

Wilo-Helix VE 2..., 4..., 6..., 10..., 16...



de Einbau- und Betriebsanleitung
en Installation and operating instructions
fr Notice de montage et de mise en service

nl Inbouw- en bedieningsvoorschriften
ru Инструкция по монтажу и эксплуатации

Fig. 1

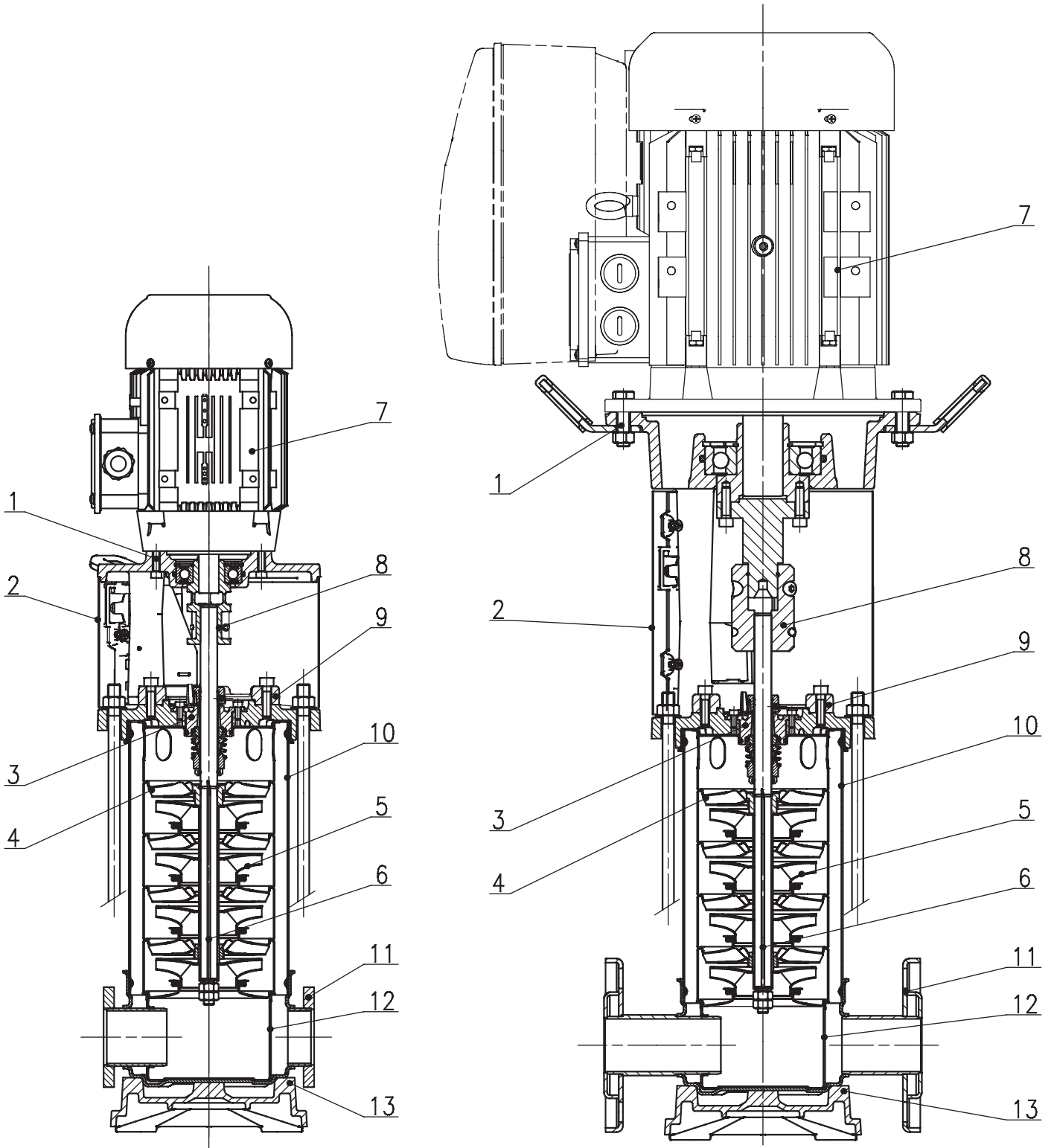


Fig. 2

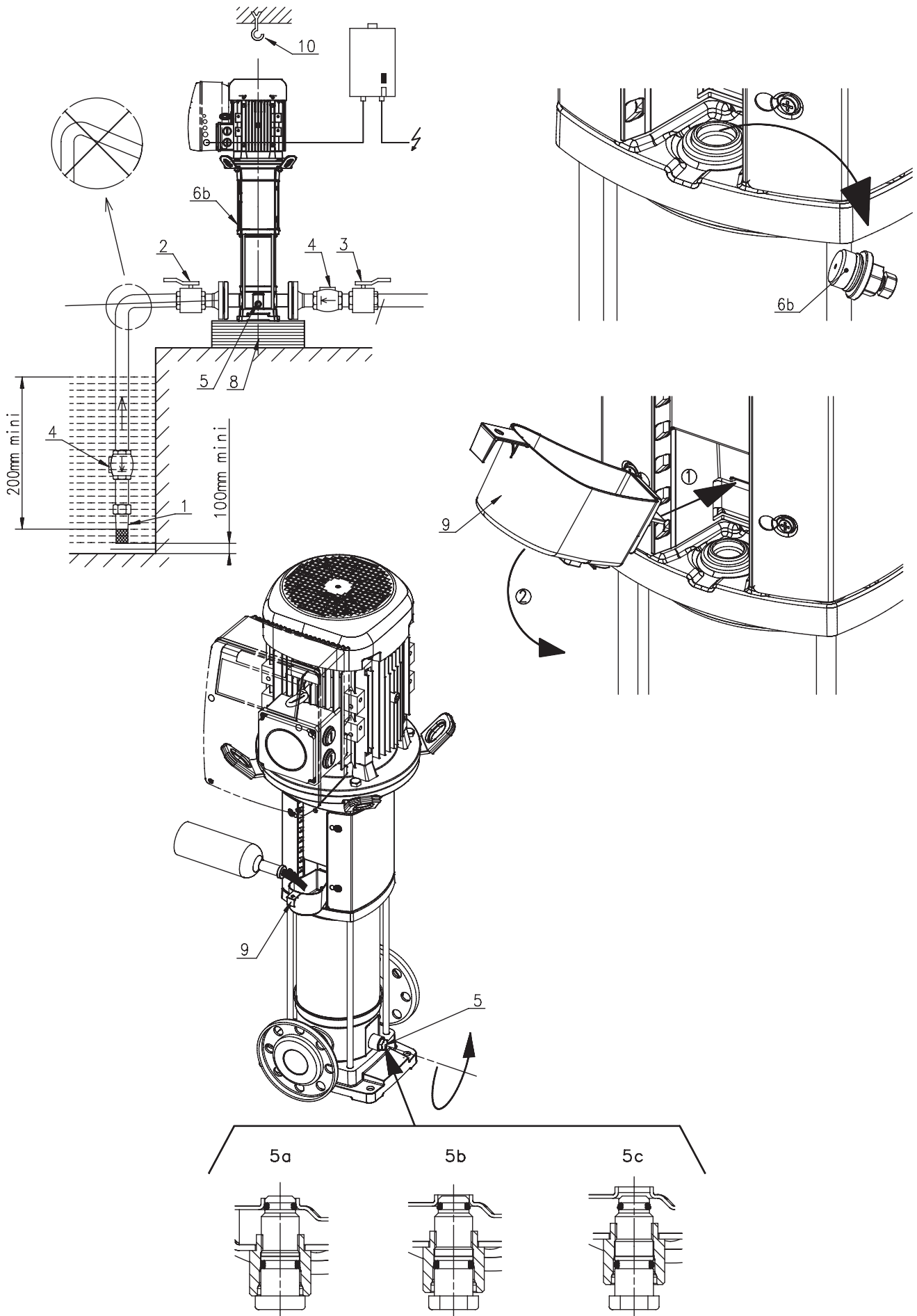


Fig. 3

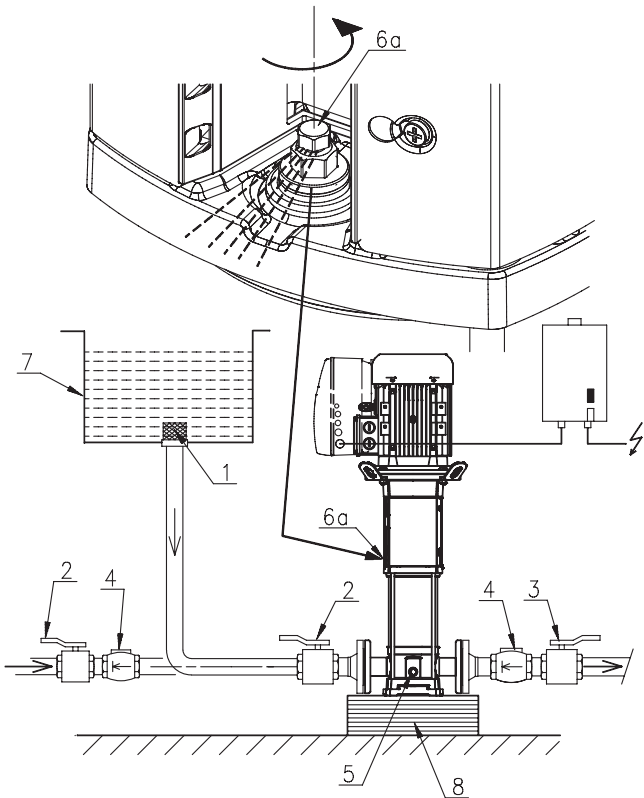


Fig. 6

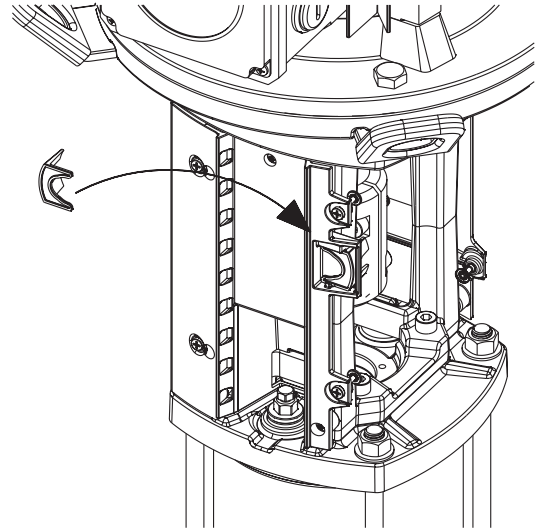
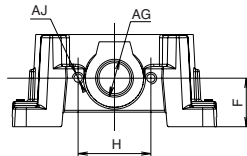
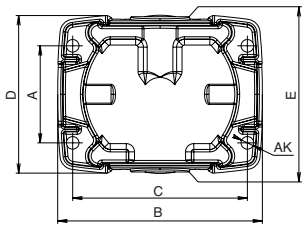
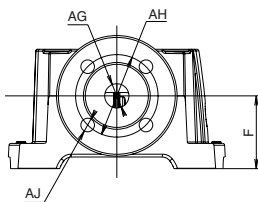
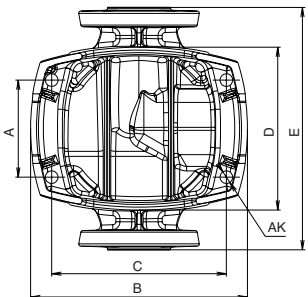


Fig. 4



Type		(mm)									
		A	B	C	D	E	F	G	H	J	K
HELIX V2...	PN16	100	212	180	162	160	50	D32	75	2xM10	4xØ13
HELIX V4...	PN16	100	212	180	162	160	50	D32	75	2xM10	4xØ13
HELIX V6...	PN16	100	212	180	162	160	50	D32	75	2xM10	4xØ13
HELIX V10...	PN16	130	251	215	181	200	80	D50	100	2xM12	4xØ13
HELIX V16...	PN16	130	251	215	181	200	90	D50	100	2xM12	4xØ13



Type		(mm)									
		A	B	C	D	E	F	G	H	J	K
HELIX V2...	PN16 PN25 PN30	100	212	180	172	250	75	D25	85	4xM12	4xØ13
HELIX V4...	PN16 PN25 PN30	100	212	180	172	250	75	D25	85	4xM12	4xØ13
HELIX V6...	PN16 PN25 PN30	100	212	180	172	250	75	D32	100	4xM16	4xØ13
HELIX V10...	PN16 PN25 PN30	130	252	215	187	280	80	D40	110	4xM16	4xØ13
HELIX V16...	PN16 PN25 PN30	130	252	215	187	300	90	D50	125	4xM16	4xØ13

Fig. 7

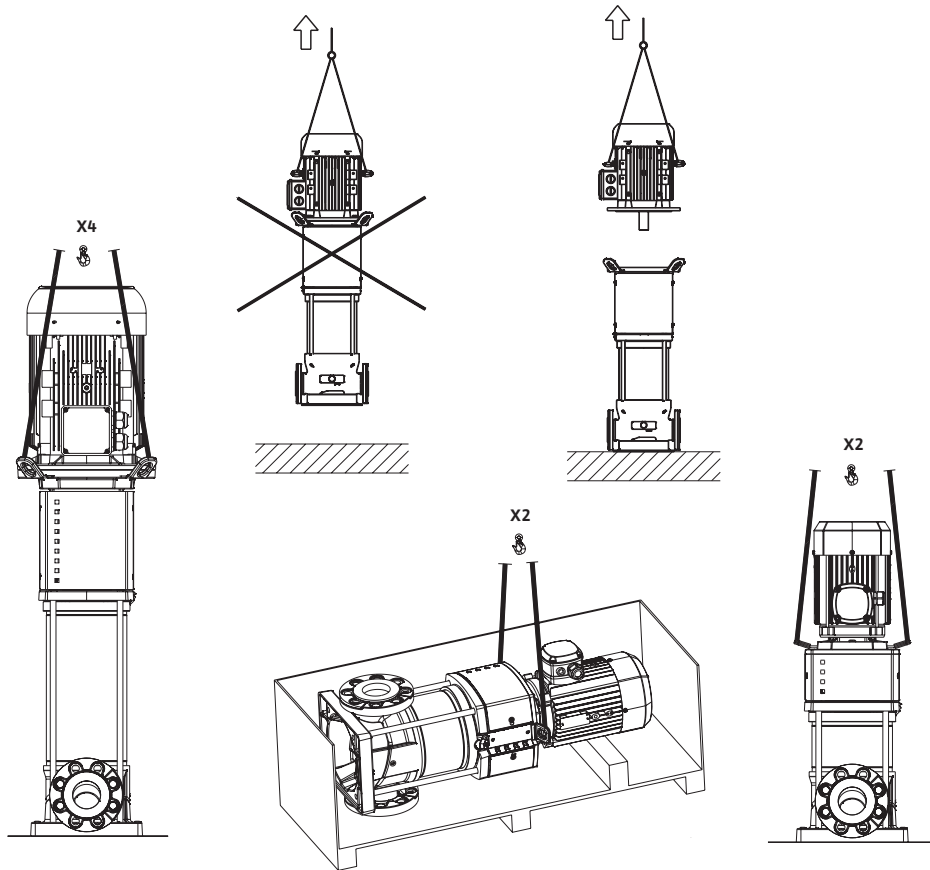


Fig. A1

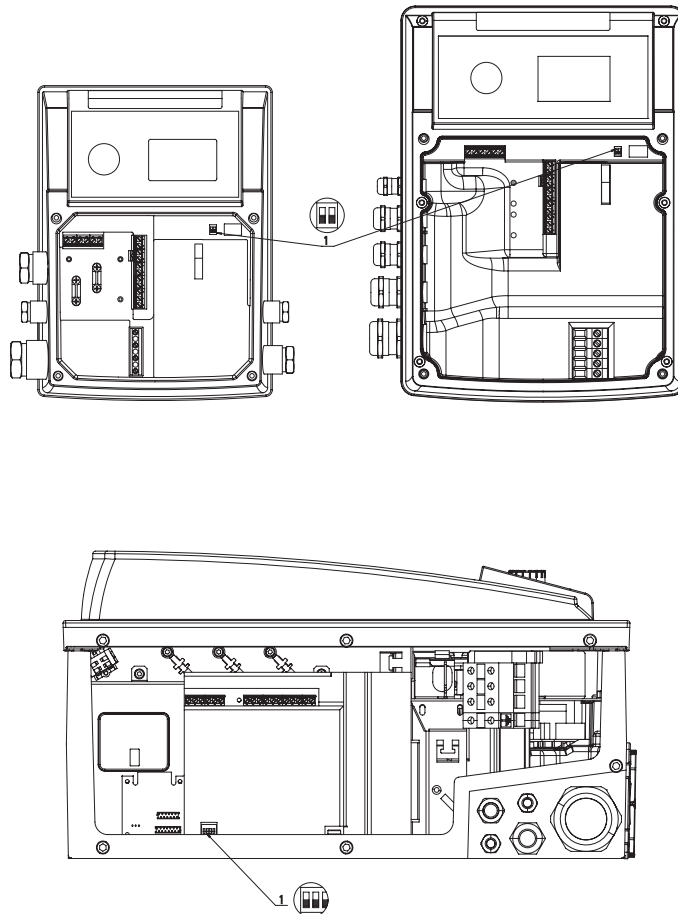


Fig. A2

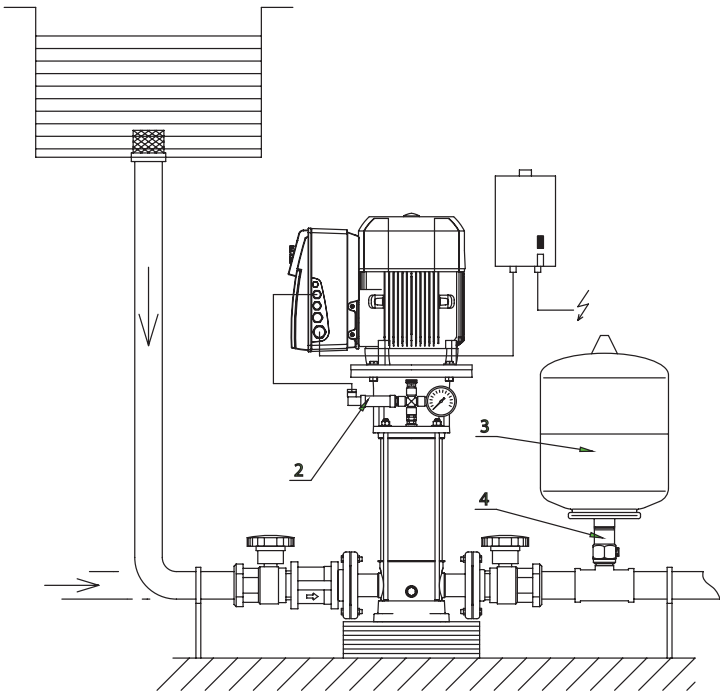


Fig. A4

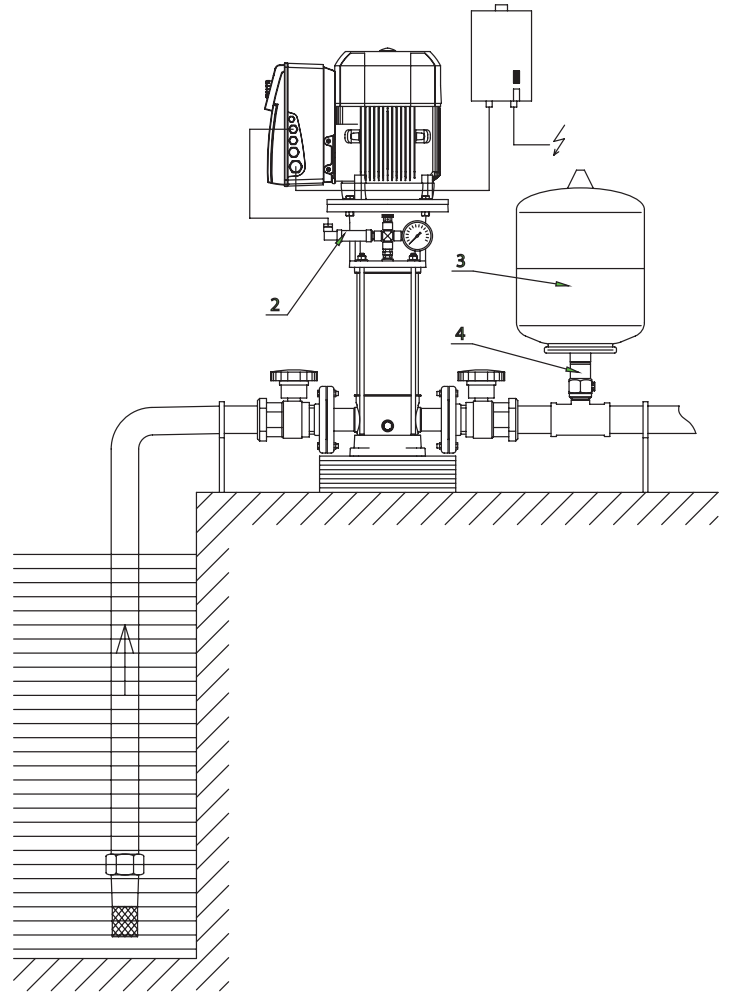
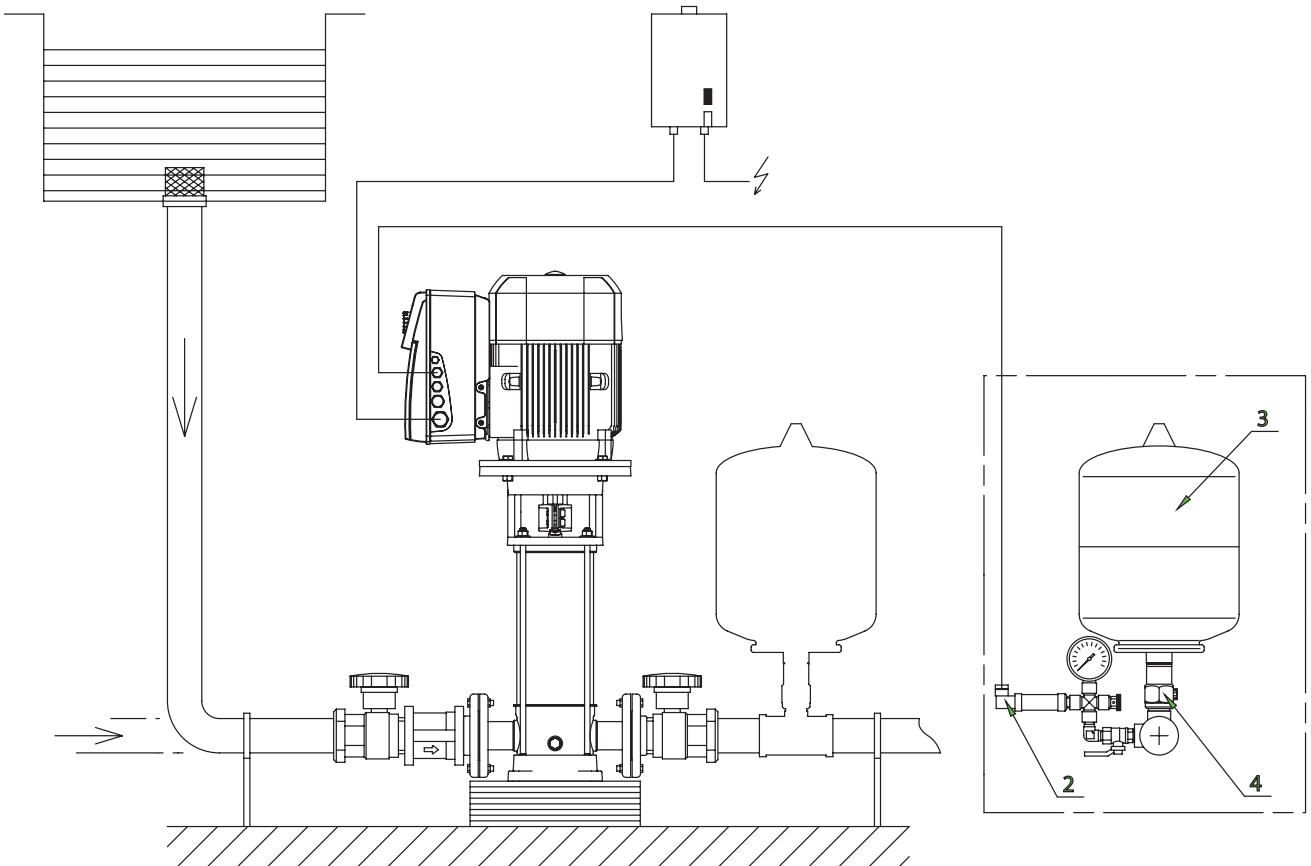


Fig. A3



1. General

1.1 About this document

The language of the original operating instructions is English. 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 information is disregarded.

CAUTION! There is a risk of damaging the product/unit. "Caution" implies that damage to the product is likely if this information 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/flow arrow,
 - identifiers for connections,
 - name 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 directives or general directives [e.g. IEC, VDE etc.] and local power supply companies must be adhered to.

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 from their own detailed study of the operating instructions.

Work on 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

When receiving the material, check that it has not been damaged during transport. If the material has been damaged during transport, take all necessary steps with the forwarding agent within the claim period.



CAUTION! Potential damage due to external influences. If the delivered material is to be installed at a later date, store it in a dry place and protect it from impacts and any external influences (humidity, frost etc.).

The product should be cleaned thoroughly before it is put into temporary storage. The product can be stored for at least one year.

Handle the pump carefully to avoid any damage prior to installation.

4. Intended use

This pump has been designed to pump hot or cold water, water/glycol mixtures or other low-viscosity liquids that are free of mineral oil, solid or abrasive substances, or materials containing long fibres. Pumping corrosive chemicals requires the manufacturer's approval.



CAUTION! Risk of explosion!

Do not use this pump for any flammable or explosive liquids.

4.1 Applications areas

- water distribution and pressure boosting,
- industrial circulation systems,
- process fluids,
- cooling-water circuits,
- fire-fighting and washing stations,
- irrigation systems, etc.

5. Technical data

5.1 Type key

Example: Helix VE1605-1/16/E/KS/xxxx	
Helix V	Vertical high-pressure multistage centrifugal pump in in-line design
E	With converter for electronic speed control
16	Nominal flow in m ³ /h
05	Number of impellers
1	Pump material code 1 = Pump housing Stainless steel 1.4301 (AISI 304) + Hydraulics 1.4307 (AISI 304) 2 = Pump housing Stainless steel 1.4404 (AISI 316L) + Hydraulics 1.4404 (AISI 316L) 5 = Pump housing Cast Iron EN-GJL-250 (standard coating) + Hydraulics 1.4307 (AISI 304)
16	Pipe connection 16 = oval flanges PN16 25 = round flanges PN25 30 = round flanges PN40
E	Seal type code E = EPDM V = FKM
KS	K = Cartridge seal, versions without "K" are equipped with simple mechanical seal S = Lantern orientation align with suction pipe
Bare-shaft pump (without motor)	
50 60	Motor frequency (Hz)
-38FF265	∅ motor shaft – lantern size
xxxx	Options code (if any)

5.2 Technical data

Maximum operating pressure																																																															
Pump casing	16, 25 ou 30 bars depend on the model																																																														
Maximum suction pressure	10 bars Note : real inlet pressure (Pinlet)+ pressure at 0 flow delivered by the pump must be below the maximum operating pressure of the pump. In case of exceeding maximum operating pressure, the ball bearing and the mechanical seal could be damaged or lifetime could decrease. P Inlet + P at 0 flow ≤ Pmax pump See pump nameplate to know the maximum operating pressure : Pmax																																																														
Temperature range																																																															
Liquid temperatures	-30°C to +120 °C -15°C to +90° C (wiht FKM seal) -20°C to + 120°C (with cast iron casing)																																																														
Ambient temperature	-15°C to +50° C (other temperature on request)																																																														
Electrical data																																																															
Motor efficiency	Motor according to IEC 60034-30																																																														
Motor Protection index	IP 55																																																														
Insulation class	155 (F)																																																														
Frequency	See motor plating																																																														
Electrical voltage	See motor plating																																																														
Other data																																																															
Humidity	< 90% without condensation																																																														
Altitude	< 1000 m (> 1000m on request)																																																														
Maximum suction head	according to NPSH of the pump																																																														
Sound pressure level dB(A) 0/+3 dB(A)	<table border="1"> <thead> <tr> <th colspan="13">Power (kW)</th> </tr> <tr> <th>0.55</th><th>0.75</th><th>1.1</th><th>1.5</th><th>2.2</th><th>3</th><th>4</th><th>5.5</th><th>7.5</th><th>11</th><th>15</th><th>18.5</th><th>22</th> </tr> </thead> <tbody> <tr> <td>61</td><td>63</td><td>67</td><td>71</td><td>72</td><td>74</td><td>78</td><td>81</td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>	Power (kW)													0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	61	63	67	71	72	74	78	81																												
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Cross-section of power cable (cable comprising of 4 wires) mm²	<table border="1"> <thead> <tr> <th colspan="13">Power (kW)</th> </tr> <tr> <th>0.55</th><th>0.75</th><th>1.1</th><th>1.5</th><th>2.2</th><th>3</th><th>4</th><th>5.5</th><th>7.5</th><th>11</th><th>15</th><th>18.5</th><th>22</th> </tr> </thead> <tbody> <tr> <td>1.2</td><td>1.5-2.5</td><td>2.5 - 4</td><td>2.5-6</td><td>4 - 6</td><td>6-10</td><td>10 - 16</td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>	Power (kW)													0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	1.2	1.5-2.5	2.5 - 4	2.5-6	4 - 6	6-10	10 - 16																													
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1.2	1.5-2.5	2.5 - 4	2.5-6	4 - 6	6-10	10 - 16																																																									
Voltage	<table border="1"> <thead> <tr> <th colspan="13">Power (kW)</th> </tr> <tr> <th>0.55</th><th>0.75</th><th>1.1</th><th>1.5</th><th>2.2</th><th>3</th><th>4</th><th>5.5</th><th>7.5</th><th>11</th><th>15</th><th>18.5</th><th>22</th> </tr> </thead> <tbody> <tr> <td colspan="6">400 V (±10%) 50 Hz</td><td colspan="6">400 V (±10%) 50 Hz</td> </tr> <tr> <td colspan="6">380 V (±10%) 60 Hz</td><td colspan="6">380 V (±10%) 60 Hz</td> </tr> <tr> <td colspan="6">480 V (±10%) 60 Hz</td><td colspan="6">480 V (±10%) 60 Hz</td> </tr> </tbody> </table>	Power (kW)													0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	400 V (±10%) 50 Hz						400 V (±10%) 50 Hz						380 V (±10%) 60 Hz						380 V (±10%) 60 Hz						480 V (±10%) 60 Hz						480 V (±10%) 60 Hz					
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- Electromagnetic compatibility(*)
 - emission in residential areas –
1st environment: PN-EN 61800-3
 - electromagnetic immunity in industrial environments –
2nd environment: PN-EN 61800-3

(*) In the frequency range between 600 MHz and 1 GHz, the display or the pressure indication in the display might be disturbed in the direct vicinity (< 1 m from the electronic module) of radio transmission installations, transmitters or similar devices working in this frequency range. The function of the pump is not affected at any time.

Outline and pipe dimensions (Fig. 4).

5.3 Scope of delivery

- Multistage pump
- Installation and operating instructions
- Counterflange, bolts and O-rings for PN16 configuration.

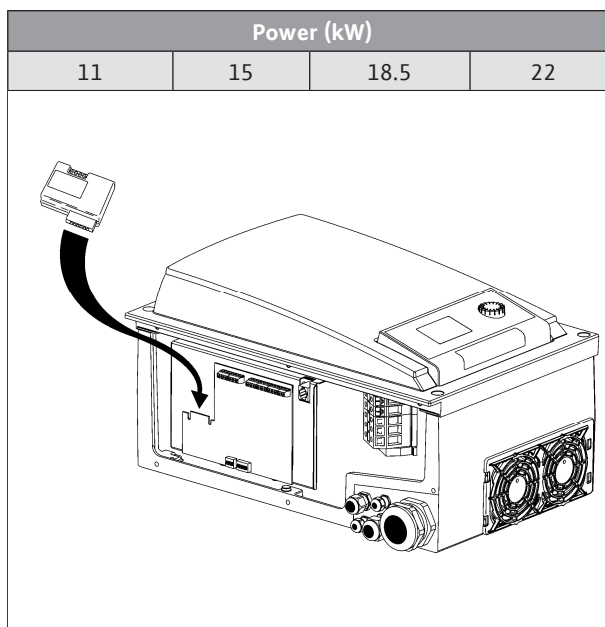
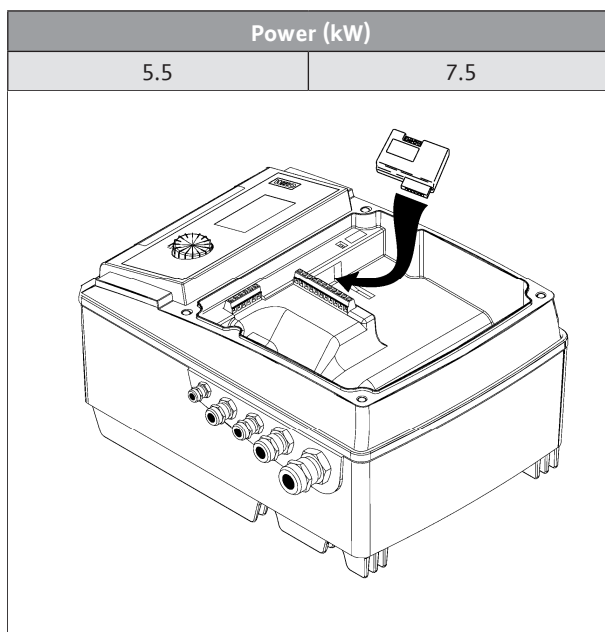
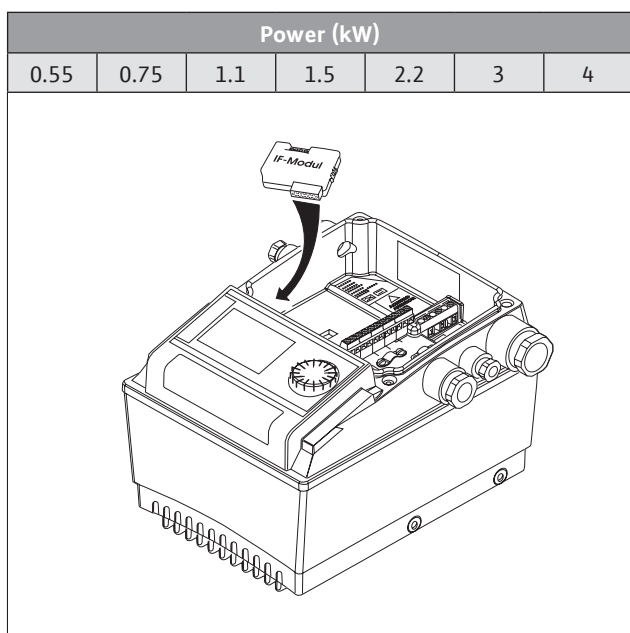
5.4 Accessories

The following original accessories are available for the Helix range:

Designation	Article n°.
2x oval counterflanges, stainless steel 1.4301 (screwing) (PN16 – 1")	4016168
2x round counterflanges in stainless steel 1.4404 (screwing) (PN40 – DN25)	4016165
2x round counterflanges in steel (welding) (PN40 – DN25)	4016162
2x oval counterflanges in stainless steel 1.4301 (screwing) (PN16 – 1" 1/4)	4016169
2x round counterflanges in stainless steel 1.4404 (screwing) (PN40 – DN32)	4016166
2x round counterflanges in steel (welding) (PN40 – DN32)	4016163
2x oval counterflanges in stainless steel 1.4301 (screwing) (PN16 – 1" 1/2)	4016170
2x round counterflanges in stainless steel 1.4404 (screwing) (PN40 – DN40)	4016167
2x round counterflanges in steel (welding) (PN40 – DN40)	4016164
2x oval counterflanges in stainless steel 1.4301 (screwing) (PN16 – 2")	4055063
2x round counterflanges in stainless steel 1.4404 (screwing) (PN40 – DN50)	4038589
2x round counterflanges in steel (welding) (PN40 – DN50)	4038588
Bypass kit 25 bar	4146786
Bypass kit (with pressure gauge 25 bar)	4146788
Baseplate with dampers for pumps up to 5,5kW	4157154

- IF-module PLR for connecting to PLR/interface converter.
- IF-module LON for connection to LONWORKS network. These modules plug directly into the connection interfaces of the converter (see fig. below).
- Non-return valves (with tab or spring ring for operation at constant pressure).
- Protection kit against dry-running.
- Sensor kit for pressure regulation (accuracy: $\leq 1\%$; use between 30 % and 100 % of the measuring range).

Use only accessories that are new.



6. Description and function

6.1 Description of the product

FIG. 1

- 1 – Motor connection bolt
- 2 – Coupling guard
- 3 – Mechanical seal
- 4 – Hydraulic stage housing
- 5 – Impeller
- 6 – Pump shaft
- 7 – Motor
- 8 – Coupling
- 9 – Lantern
- 10 – Tube liner
- 11 – Flange
- 12 – Pump housing
- 13 – Base plate

FIG. 2, 3

- 1 – Strainer
- 2 – Pump suction valve
- 3 – Pump discharge valve
- 4 – Check valve
- 5 – Drain + priming plug
- 6 – Venting plug and filling plug
- 7 – Tank
- 8 – Foundation block
- 10 – Lifting hook

FIG. A1, A2, A3, A4

- 1 – Switch block
- 2 – Pressure sensor
- 3 – Tank
- 4 – Insulation valve of the tank

6.2 Function of the product

- Helix pumps are vertical multistage high-pressure non-self-priming pumps for in-line connection.
- Helix pumps combine highly efficient hydraulic systems and motors.
- All metal components in contact with the fluid are made of stainless steel.
- For models equipped with the heaviest motor (> 40 kg), a specific coupling allows the seal to be replaced without removing the motor. A cartridge seal is then used in order to facilitate maintenance.
- Special handling devices are integrated to facilitate pump installation (Fig. 8).

7. Installation and electrical connection

All installation and electrical work may only be carried out by qualified personnel and in compliance with local codes and regulations!



WARNING! Risk of severe injury!

Ensure that all existing regulations concerning the prevention of accidents are observed.



WARNING! Risk of electrical shock!

Ensure that any electrical hazard is avoided.

7.1 Installation

Unpack the pump and dispose of the packaging in accordance with all regulations concerning the protection of the environment.

7.2 Installation

The pump must only be installed in a dry, well-ventilated and frost-free location.



CAUTION! Risk of damage to the pump!

Contamination and solder residue in to the pump body may affect pump operation.

- It is recommended to perform any welding and soldering work before installing the pump.
 - Flush the system thoroughly before installing the pump.
- Install the pump in an easily accessible position to facilitate inspection or replacement.
 - For heavy pumps, install a lifting hook (Fig. 2, Pos. 10) above the pump to facilitate its disassembly.



WARNING! Hot surface! Risk of burns!

Position the pump in such a way that any contact with hot pump surfaces is prevented during operation.

- Install the pump in a dry and frost-free place on a flat concrete block using appropriate accessories. If possible, use an insulating material under the concrete block (cork or reinforced rubber) to avoid any noise and vibration transmission into the installation.



WARNING! Risk of tipping!

Ensure that the pump is correctly secured to the ground.

- The pump must be installed in an easily accessible location to facilitate inspection and removal work. The pump must always be installed perfectly upright on a sufficiently heavy concrete base.



CAUTION! Hazard caused by foreign parts inside the pump!

Ensure that all blanking plugs are removed from the pump housing before installation.



NOTE: All pumps are factory-tested for their hydraulic properties and may therefore contain small amount of residual water. For hygienic purposes, it is recommended to rinse the pump before any installing it in any potable water supply.

- For installation and connection dimensions see section 5.2.
- Lift the pump only with appropriate lifting devices and suitable slings in compliance with lifting regulations. The integrated lifting hooks must be used for lifting and the fixation of the pump.



WARNING! Risk of tipping!

There is a high risk of falling due to the high position of the centre of gravity especially for larger pumps. Take special care to the safe fixation of the pump during handling.



WARNING! Risk of tipping!

Use integrated lifting hooks only if they are not damaged (e.g. by corrosion). Replace them, if required.



WARNING! Risk of tipping!

Never lift the complete pump using the motor hooks as these are designed to lift the motor only.

- Motors are equipped with drain holes for condensed water that are sealed at the factory by plastic plugs to ensure IP55 protection. If used in air-conditioning or cooling systems, remove these plugs to allow draining.

7.3 Pipe connection

- Connect the pump to the pipes by using appropriate counterflanges, bolts, nuts and gaskets.



CAUTION!

Tightening of screws or bolts must not exceed:

Configuration PN16 /PN25	
M10 – 20 N.m	M12 – 30 N.m
Configuration PN40	
M12 – 50 N.m	M16 – 80 N.m

The use of an impact wrench is prohibited.

- The flow direction of the pump is indicated on the rating plate of the pump.
- The pump must be installed so that it does not induce any stress into the pipework. The pipes must be attached so that the pump does not bear their weight.
- The installation of insulation valves on the suction and discharge side of the pump is recommended.
- Use expansion joints to mitigate noise and vibration, if required.
- The nominal cross-section of the suction pipe should be at least as large as that of the pump connection.
- The installation of a check valve in the discharge pipe is recommended to protect the pump against pressure impulses.
- When directly connected to a public drinking water system, the suction pipe must be equipped with a check valve and a guard valve.
- When indirectly connected via a tank, the suction pipe must be equipped with a strainer to protect pump and check valve against impurities.

7.4 Motor connection for bare-shaft pump (without motor)

- Remove the coupling guards.



NOTE: Coupling guards can be removed without removing the screws completely.

- Attach the motor to the pump using screws (for FT lantern size – see product designation) or screws, nuts and handling devices (for FF lantern size – see product designation) provided with

the pump. Verify motor power and dimensions in Wilo catalogue.



NOTE: Motor power can be adjusted in accordance with the fluid's characteristics. Contact the Wilo customer service if required.

- Close the coupling guards by tightening all screws provided with the pump.

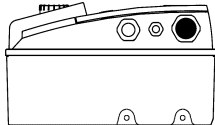
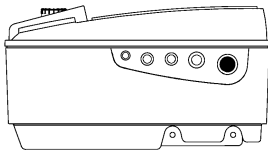
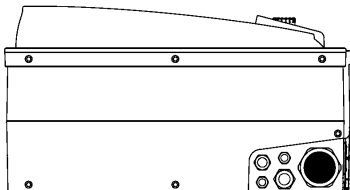
7.5 Electrical connections



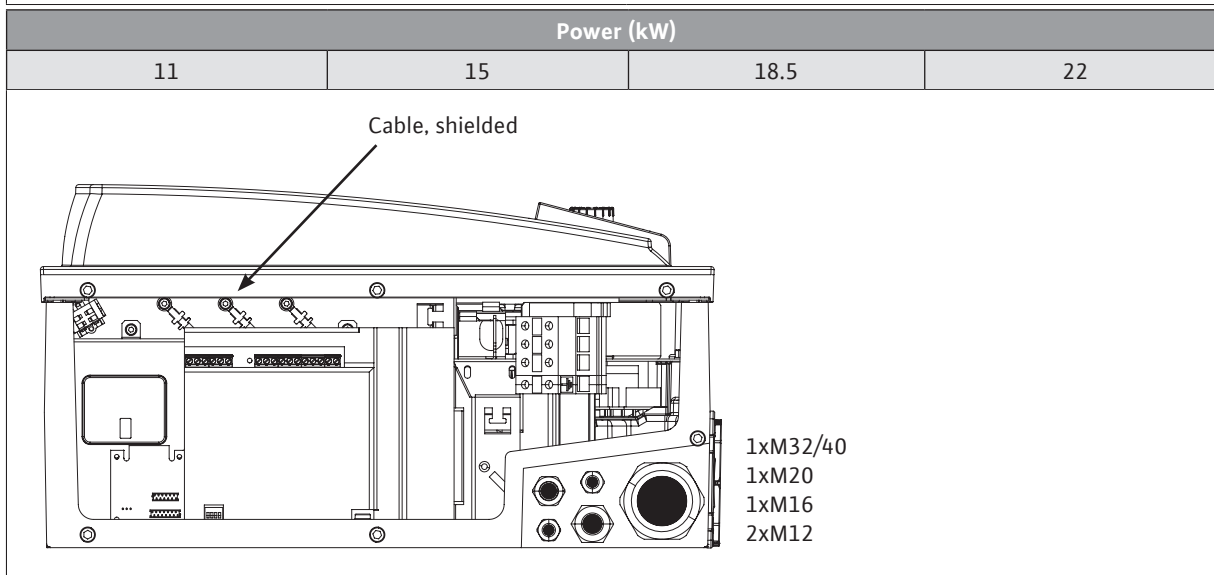
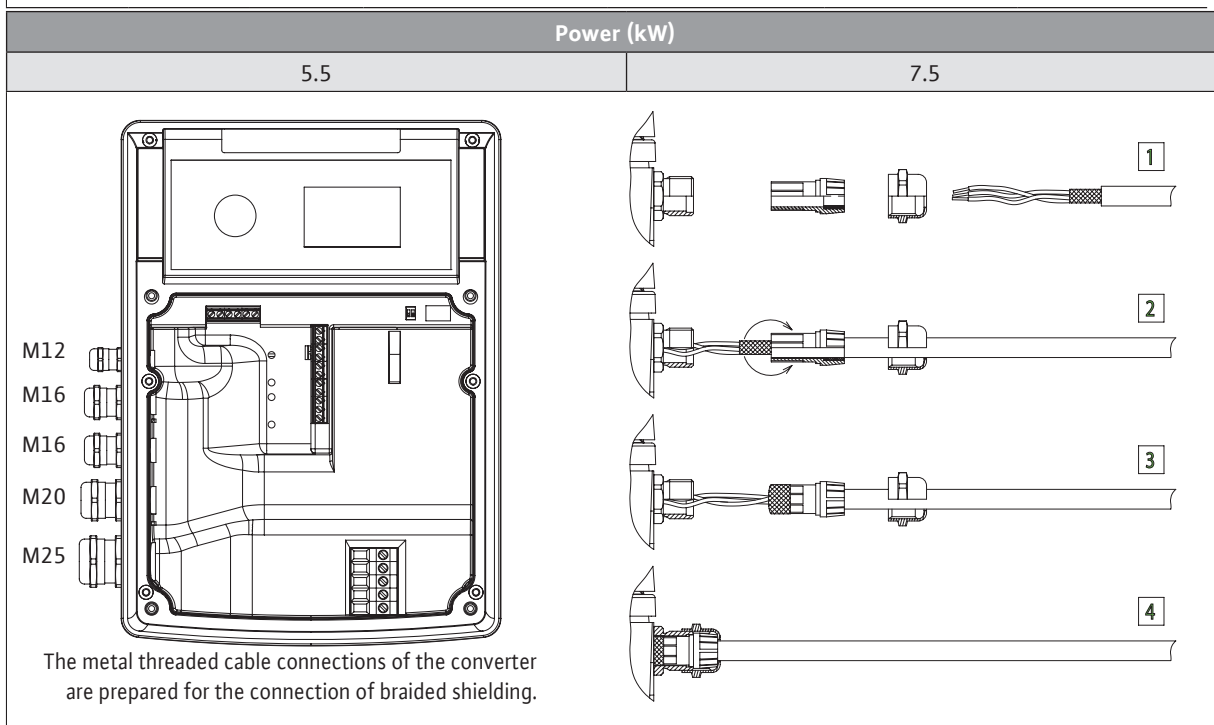
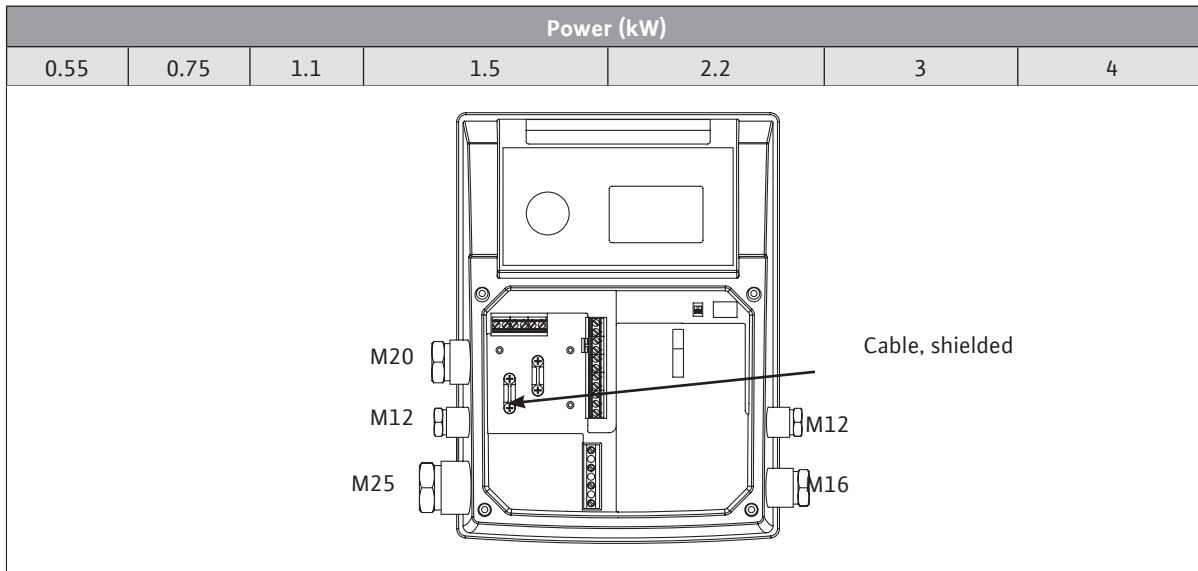
WARNING! Risk of electrical shock!!!

Ensure that any electrical hazard is avoided.

- Electrical work must only be carried out by qualified electricians!
- Ensure that the power supply is switched off and secured against unauthorised switching before making any electrical connections.
- Safe installation and operation requires the pump to be properly earthed at the power supply's grounding terminals.
- Check that operating current, voltage and frequency comply with the specifications on the motor rating plate.
- The pump must be connected to the power supply by a solid cable equipped with an earthed plug-connection or a main power switch.
- Three-phase motors must be connected to an approved motor starter. The set nominal current must correspond to the electrical data specified on the pump motor rating plate.
- The supply cable must be routed in such a way that it does not contact the pipework and/or pump and motor casing.
- Pump and/or installation must be earthed in compliance with local regulations. A residual current device (RCD) may be used for extra protection.
- The power cable (3 phases + earth) must be fed through the threaded cable connection shown in black below. Non-assigned threaded cable connections must remain sealed with the plugs provided by the manufacturer.

Power (kW)														
0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22		
M25							M25				M32/M40			
														

- The input cables for sensor, external setpoint, [Ext.off] and [Aux] must be shielded.



- The electric characteristics (frequency, voltage, nominal current) of the frequency converter are specified on the pump identification label. Ensure that the frequency converter complies with the mains supply.
- The electric protection of the motor is integrated into the converter. The parameters must comply with the pump characteristics and must ensure the protection of pump and motor.
- In case of impedance between earth and neutral point, install a protection device upstream of the frequency converter.
- Provide a fused isolation switch (type gF) to protect the mains installation.



NOTE: If a residual current device (RCD) is installed for user protection, it must have a delay effect. Adjust it according to the current mentioned on the pump identification label.

NOTE: This pump is equipped with a frequency converter and may not be protected by a residual current device. Frequency converters can impair the function of residual current circuits.

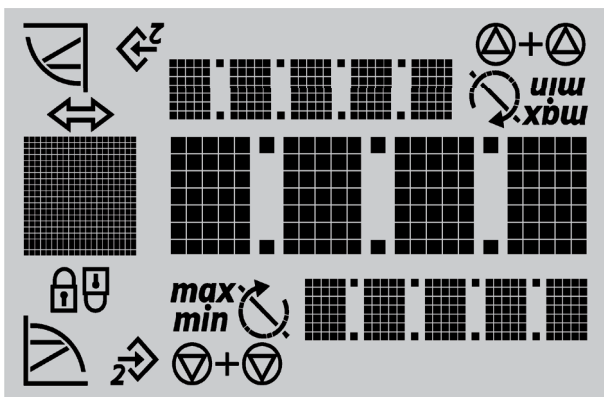
Exception: Residual current devices (RCDs) with selective and universal-current sensitivity may be used.

- Labelling: RCD
- Trigger current: > 30 mA.

- Use only power cables complying with applicable regulations.
- Max. permissible mains side fuse protection: 25 A.

Trigger characteristic of the fuses: B.

As soon as the power supply to the electronic module is established, a 2-second display test is carried out during which all characters on the display are shown.



NOTE: Requirements and limits for harmonic currents.

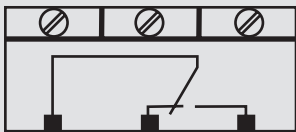
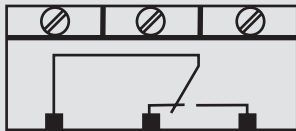
Pumps with the engine-power classes of 11 kW, 15 kW, 18.5 kW and 22 kW are equipment for professional usage. These pumps are subject to special connectivity conditions since a short-circuit ratio R_{sc} of 33 at the connecting point is not sufficient. The connection to the public low-voltage systems is regulated by the standard IEC 61000-3-12 – the basis for these pumps' rating is table 4 for (balanced) three-phase pumps under specified conditions. For all public connection points, the short-circuit power S_{sc} at the interface between the user's electrical installation and the public power system must be greater than or equal to the values in the table below. It is the responsibility of the installer or of the user of the pumps to ensure that the pump is operated properly, consultation the distribution network operator if necessary. If the pump is used within an industrial middle-voltage system, the connectivity conditions are the sole responsibility of the operator.

Motor power [kW]	Short circuit power S_{sc} [kVA]
11	1800
15	2400
18,5	3000
22	3500

By installing an appropriate harmonic filter between the pump and the power supply, the harmonic current content will be reduced, if needed.

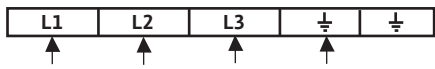
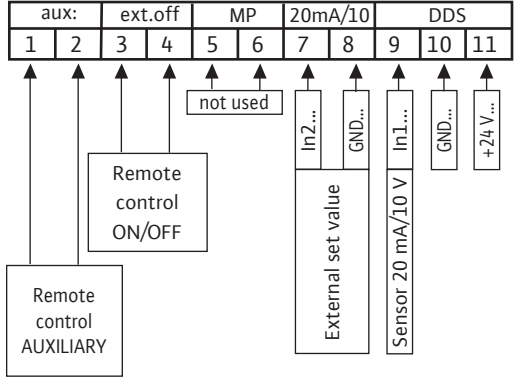
Connection terminal assignment.

- Remove the screws and take off the converter cover.

Designation	Assignment	Notes
L1, L2, L3	Mains connections voltage	Three-phase current 3 ~ IEC38
PE	Earth connections	0,55 0,75 1,1 1,5 2,2 3 4 5,5 7,5 11 15 18,5 22 x1 x2
IN1	Input sensor Mains connections voltage	Type of signal: Voltage (0 – 10 V, 2 – 10 V) Input resistance: $R_i \geq 10 \text{ k}\Omega$ Signal type: current (0 – 20 mA, 4 – 20 mA) Input resistance: $R_B = 500 \Omega$ Can be configured in the „Service“ menu <5.3.0.0>
IN2	External input setpoint	Type of signal: Voltage (0 – 10 V, 2 – 10 V) Input resistance: $R_i \geq 10 \text{ k}\Omega$ Signal type: current (0 – 20 mA, 4 – 20 mA) Input resistance: $R_B = 500 \Omega$ Can be configured in the „Service“ menu <5.4.0.0>
GND (x2)	Earth connections	For both input IN1 and IN2
+ 24 V	DC voltage for sensor	Max. load: 60 mA The terminal is short-circuit-proof.
Aux	Control input (Auxiliary) „Overriding Off“ for external potential-free switch	The pump can be switched on/off using the external potential-free contact. This input is provided for auxiliary functions, e.g. dry-running sensor, etc.
Ext. off	Control input (ON/OFF) „Overriding Off“ for external potential-free switch	The pump can be switched on/off using the external potential-free contact. In systems with a high cycling frequency (> 20 on/off switching cycles per day), on/off-cycling is to be performed via „Ext. off“.
SBM	„Available transfer“ relay 	In normal operation, the relay is activated when the pump is running or in standby. The relay is deactivated if an initial defect occurs or if the main power supply is disconnected (pump stops). Pump availability is signalled to the control box. Can be configured in the „Service“ menu <5.7.6.0> Contact load: Minimum 12 V DC, 10 mA Maximum: 250 V AC, 1 A
SSM	„Failures transfer“ relay 	If consecutive defects of the same type are detected (from 1 to 6 according to significance), the pump stops and this relay is activated (until manual intervention). Contact load: Minimum 12 V DC, 10 mA Maximum: 250 V AC, 1 A
PLR	Connection terminals at PLR	The optional IF-module PLR must be pushed into the multiplug in the connection area of the converter. The connection is protected against reversed polarity.
LON	Connection terminals at LON	The optional IF-module LON must be pushed into the multiplug in the connection area of the converter. The connection is protected against reversed polarity.



NOTE: Terminals IN1, IN2, GND and Ext. Off meet the requirements for „safe isolation“ (in acc. with EN61800-5-1) at the mains terminals as well as at SBM and SSM terminals (and vice versa).

Connection to mains supply	Power terminals
<p>Connect the 4-wire cable to the power terminals (phases + earth).</p>	 <p>A horizontal row of five terminals. The first three are labeled L1, L2, and L3. The last two are earth symbols. Arrows point upwards from each terminal.</p>
Connection of inputs / outputs	Input/output terminals
<ul style="list-style-type: none"> The input cables for sensor, external setpoint, [Ext.off] and [Aux] must be shielded. 	 <p>A diagram showing 11 terminals in a row, numbered 1 to 11. Above the terminals are labels: 'aux:' above 1-2, 'ext.off' above 3-4, 'MP' above 5-6, '20mA/10' above 7-8, and 'DDS' above 9-11. Below the terminals are various connection points: 'Remote control AUXILIARY' connected to 1-2; 'Remote control ON/OFF' connected to 3-4; 'not used' above 5-6; 'In2...' connected to 7; 'GND..' connected to 8; 'External set value' connected to 7-8; 'In1...' connected to 9; 'GND...' connected to 10; and '+24 V...' connected to 11. Arrows point from the connection boxes to the terminals.</p>
<ul style="list-style-type: none"> The remote control allows the pump to be switched On and Off (free contact), this function has priority over other functions. The remote control can be removed by bridging the terminals (3 and 4). 	<p>Example: Float switch, pressure gauge for dry-running, etc.</p>

„Speed control“ connection	
Setting the frequency manually:	
Setting the frequency via external control:	
„Constant pressure“ or „Variable pressure“ connection	
Control by pressure sensor: • 2 wires ([20 mA/10 V]/+24 V) • 3 wires ([20 mA/10 V] / 0 V/+24 V) and setpoint turning the rotary knob	
Control by pressure sensor: • 2 wires ([20 mA/10 V]/+24 V) • 3 wires ([20 mA/10 V] / 0 V/+24 V) and setpoint setting by external set value	
„P.I.D. control“ connection	
Control by sensor (temperature, flow rate, etc.): • 2 wires ([20 mA/10 V]/+24 V) • 3 wires ([20 mA/10 V] / 0 V/+24 V) and setpoint turning the rotary knob	
Control by sensor (temperature, flow rate, etc.): • 2 wires ([20 mA/10 V]/+24 V) • 3 wires ([20 mA/10 V] / 0 V/+24 V) and setpoint setting by external set value	



DANGER! Danger to life!

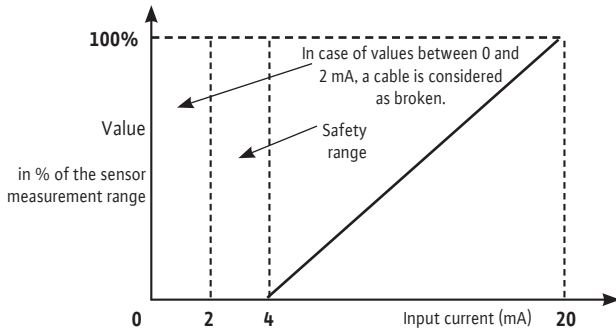
Hazardous contact voltage due to discharging converter capacitors.

- Before any intervention on the converter, wait for 5 minutes after disconnecting from the supply voltage.
- Ensure that all electrical connections and contacts are voltage-free.
- Verify the correct assignment of the connection terminals.
- Verify that pump and installation are properly earthed.

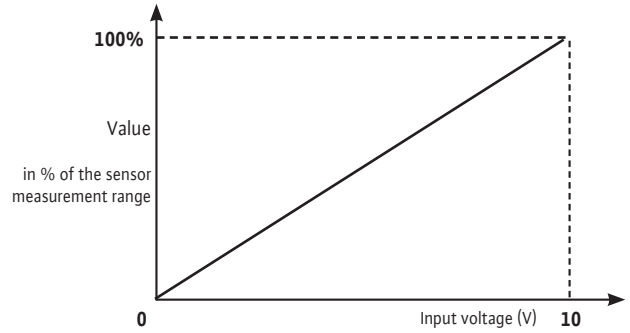
Control curves

IN1: Input signal in modes „Constant pressure“, „Variable pressure“ and „P.I.D. control“

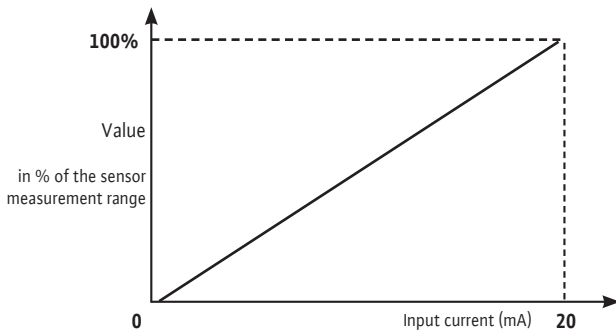
Sensor signal 4 – 20 mA



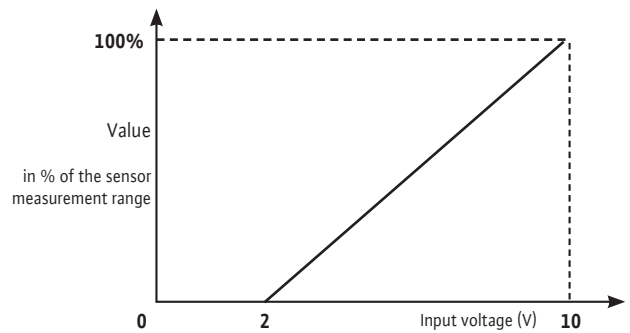
Sensor signal 0 – 10 V



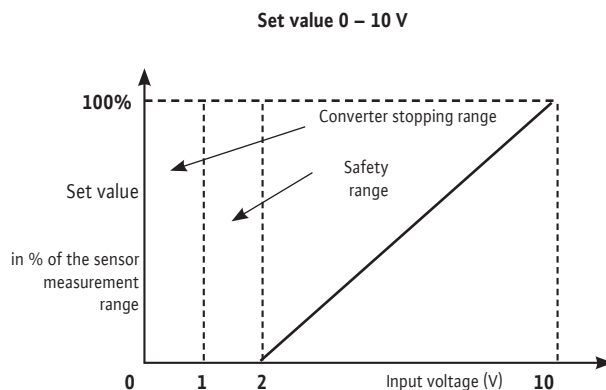
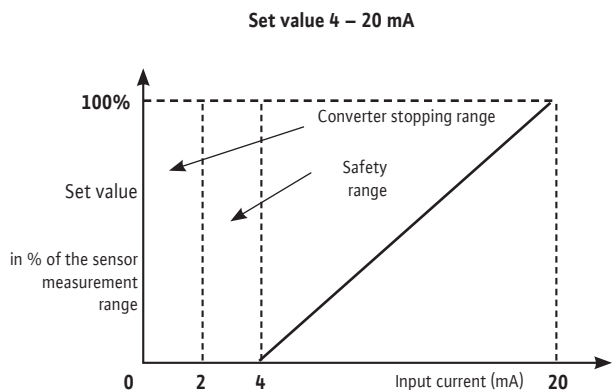
Sensor signal 0 – 20 mA



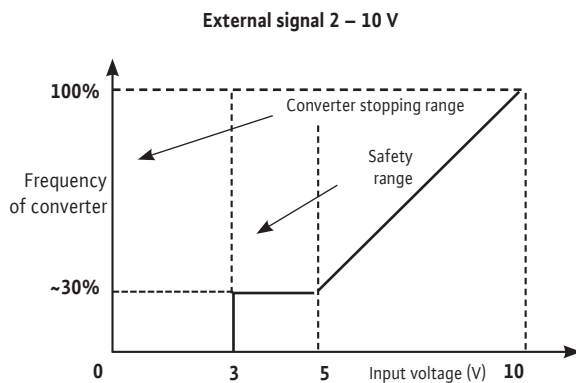
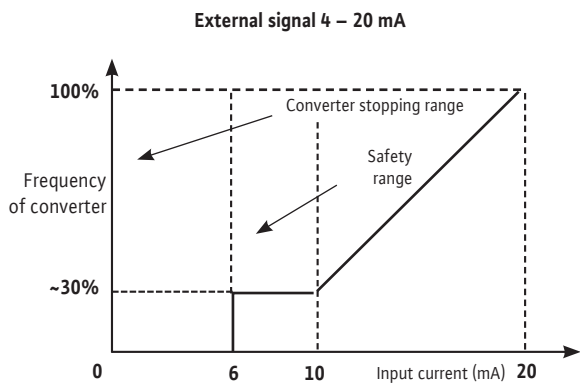
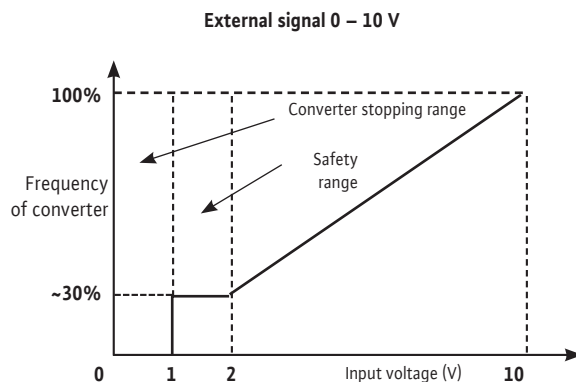
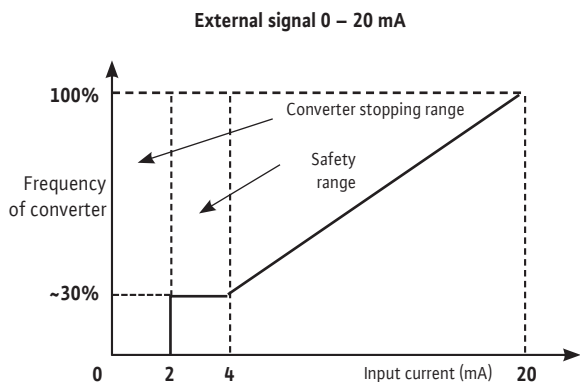
Sensor signal 2 – 10 V



IN2: Input of external set value control in mode „Constant pressure“, „Variable pressure“ and „P.I.D. control“



IN2: Input of external frequency control in mode „Speed control“



8. Commissioning

8.1 System priming and venting



CAUTION! Risk of damage to the pump!

Never operate the pump in a dry state.
Ensure that the system is primed before starting the pump.

8.1.1 Venting process – Operation with sufficient supply pressure (Fig. 3)

- Close the two guard valves (2, 3).
- Unscrew the venting plug (6a).
- Slowly open the guard valve on the suction side (2) and completely fill the pump.
- Tighten the venting plug after the air has escaped and pumped liquid begins to flow (6a).



WARNING!

If the pumped fluid is hot and under high pressure, the fluid escaping at the venting plug may cause burns or other injuries.

- Open the guard valve on the suction side completely (2).
- Start the pump and verify that the flow direction complies with the specification on the pump rating plate. If this is not the case, interchange two phases in the terminal box.



CAUTION! An incorrect flow direction will cause a poor pump performance and may damage the coupling.

- Open the guard valve on the discharge side (3).

8.1.2 Venting process – Pump in suction mode (Fig. 2)

- Close the guard valve on the discharge side (3). Open the guard valve on the suction side (2).
- Remove the filling plug (6b).
- Partially open the venting plug (5b).
- Fill pump and suction pipe with water.
- Ensure that there is no air trapped in the pump and suction pipe. Fill the system until all air is removed.
- Close the filling plug with the venting plug (6b).
- Start the pump and verify that the flow direction complies with the specification on the pump rating plate. If this is not the case, interchange two phases in the terminal box.



CAUTION! An incorrect flow direction will cause a poor pump performance and may damage the coupling.

- Slightly open the guard valve on the discharge side (3).
- Unscrew the venting plug from the filling plug to remove the air (6a).
- Tighten the venting plug when the air has escaped and pumped liquid begins to flow.



WARNING!

If the pumped fluid is hot and under high pressure, the liquid escaping at the venting plug may cause burns or other injuries.

- Fully open the guard valve on the discharge side (3).
- Close the venting plug (5a).

8.2 Starting the pump



CAUTION! Risk of damage to the pump!

Never operate the pump at zero flow (closed discharge valve).



WARNING! Risk of injury!

Coupling guards must be in place and secured by all relevant fasteners when the pump is running.



WARNING! Harmful noise!

High-power pumps may emit a high noise level. Use appropriate protection when staying close to the pump for any extended period.



WARNING!

The installation must be laid out in such a way that there is no risk of injury in case of liquid leakage (e.g. caused by mechanical seal failure).

8.3 Operation with frequency converter

8.3.1 Control elements

The converter is controlled using the following control elements:

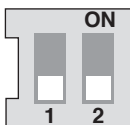
Rotary knob



Selecting a new parameter only requires rotating the knob in direction „+“ to the right or „-“ to the left.

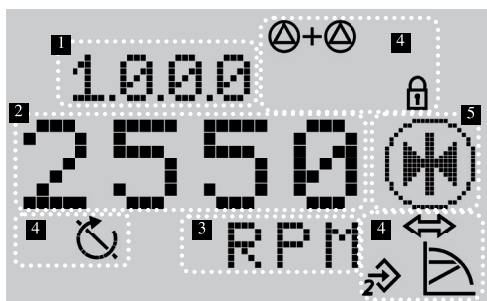
- A short impulse on the rotary knob confirms this new setting.

Switches



- This converter has a block with two switches with two positions (Fig. A1, Pos. 1):
- Switch 1 switches between „OPERATION“ mode [switch 1->OFF] and „SERVICE“ mode [switch 1->ON]. Position „OPERATION“ enables the selected mode and prevents access to parameter input (normal operation). Position „SERVICE“ is used to enter the parameters for different operations.
- Switch 2 activates or deactivates the „Access lock“ (see section 8.5.3).

8.3.2 Display structure



Pos.	Description
1	Menu number
2	Value display
3	Units display
4	Standard symbols
5	Icon display

8.3.3 Description of standard symbols

Symbol	Description
	Operation in „Speed control“ mode.
	Operation in „Constant pressure“ or „P.I.D. control“ mode.
	Operation in „Variable pressure“ or „P.I.D. control“ mode.
	Access locked. When this symbol appears, current settings or measurements cannot be changed. The information displayed is for reading purposes only.
	BMS (Building Management System) PLR or LON is active.
	Pump is running.
	Pump has stopped.

8.3.4 Display

Display status page

- The status page appears as the default page of the display. The currently set setpoint is displayed. Basic settings are displayed by symbols.





Example of display status page



NOTE: If the rotary knob is not activated within 30 seconds in any of the menus, the display returns to the status page without saving the change.

Navigation element

- The menu structure allows to call the functions of the converter. A number is attributed to every menu and submenu.
- Turn the rotary knob to scroll through any menu level (e.g. 4000 -> 5000).
- Blinking elements (value, menu number, symbol or icon) allow the selection of a new value, a new menu number or a new function.

Symbol	Description
	When the arrow appears: • Press the rotary knob to access the submenu (e.g. 4000 -> 4100).
	When the arrow „return“ appears: • Press the rotary knob to access the next higher menu (e.g. 4150 -> 4100).

8.3.5 Menu description

List (Fig. A5)

<1.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Adjustment of the setpoint, possible for both cases.
SERVICE	ON	

- Turn the rotary knob to adjust the setpoint. The display changes to menu <1.0.0.0> and the setpoint starts flashing. Rotate the rotary knob further (or use the arrows) to increase or decrease the value.
- Press the rotary knob to confirm the change, the display returns to the status page.

<2.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Reading of operating modes only.
SERVICE	ON	Setting of operating modes.

- The available operating modes are „Speed control“, „Constant pressure“, „Variable pressure“ and P.I.D control.

<3.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Setting the pump ON/OFF.
SERVICE	ON	

<4.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Read-only display of the „Information“ menu.
SERVICE	ON	

- Menu „Information“ displays measuring, device and operating data (Fig. A6).

<5.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Read-only display of the „Service“ menu.
SERVICE	ON	Setting for „Service“ menu.

- Menu „Service“ provides access to the converter parameter setting.

<6.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Display of the fault page.
SERVICE	ON	

- If one or several defects occur, the defects page appears.
The letter „E“ followed by a three digit code appears (see section 11).

<7.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Display of „Access lock“ symbol.
SERVICE	ON	

- The „Access lock“ is available when switch 2 is in the ON position.



CAUTION! Risk of material damage!

Inadequate setting changes may cause pump operation faults which may lead to material damage of the pump or installation.

- Settings in „SERVICE“ mode should only be made during commissioning and by qualified personnel only.

Fig. A5

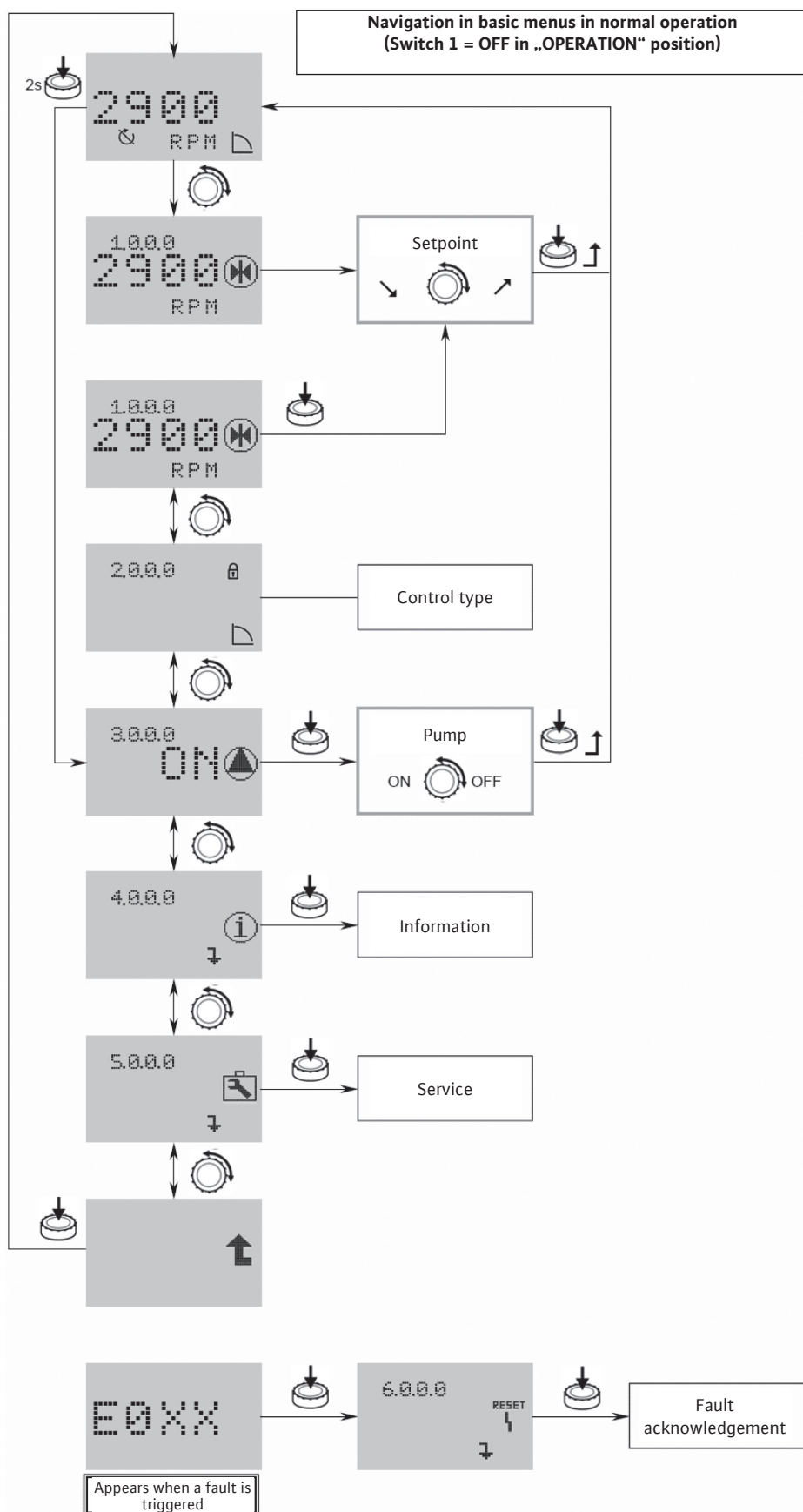
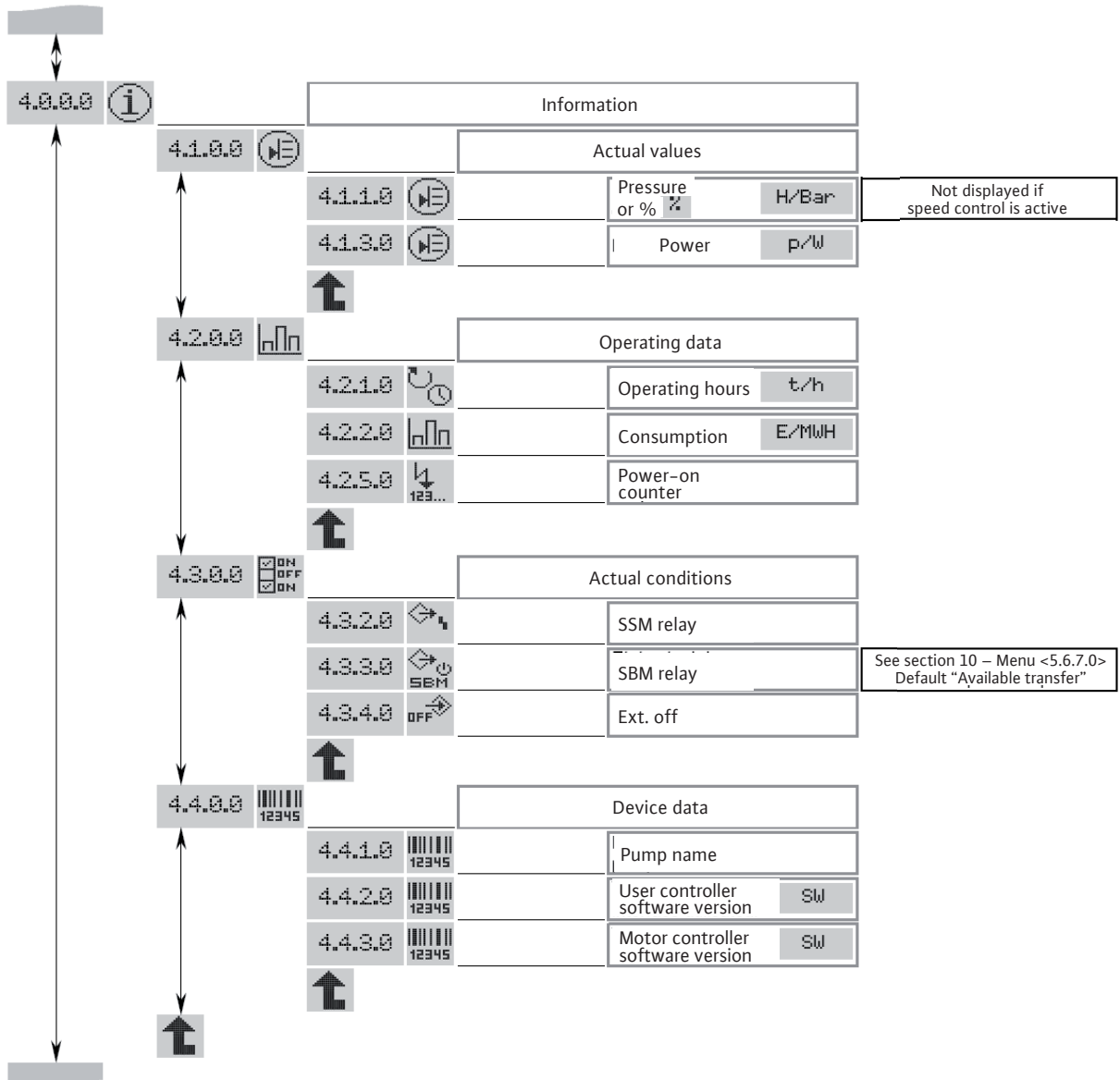


Fig. A6

Navigation in menu <4.0.0.0> „Information“



Parameterisation of menu <2.0.0.0> and <5.0.0.0>

In „SERVICE“ mode, menu parameters <2.0.0.0> and <5.0.0.0> can be adjusted.

The following two setting modes exist:

- „**Easy Mode**“: provides quick access to the 3 operating modes.
- „**Expert Mode**“: provides access to all existing parameters.
- Set switch 1 to the ON position (Fig. A1, Pos. 1).
- „SERVICE“ mode is activated.
This symbol flashes on the status page of the display (Fig. A7).

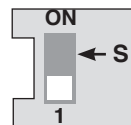
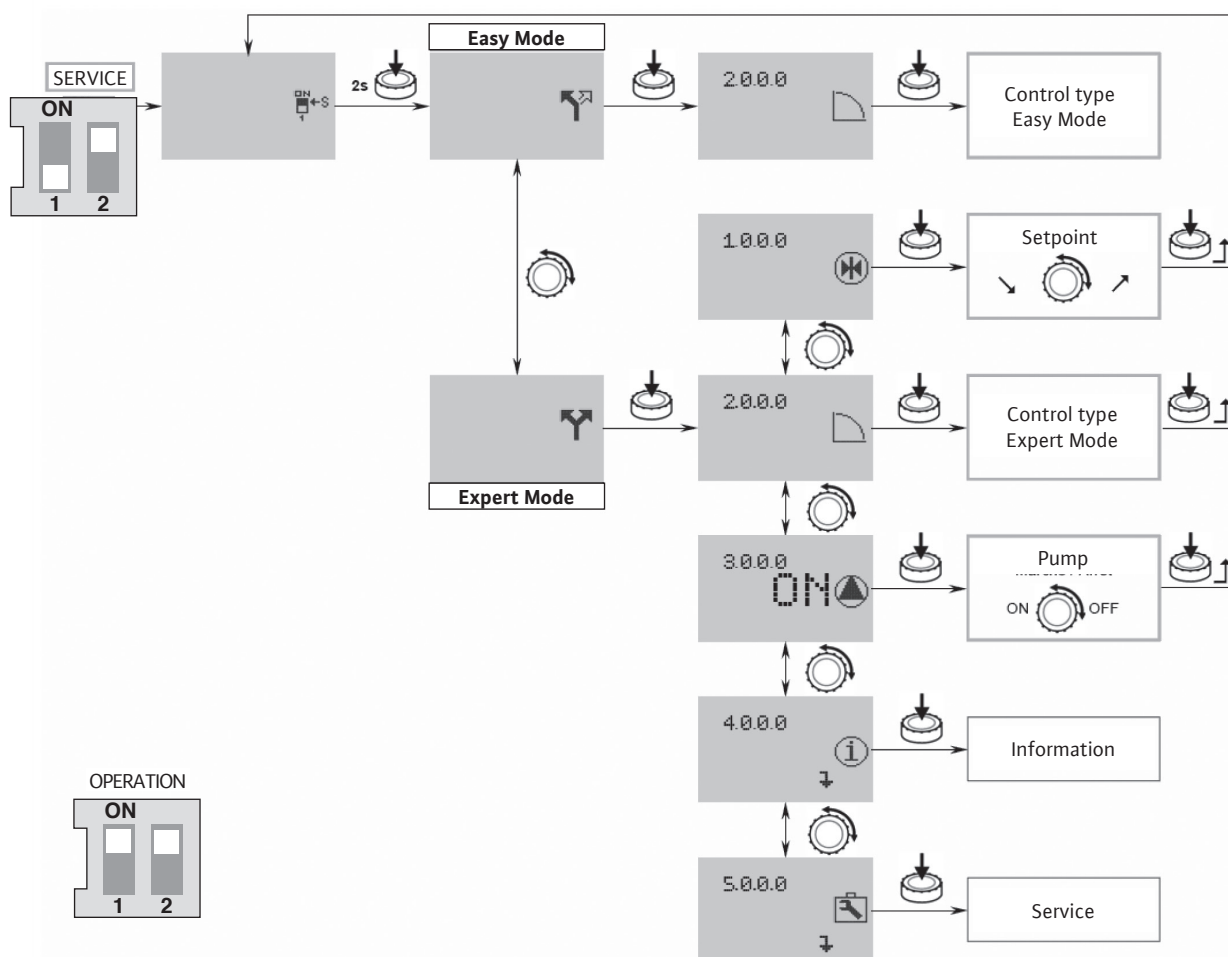


Fig. A7



Easy Mode

- Press the rotary knob within 2 seconds. The symbol „Easy Mode“ appears (Fig. A7).
- Press the rotary knob to confirm the selection. The display changes to menu <2.0.0.0>.
- „Easy Mode“ facilitates the quick setting of the 3 operating modes (Fig. A8)
- Speed control“
- „Constant pressure“/“Variable pressure“
- „P.I.D. control“
- After setting, set switch 1 to the OFF position (Fig. A1, Pos. 1).



Expert Mode

- Press the rotary knob within 2 seconds. Go to Expert mode, the symbol „Expert Mode“ appears (Fig. A7).
- Press the rotary knob to confirm the selection. The display changes to menu <2.0.0.0>.
- First, select the operating mode in menu <2.0.0.0>.
- „Speed control“
- „Constant pressure“/“Variable pressure“
- „P.I.D. control“
- Then, in menu <5.0.0.0>, the Expert mode provides access to all converter parameters (Fig. A9).
- After setting, set switch 1 to the OFF position (Fig. A1, pos. 1).



Fig. A8

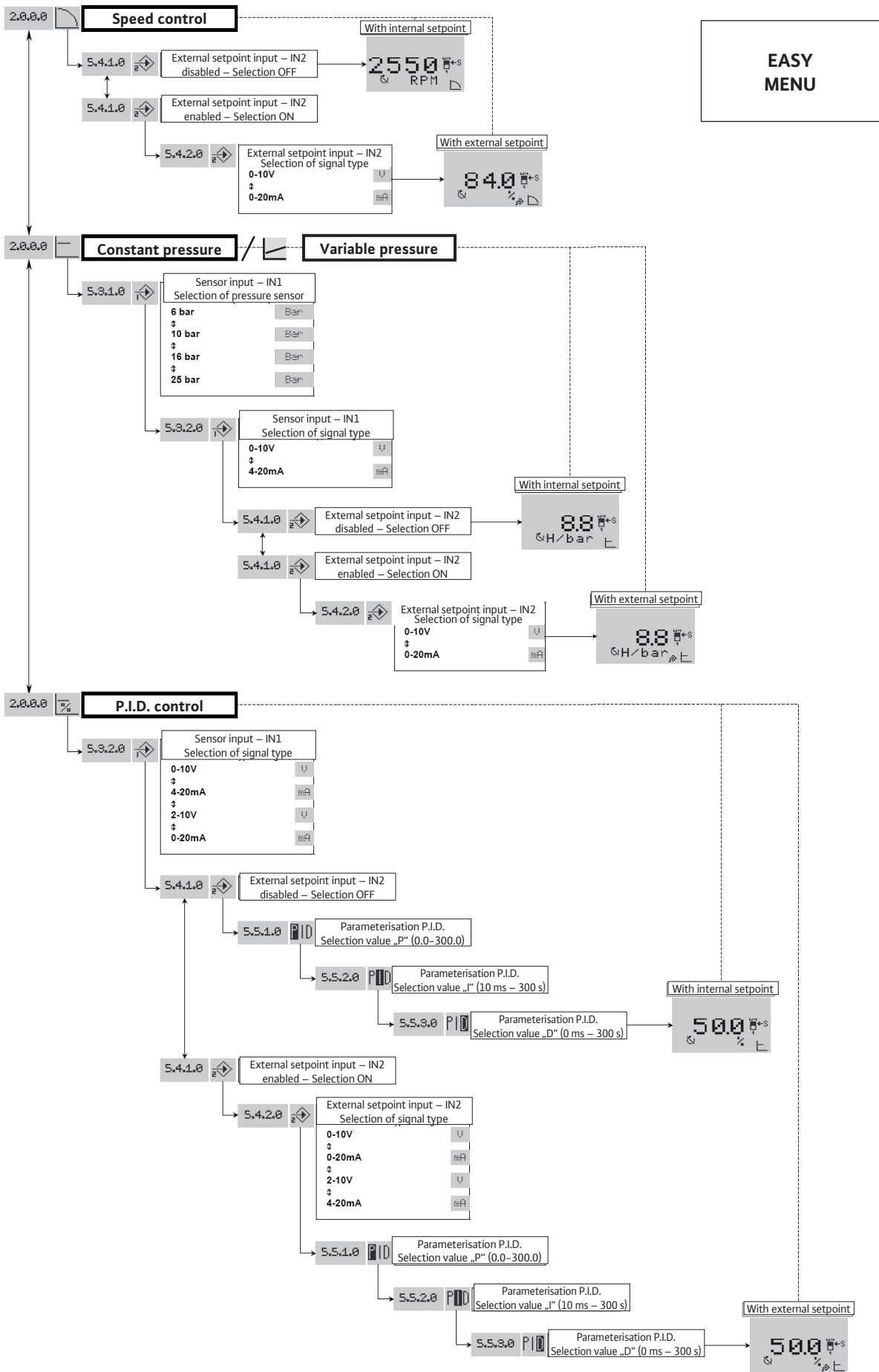
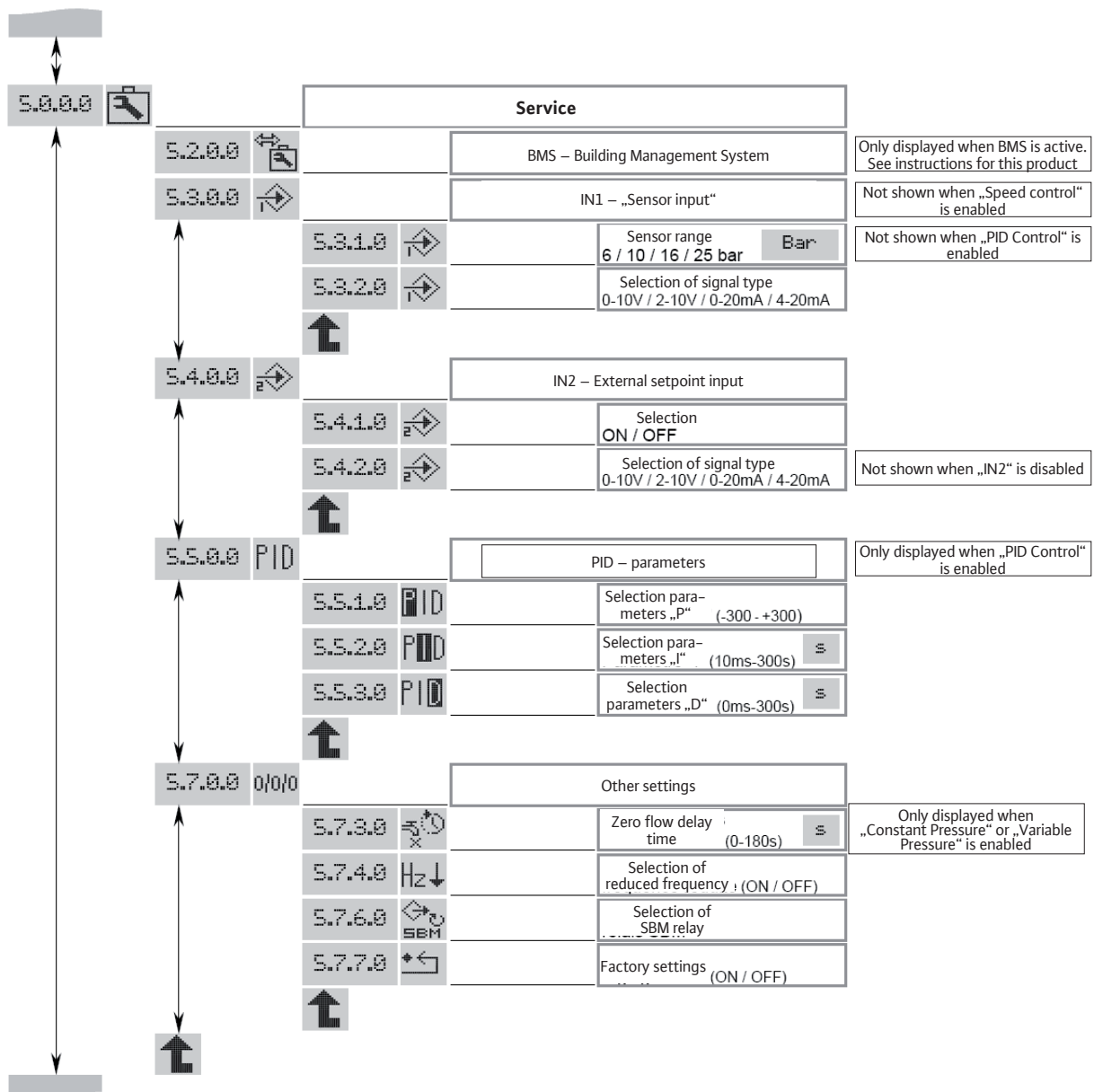


Fig. A9

EXPERT MENU



Access lock

Function „Access lock“ can be used to lock the pump settings.

To activate or deactivate this function, proceed as follows:

- Set switch 2 to the ON position (Fig. A1, Pos. 1). Menu <7.0.0.0> is called up.
- Turn the rotary knob to enable or disable the locking function. The current state of the locking function is indicated by the following symbols:



Lock enabled: Parameters are locked, menus are accessible in read-only mode only.



Lock disabled: Parameters can be changed, access to menus is allowed to make setting.

- Return switch 2 to the OFF position (Fig. A1, Pos. 1). The display returns to the status page.

8.3.6 Configurations



NOTE: If the pump is supplied as separate part and as an integral part of a system assembled by us, the standard configuration mode is „Speed control“.

„Speed control“ mode (Fig. 2, 3)

Setting the frequency manually or by external control:

- For starting up, we recommend to set the motor speed to 2400 RPM.

„Constant pressure“ and „Variable pressure“ mode (Fig. A2, A3, A7)

Regulation by pressure sensor and setpoint (internal or external). In case of variable pressure mode put off the zero flow delay time in menu 5.7.3.0.

- The addition of a pressure sensor (with tank; sensor kit supplied as accessory) allows the pump to be pressure-controlled (with no water in the tank, pressurise the tank to a pressure of 0.3 bar below the pressure control value of the pump).
- The accuracy of the sensor shall be $\leq 1\%$, and it should be used between 30 % and 100 % of the measuring range. The tank must have a usable volume of at least 8 litres.
- For starting up, we recommend a pressure set value of 60 % of the maximum pressure.

„P.I.D. control“ mode

Control by a sensor (temperature, flow rate, etc.) by P.I.D. control and setpoint (internal or external).

9. Maintenance

All servicing must be performed by an authorized service representative only!



WARNING! Risk of electrical shock!

Ensure that any electrical hazard is avoided. Ensure that the power supply is switched off and secured against unauthorised switching before performing any work on the electric system.



WARNING! Risk of scalding!

In case of high water temperatures and high system pressures, close the insulating valves upstream and downstream of the pump. First, allow pump to cool down.

- These pumps are maintenance free. Nevertheless a regular check is recommended every 15 000 hours.
- In option, mechanical seal could be easily replace on some models thanks to its cartridge seal design. Insert its adjusting wedge in its housing (see fig. 6) once mechanical seal position is set.
- Always keep the pump perfectly clean.
- Pumps which are not being used during periods of frost should be drained to avoid damage: Close the guard valves, open completely the drain-priming plug and the air bleed screw.
- Service life : 10 years depending on the operating conditions and whether all requirements described in the operation manual have been met.

10. Faults, causes and remedies



WARNING! Risk of electrical shock!

Ensure that any electrical hazard is avoided.
Ensure that the power supply is switched off and secured against unauthorised switching before performing any work on the electric system.



WARNING! Risk of scalding!

In case of high water temperatures and high system pressures, close the insulating valves upstream and downstream of the pump.
First, allow pump to cool down.

Fault	Possible causes	Remedies
Pump does not operate	No current	Check fuses, wiring and connections
	Thermistor tripping device has tripped cutting off power	Eliminate any cause of overloading of the motor
Pumps is running but output is insufficient	Incorrect direction of rotation	Check the direction of rotation of the motor and correct it if necessary
	Parts of the pump are obstructed by foreign bodies	Check and clean the pump
	Air in suction pipe	Seal the suction pipe so that it is airtight
	Suction pipe too narrow	Install a larger suction pipe
	Valve opening is insufficient	Open the valve properly
Pump output is erratic	Air inside the pump	Vent the pump; check that the suction pipe is airtight. If required, start the pump for 20 – 30 s – open the venting plug to remove air – close the venting plug and repeat the procedure several times until no more air escapes from the pump
Pump vibrates or is noisy	Foreign bodies inside the pump	Remove the foreign bodies
	Pump is not correctly attached to ground	Retighten the screws
	Bearing damaged	Call Wilo customer service
Motor overheats, motor protection trips	Open circuit in one of the phases	Check fuses, wiring and connections
	Ambient temperature too high	Provide cooling
Mechanical seal leaks	Mechanical seal is damaged	Replace the mechanical seal
Flow is erratic	In „Constant pressure“ or „Variable pressure“ mode, the pressure sensor is not adequate	Replace with a sensor with matching pressure range and accuracy
In „Constant pressure“ mode, the pump does not stop if the flow is zero	The non-return valve is not tight	Clean it or replace it
	The non-return valve is not adequate	Replace it by an adequate non-return valve
	Low tank capacity due to installation	Change it or add a tank to the installation

If the fault cannot be resolved, please contact the Wilo customer service.

Faults must be remedied by qualified personnel only!
 Observe the safety instructions in section 9 Maintenance!

Relays

The converter is fitted with 2 output relays serving as interface with the centralized control, e.g.: control box, pump control.

SBM relay:

This relay can be configured in „Service“ menu < 5.7.6.0 > in 3 operating states.



State: 1 (set by default)

„Available transfer“ relay (normal operation of this pump type).

The relay is activated when the pump is running or in standby.

The relay is deactivated if an initial defect occurs or if the main power supply is disconnected (pump stops). Pump availability is signalled to the control box.



State: 2

„Run transfer“ relay.

The relay is activated when the pump is running.



State: 3

„Power on transfer“ relay.

The relay is activated when the pump is connected to the network.

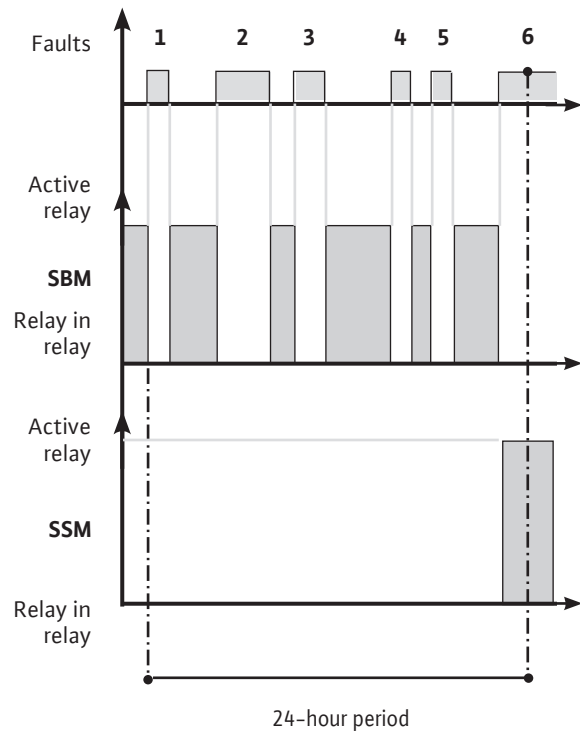
SSM relay:

„Failures transfer“ relay.

If consecutive defects of the same type are detected (from 1 to 6 according to significance), the pump stops, and the relay is activated (until manual intervention).

Example: 6 defects with a variable time limit within 24 hours.

State of SBM relay is „Available transfer“.



10.1 Faults table

All incidents hereafter mentioned will have the following effect:

- Deactivation of the SBM relay (when parameterised in „available transfer“ mode).
- Activation of the SSM relay „failure transfer“ when the maximum quantity of one fault type is reached within a 24-hour period.
- Lighting of a red LED.

Fault number	Response time before fault signalling	Time before consideration of fault, after signalling	Waiting period before automatic restart	Max. faults within 24 hours	Faults Possible causes	Remedies	Waiting period before reset
E001	60 s	Immediately	60 s	6	Pump is in overload condition, defective	Density and/or viscosity of the conveyed liquid is too high	300 s
					Pump is obstructed by particles	Dismantle the pump and replace or clean the defective components	
E004 (E032)	~ 5 s	300 s	Immediately if defective deleted	6	Converter supply experiences undervoltage	Check the converter terminals: • Fault if network < 330 V	0s
E005 (E033)	~ 5 s	300 s	Immediately if defective deleted	6	Converter supply experiences overvoltage	Check the converter terminals: • Fault if network > 480 V (0,55 to 7,5 kW) • Fault if network > 506V (11 to 22kW)	0s
E006	~ 5 s	300 s	Immediately if defective deleted	6	A supply phase is missing	Check the supply	0s
E007	Immediately	Immediately	Immediately if defective deleted	No limit	The converter runs like a generator. Warning signal, pump is not stopped	Pump veers, check tightness of the non-return valve	0s
E010	~ 5 s	Immediately	No restart	1	Pump is locked	Dismantle the pump, clean it and replace defective parts. It may be a mechanical failure of the motor (bearings)	60 s
E011	60 s	Immediately	60 s	6	Pump is no longer primed or is running dry	Prime the pump by filling it (see section 9.3) Check the tightness of the foot valve	300 s
E020	~ 5 s	Immediately	300 s	6	Motor overheats	Clean the cooling ribs of the motor	300 s
					Ambient temperature exceeds than +50 °C	The motor is designed for operation at an ambient temperature of +50 °C	
E023	Immediately	Immediately	60 s	6	Motor has short-circuit	Dismantle the frequency converter of the pump, check and replace it, if required	60 s
E025	Immediately	Immediately	No restart	1	Missing phase at the motor	Check the connection between motor and converter	60 s
E026	~ 5 s	Immediately	300 s	6	The thermal sensor of the motor is defective or is not correctly connected	Dismantle the frequency converter of the pump, check and replace it, if required	300 s
E030 E031	~ 5 s	Immediately	300 s	6	Converter overheats	Clean the cooling ribs at the rear and under the converter as well as the fan cover	300 s
					Ambient temperature exceeds than +50 °C	The converter is design to operate at an ambient temperature of +50 °C	
E042	~ 5 s	Immediately	No restart	1	The sensor cable (4 – 20 mA) is interrupted	Check the correct supply and the cable connection of the sensor	60 s
E050	300 s	Immediately	Immediately if defective deleted	No limit	BMS communication time-out	Check the connection.	0s
E070	Immediately	Immediately	No restart	1	Internal communication error	Contact after-sales technician	60 s
E071	Immediately	Immediately	No restart	1	EEPROM error	Contact after-sales technician	60 s
E072	Immediately	Immediately	No restart	1	Problem inside converter	Contact after-sales technician	60 s
E075	Immediately	Immediately	No restart	1	Inrush-current relay defective	Contact after-sales technician	60 s
E076	Immediately	Immediately	No restart	1	Current sensor defective	Contact after-sales technician	60 s
E099	Immediately	Immediately	No restart	1	Unknown pump type	Contact after-sales technician	Power off/on

10.2 Acknowledging faults



CAUTION! Material damage!

Only acknowledge faults after they have been resolved.

- Faults may be resolved by qualified technicians only.
- When in doubt, contact the manufacturer.

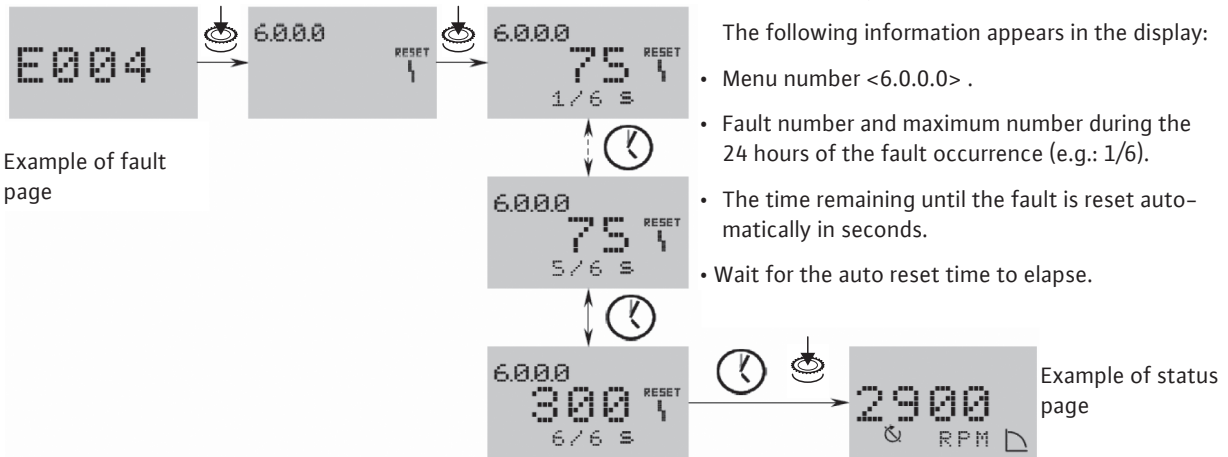
In case of a fault, the fault page is displayed instead of the status page.

To acknowledge a fault, proceed as follows.

- Press the rotary knob.

The following information appears in the display:

- Menu number <6.0.0.0> .
- Fault number and maximum number during the 24 hours of the fault occurrence (e.g.: 1/6).
- The time remaining until the fault is reset automatically in seconds.
- Wait for the auto reset time to elapse.



A timer runs inside the system. The remaining time (in seconds) until the fault is automatically acknowledged is displayed.

- When the maximum number of faults is reached and the last timer has elapsed, press the rotary knob to acknowledge.

The display returns to the status page.



NOTE: If time for the resolution of the defect remains after the fault signal (e.g. 300 s), then the fault must always be acknowledged manually. The auto reset timer is inactive and „- -“ is displayed.

11. Spare parts

All spare parts must be ordered through the Wilo customer service.

Please state all data shown on the rating plate with each order to avoid queries and incorrect orders.

The spare parts catalogue is available at www.wilo.com.

12. Safe disposal

Proper disposal and recycling of this product prevents damage to the environment and risks to personal health.

Disposal in accordance with the regulations requires the product to be drained and cleaned. Lubricants must be collected. The pump components are to be separated according to material (metal, plastic, electronics).

1. Use public or private disposal organizations when disposing of all or part of the product.
2. For more information on proper disposal, please contact your local council or waste disposal office or the supplier from whom you obtained the product.



NOTE: The pump must not be disposed of along with household waste. Further information on recycling can be found at www.wilo-recycling.com.

Subject to change without prior notice.

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