissible range.
		Check the delivery head setting and set to lower head if necessary.
Building does not get warm.	Thermal output of the heating surfaces is too low.	Increase setpoint (see 8.2.1).
		Set control mode to $\Delta p$ -c.

Table 10: Faults with external interference sources

### 10.1 Fault signals

- The fault signal is indicated by the LED display (fig. 1a, item 1.1).
- The fault signal LED is continuously illuminated in red (fig. 1a, item 1.2).
- SSM contact opens.
- The pump switches off (depending on the error code), and attempts a cyclical restart.



EXCEPTION: Error code E10 (blocking)

After approx. 10 minutes, the pump switches off permanently and displays the error code.