

Pioneering for You

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Wilo-Helix EXCEL Complete



Installation and operation manual

Fig. 1

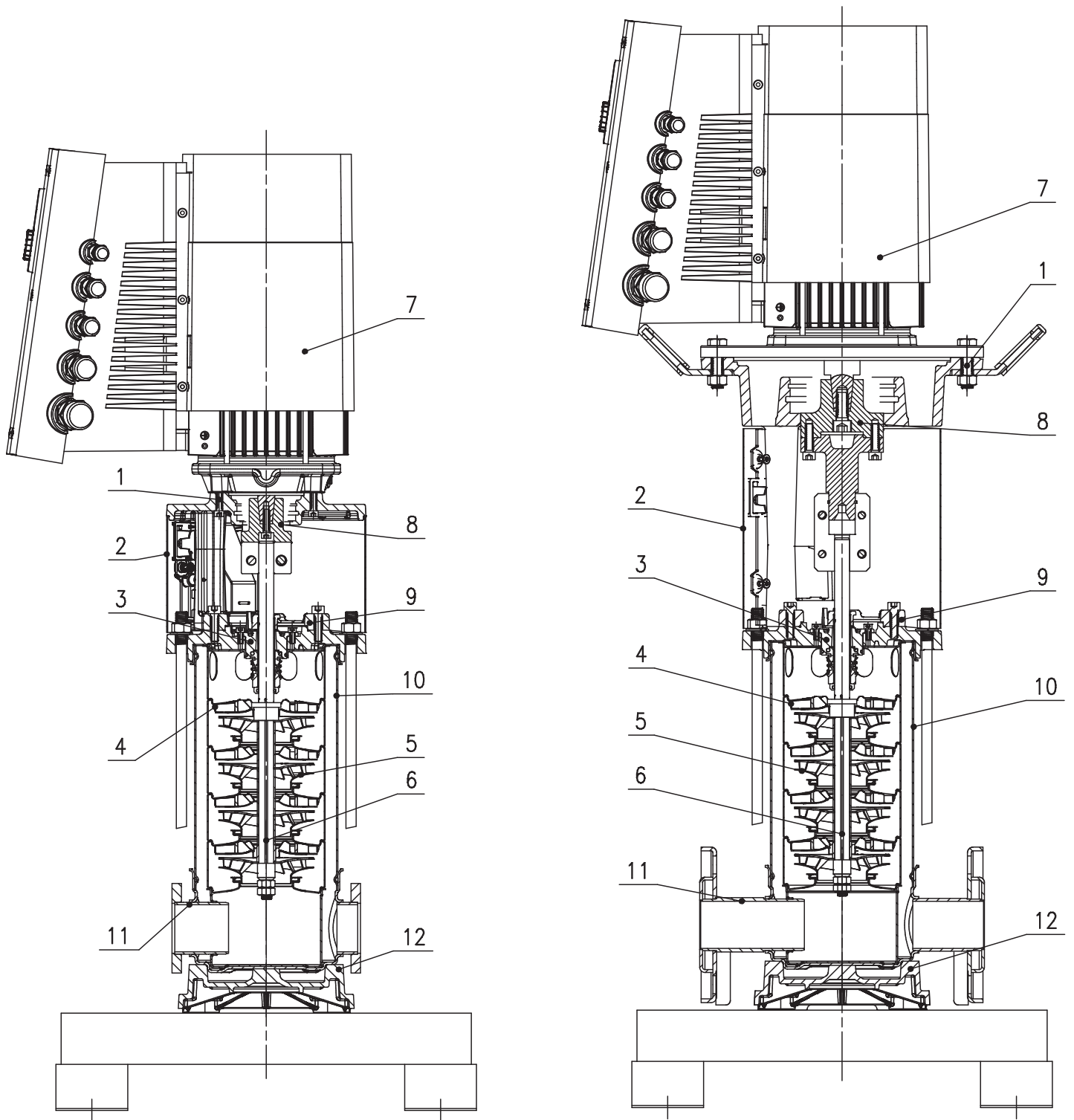


Fig. 2

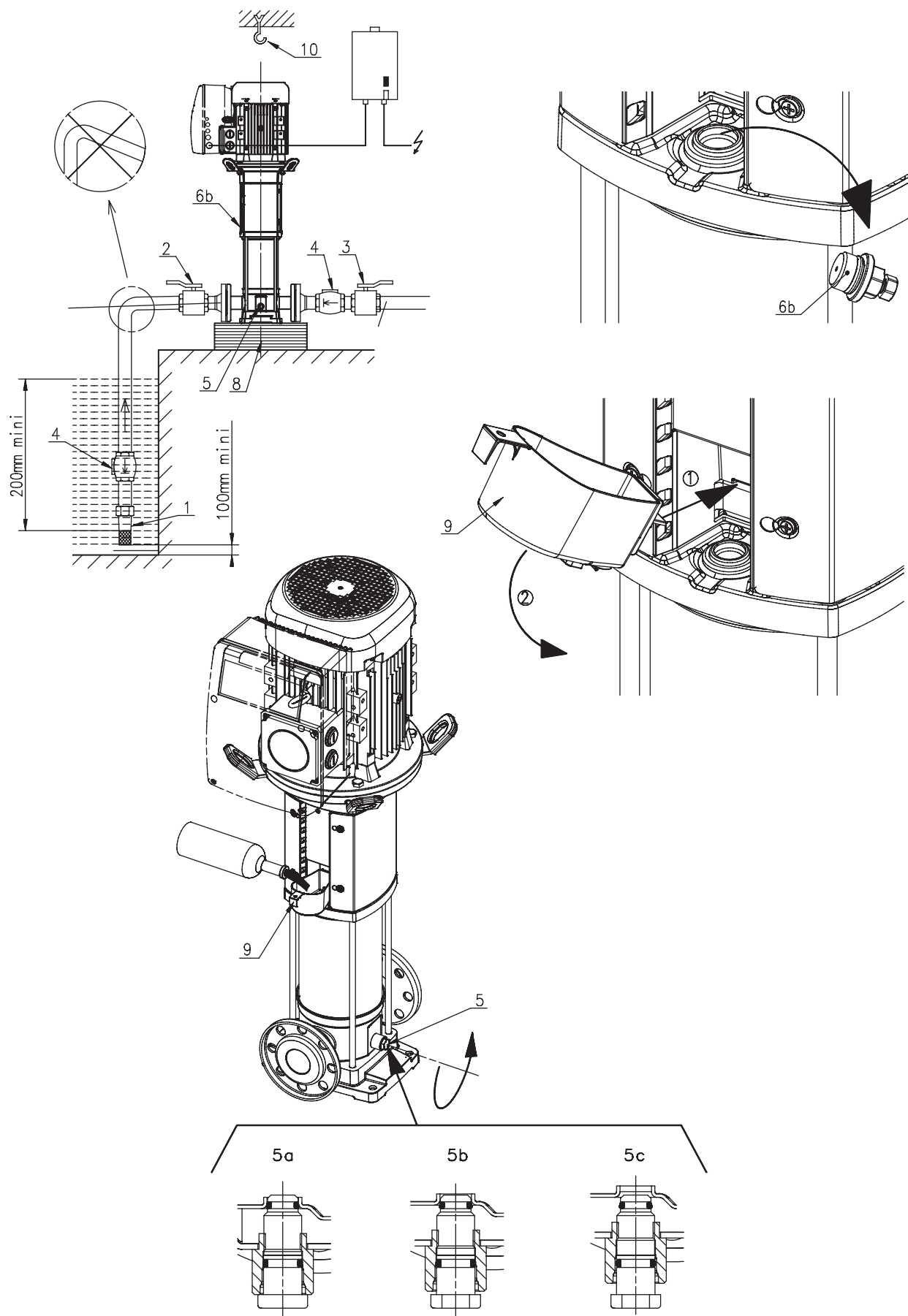


Fig. 3

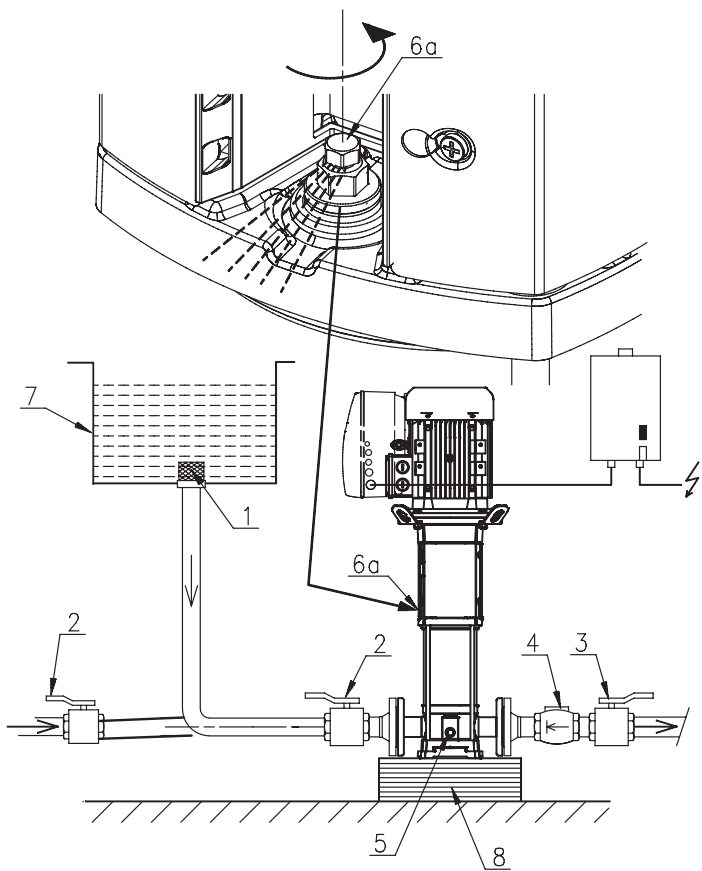


Fig. 4

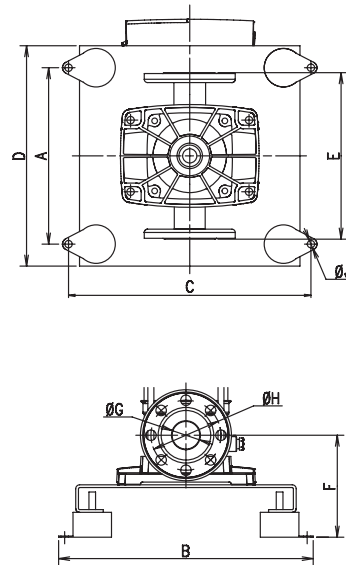


Fig. A1

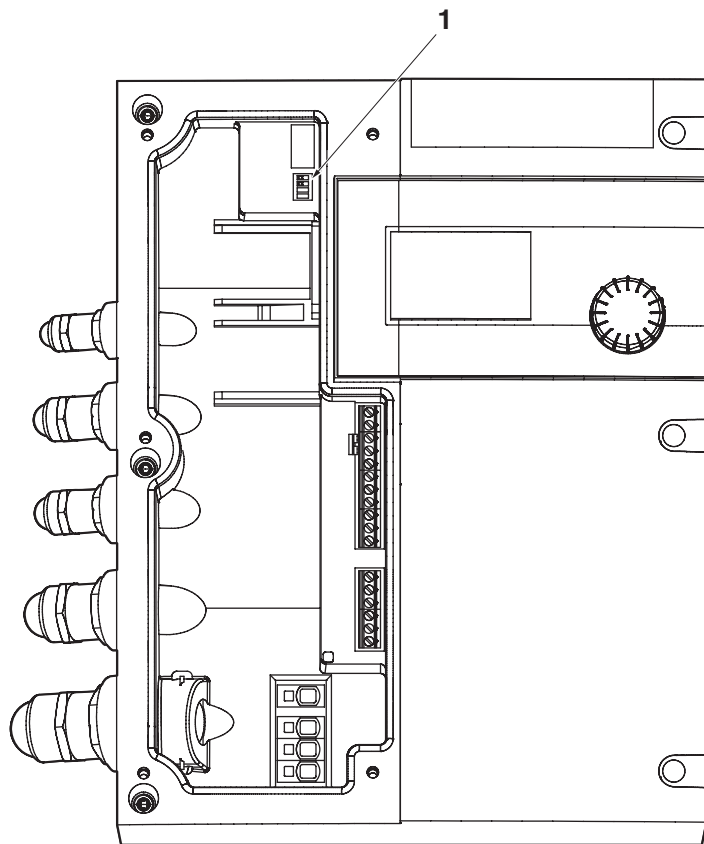


Fig. A2

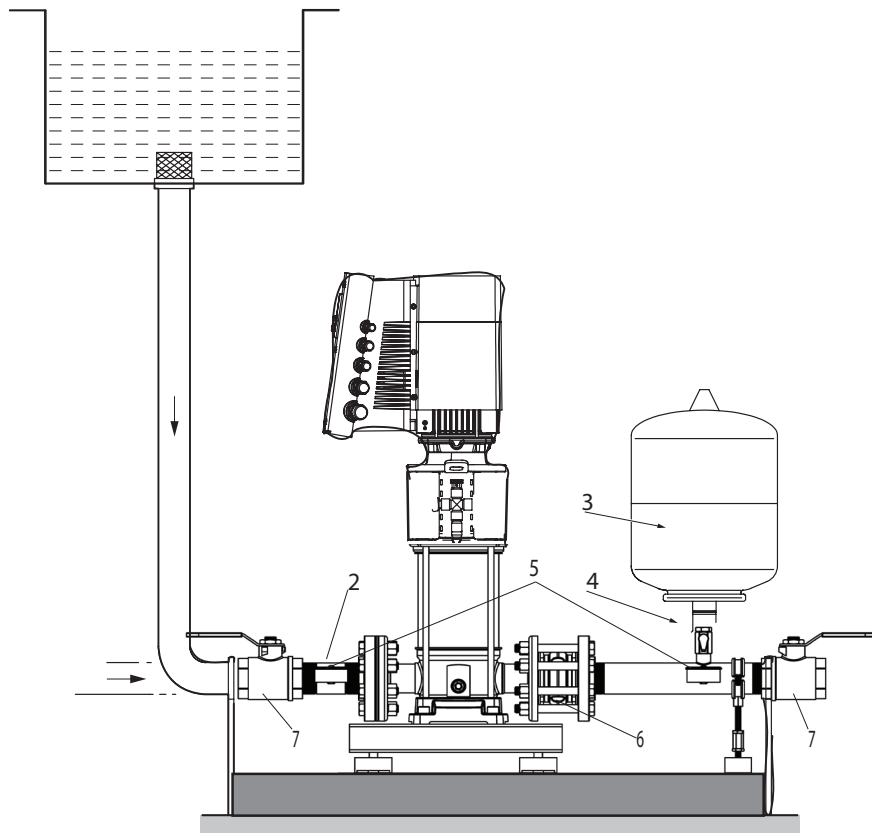


Fig. A3

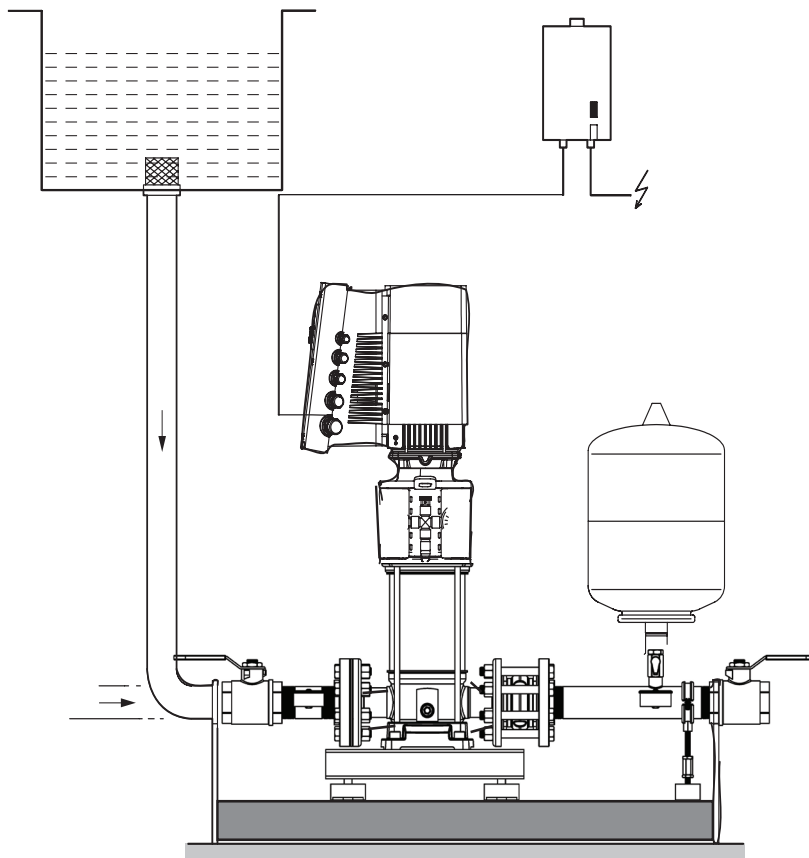


Fig. A4

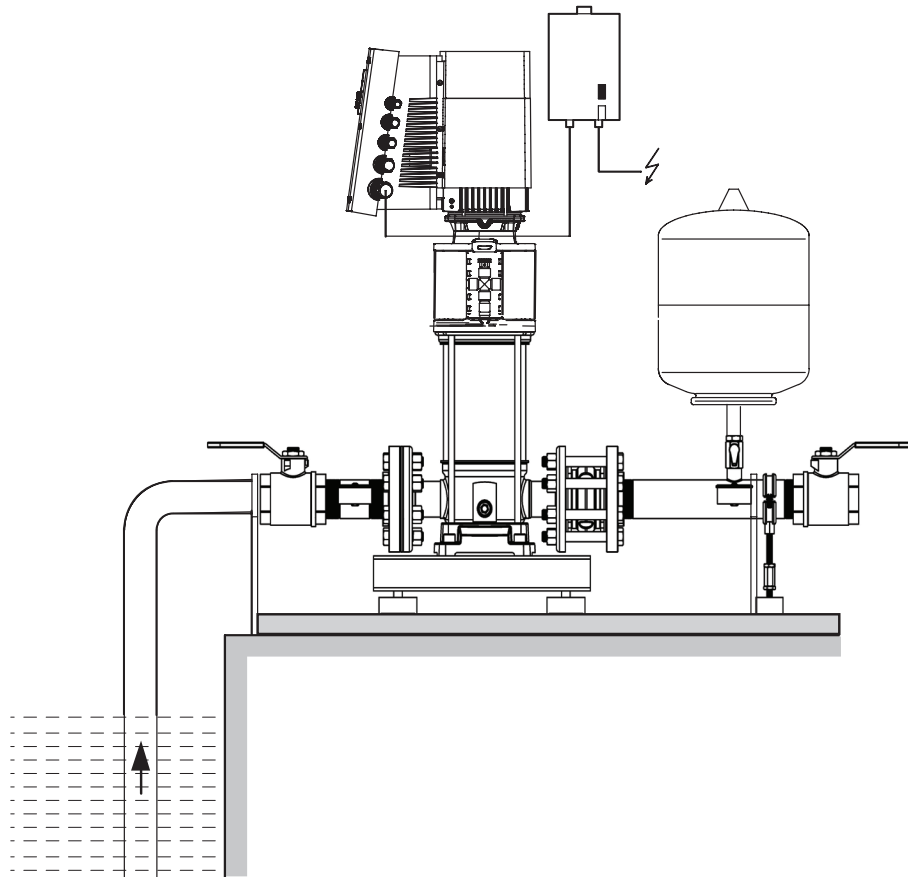


Fig. A5

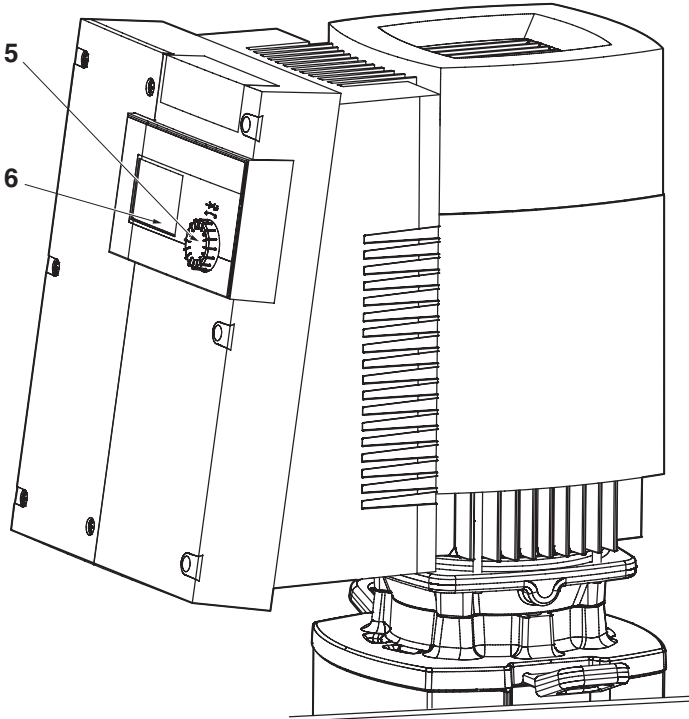
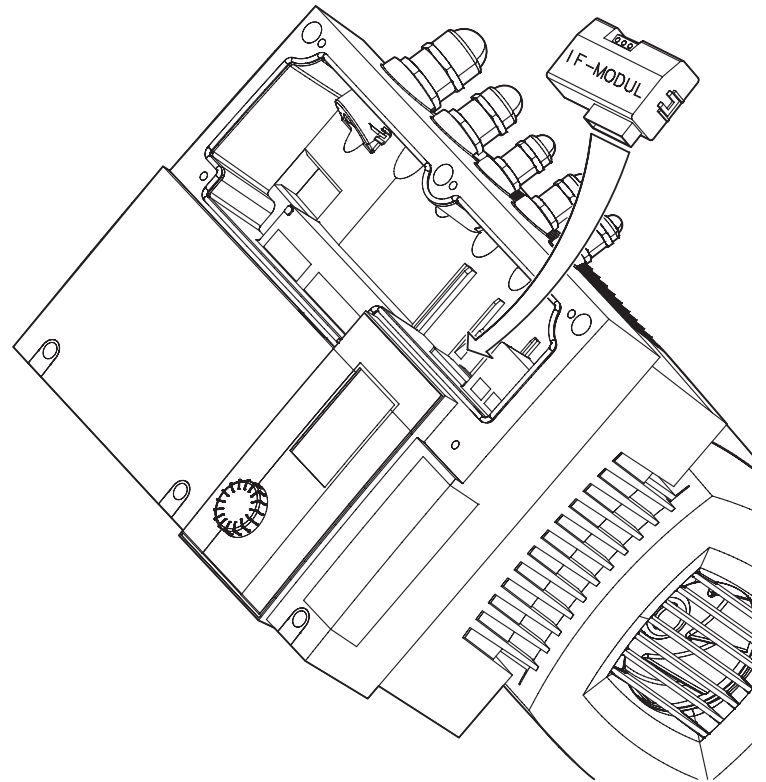


Fig. A6



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.

2. Safety

These instructions contain important information which must be followed when installing and operating the pressure boosting package. It is therefore imperative that they be read by both the installer and the operator before the pump is installed or operated.

Both the general safety instructions in this section and the more specific safety points in the following sections should be observed.

2.1 Instruction symbols used in this operating manual

Symbols



General danger symbol



Hazards from electrical causes



NOTE: ...

Signals words:

DANGER! Imminently hazardous situation. Will result in death or serious injury if not avoided.

WARNING! Risk of (serious) injury. 'Warning' implies that failure to comply with the safety instructions is likely to result in (severe) personal injury.

CAUTION! Risk of damage to the pump/installation. 'Caution' refers to potential product damage if this information is disregarded.

NOTE: Useful information on the handling of the product. It attends the user to possible problems.

2.2 Personnel qualification

The personnel installing the pump must have the appropriate qualification for this work.

2.3 Risks incurred by failure to comply with the safety instructions

Failure to comply with the safety instructions could result in personal injury or damage to the pump or installation. Failure to comply with the safety instructions could also invalidate any claim for damages.

In particular, failure to comply with these safety instructions could give rise, for example, to the following risks:

- Failure of important pump or installation functions,
- Failure of specified maintenance and repair methods,
- Personal injury due to electrical, mechanical and environmental causes,
- Damage to property.

2.4 Safety precautions for the operator

The relevant accident precaution regulations must be observed. Dangers caused by electrical energy must be excluded. Local or general regulations [e.g. NEC, IEC, VDE, etc.] and directives from local electrical supply companies are to be followed.

2.5 Safety precautions for inspection and installation

The operator must ensure that all inspection and installation work is carried out by authorized and qualified specialists who have carefully studied these instructions.

Work on the pump/unit must be carried out only with the pump disconnected (locked out) from the electrical supply and at complete standstill.

2.6 Unauthorized alterations and manufacture of spare parts

Alterations to the pump or installation may only be made in agreement with the manufacturer. The use of original spare parts and accessories authorized by the manufacturer will ensure safety. The use of any other parts may invalidate claims revoking the liability of the manufacturer.

2.7 Improper use

The operation of the pressure booster package can only be guaranteed if it is used in accordance with paragraph 4 of the operating instructions. All values must neither exceed nor fall below the limit values given in the catalogue or data sheet.

3. Transport and interim storage

When receiving the material, check that there has been no damage during the transport. If shipping damage has occurred, take all necessary steps with the carrier within the allowed time.



CAUTION! Outside influences may cause damages!
If the delivered material is to be installed later on, store it in a dry place and protect it from impacts and any outside influences (humidity, frost etc.).

Handle the pump carefully so as not to damage the unit prior to installation!

4. Application

This pump's basic function is to pump hot or cold water, water with glycol or other low viscosity fluids that contain no mineral oil, solid or abrasive substances, or materials having long fibres. The manufacturer's approval is required for use to pump corrosive chemicals.



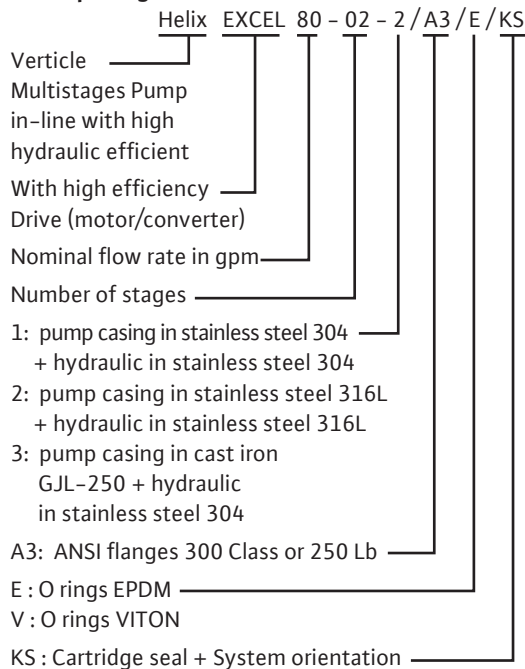
DANGER! Risk of explosion!
Do not use this pump to handle flammable or explosive liquids.

Application areas:

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

5. Technical data

5.1 Pump designation



5.2 Technical data

- Maximum operating pressure
 - Pump casing: 363 PSI (25 BAR)
 - Maximum suction pressure: 145 PSI (10 BAR)
- Temperature range
 - Fluid temperature: 5 to 248 F (120°C)
 - Ambient temperature: 5 to 104 F (40°C)
- Electrical data:
 - Motor efficiency: >93% (>IE4)
 - Motor protection index: Enclosure Type 5 Indoor Use Only
 - Electrical voltage: 400V (±10%) 50Hz
380V (±10%) 60Hz
460V (±10%) 60Hz
- Ambient humidity: < 90 % without condensation
- Acoustic pressure level: ≤ 68 dB(A)
- Electromagnetic compatibility (*)
 - residential emission - 1st environment: EN 61800-3
 - industrial immunity - 2nd environment: EN 61800-3
- Internal electrical circuit: Isolated secondary circuit, Limited voltage/current circuit.
 - PLEV, galvanically isolated
- Section of the power cable (cable equipped of 4 wires):
 - 1,1kW : 4 x 15 AWG (1,5 mm²) Minimum
4 x 13 AWG (2,5 mm²) Maximum
 - 2,2/3,2/4,2 kW : 4 x 13 AWG (2,5 mm²) Minimum
4 x 11 AWG (4 mm²) Maximum
 - 5,5/6,5/7,5 kW : 4 x 11 AWG (4 mm²)

(*) 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 functioning of the pump is at no time affected.

Outline and pipe dimensions (Fig. 4).

Dimensions	Types	
	Helix EXCEL 10.../20.../30...	Helix EXCEL 50.../80...
A	12 5/8"	
B	18 1/4"	
C	17 5/16"	
D	16 1/8"	
E	9 7/8"	11 3/4"
F	6 3/4"	7 1/4"
G	1 1/4"	2"
H	4"	5"
J	4x Ø9/16"	

5.3 Scope of Supply

- Multistage pump.
- Installation and operating instructions.

5.4 Accessories

Original accessories are available for Helix EXCEL range.

The accessories must be ordered separately.

- IF-Module PLR for connecting to PLR/interface converter.
- IF-Module LON for connection to the LONWORKS network (Fig. A6).
- Non-return valves (with nose or spring ring when operating in constant pressure).
- protection kit against dry-running.
- sensor kit for pressure regulation (accuracy: $\leq 1\%$; use between 30 % and 100 % of the reading range).

Use of new accessories is recommended.

6. Description and function

6.1 Product description

Fig. 1

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

Fig. 2 and 3

- 1 - Strainer
- 2 - Suction side isolation valve
- 3 - Discharge side isolation valve
- 4 - Check valve
- 5 - Drain + priming plug
- 6 - Air bleed screw + Filling plug
- 7 - Tank
- 8 - Foundation block
- 10 - Lifting hook

Fig. A1, A2, A3 and A4

- 1 - Dip Switches
- 2 - Pressure sensor (180 degrees from gauge)
- 3 - Tank
- 4 - Tank isolation valve
- 5 - Pressure Gauges
- 6 - Check Valve
- 7 - Isolation Valve

6.2 Design of product

- Helix EXCEL pumps are vertical high pressure non-self priming pumps with inline connection based on multistage design.
- Helix EXCEL pumps combine use of both high efficiency hydraulics and electronically- commutated motors.
- All metallic parts in contact with water are made of stainless steel.
- For models equipped with heaviest motor > 90lbs , a specific coupling allows to change the seal without removing the motor. A cartridge seal is then used in order to ease maintenance.
- Special handling devices are integrated in order to facilitate pump installation.

7. Installation and electrical connection



Installation and electrical work in compliance with any local codes and by qualified personnel only.



WARNING! Bodily injury!

Existing regulations for the prevention of accidents must be observed.

WARNING! Electrical shock hazard!

Dangers caused by electrical energy must be excluded.

7.1 Commissioning

Unpack the pump and dispose of the packaging in an environmentally-responsible manner.



7.2 Installation

The pumping booster package must be installed in a dry, well-ventilated and frost-free place.

CAUTION! Possible damage of the pump!

Dirt and solder drops in to the pump body can affect the pump operation.

- It is recommended that any welding and solde-

ring work be done before installing the pump.

- Thoroughly flush the system out before installing the pump.

- The pumping boosting package must be installed in an easily accessible position to facilitate inspection or replacement.



- For heavy pump boosting packages, install a lifting hook (Fig. 2, ref. 10) above the pump in order to ease its disassembly.

WARNING! Risk of accident by hot surfaces!

The pumping booster package must be positioned so that someone cannot come into contact with the hot pump surfaces while in operation.

- Install the pumping booster package in a dry place protected from frost, 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 fall!

The pump must be correctly screwed to the ground.



- Place the pump where it will be easy to reach, to facilitate inspection and removal work. The pump must always be installed perfectly upright on a sufficiently heavy concrete base.



CAUTION! Risk of parts inside the pump!

Take care to remove port covers of the pump housing before installation.

NOTE: Pumps may be tested regarding hydraulic features in factory, some water may remain in them. It is recommended for hygienic purposes, to carry out a rinsing of the pump before any using with potable water supply.



- The installation and connection dimensions are given in section 5.2.
- Lift the pump carefully by using the integrated hooks rings, if necessary with a hoist and suitable slings according to the current hoist guidelines.



WARNING! Risk of fall!

Vertical multistage pumps may have a high center of gravity. Take care to secure the pump firmly to avoid risks.



WARNING! Risk of fall!

Use integrated rings only if they are not damaged (no corrosion ...). Replace them if needed.

WARNING! Risk of fall!

The pump must be never carried by using motor lifting lugs: these are only designed to lift the motor alone.

- The motor is provided with condensate hole

(under the motor), filled in factory by caps to guarantee the IP55 protection. For use in environments where condensate may occur (such as humid or chilled water applications), the condensate plugs must be removed to allow for proper evacuation of fluid from the motor .



7.3 Pipe connection

- Connect the pumping booster package to the system piping using either NPT fittings or 150 Class ANSI Flanges.

CAUTION!

Tightening of screws or bolts must not exceed 90 inch-lbs (10 daN.m).

Use of impact wrench is prohibited.

- The direction of fluid flow is indicated on the pump.
- Pump must be installed in such a way that it is not stressed by the pipework. The pipes must be attached so that the pump does not bear their weight.
- Use of expansion joints may mitigate noise and vibration of the pumping booster package.
- As regards the nominal cross-section of the suction pipe, we recommend a cross-section at least as large as that of the pump connection.
- A check valve is placed on the discharge pipe in order to protect the pump against water-hammer shock.
- For indirect connection via a tank, the suction pipe must have a strainer to keep any impurities out of the pumpin booster package.

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

- Remove coupling guards.



NOTE: Coupling guards can be removed without entirely unscrewing screws.

- Install the motor on the pump by using screws (FT lantern size – see product designation) or bolts, nuts and handling devices (FF lantern size – see product designation) provided with the pump: check motor power and dimension in Wilo catalogue.



NOTE: Depending on fluid characteristics, motor power could be modified. Contact Wilo Customer Services if needed.

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

7.5 Electrical connections



DANGER! Danger of death!

National Electrical Codes (NEC), local codes and regulations must be followed.



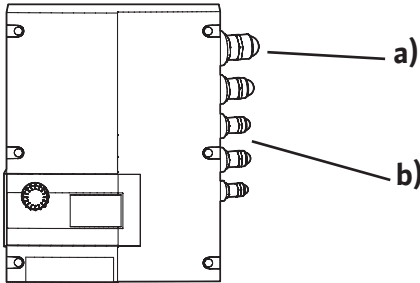
WARNING! Electrical shock hazard!

Dangers caused by electrical energy must be excluded.

- Electrical work by a qualified electrician only!
- All electrical connections must be performed after the electrical supply has been switched off and secured against unauthorized switching.
- For safe installation and operation a proper grounding of the pump to the power supply's grounding terminals is required.



NOTE: Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Elec-



trical Code and any additional local codes.

(Pos. a) The electrical connection must be established via a fixed power cable which has a plug attachment or an all-pole switch with a contact opening width of at least 1/8" (3 mm). Use 140/167 °F (60/75°C) copper conductors only. The power cable is to be fed through the NPT 3/4" threaded cable connection. Cross-section of power cable to be maintained (3 phases + Earth).

- (Pos. b) The sensor, external setpoint and [ext. off] input cable must be necessarily screened and must be inserted into the NPT 1/4" or NPT 1/2" threaded cable connection.



NOTE: Observe the tightening torque.

Be sure to use a calibrated torque wrench, see table below.

- The electric characteristics (frequency, voltage, nominal current) of the motor-converter are mentioned on the pump identification sticker. Check that the motor-converter complies with the mains

supply used.

- The electric protection of the motor is integrated into the converter. The parameters take into account the characteristics of the pump ensure the protection of the motor and pump.
- Install correct electrical overloads and breakers to protect the installation mains voltage.



NOTE: If you have to install a differential circuit-breaker for users protection, it must have a delay effect. Adjust it according to the current mentioned on the pump identification sticker.



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

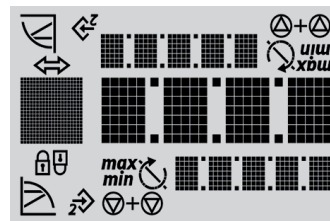
Exception: Residual-current-operated protection switches which have a selective design are allowed.



- Labelling: RCD

- Trigger current: > 30 mA.

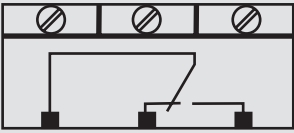
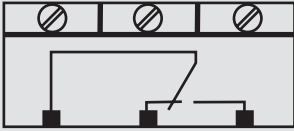
- Use power cables conforming to standards.
- Network protection: maximum acceptable 25 A
- Trigger characteristic of the fuses: B
- Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical Amperes, 480 V maximum when protected by CC, J or RK5 Class Fuses, rated 20 A
- Internal overload protection operates prior to reaching the 110% of the motor full load.
- As soon as the power supply of the converter has been activated, a 2 second display test is car-




Parts	Screw type	Tightening torque lbf.ft ± 10% / lb.in ± 10% (Nm ± 10%) (if not otherwise specified) (1 ft = 12 in)
Protective plate	M5 Hexagon head 0.3 in (8 mm)	3/36 (3.5)
Fan cover	Hexagon socket 0.12 in (3 mm)	3 ^{+0.37} / 36 ^{+4.44} (4+0.5)
Electronic module	M5 Hexagon socket 0.16 in (4 mm)	1.5/18 (2)
Module cover	Phillips recessed head PZ2	0.6/7.2 (0.8)
Control terminals	Slotted-head screw 0.14 x 0.02 in (3.5 x 0.6 mm)	0.4 ^{+0.07} / 4.8 ^{+0.84} (0.5+0.1)
Power terminals	Slotted-head screw SFZ 1-0.02 x 0.14 in (SFZ 1-0,6 x 3,5 mm)	0.4/4.8 (0.5) Plugging of the cable without tools. Releasing of the cable with a screwdriver.
Union nut, cable lead-throughs	NPT 1/4" Hexagon head 0.7 in (17 mm) NPT 1/2" Hexagon head 0.8 in (22 mm) NPT 3/4" Hexagon head 1.1 in (27 mm)	4/48 (6) 6/72 (8) 8/96 (11)

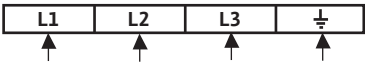
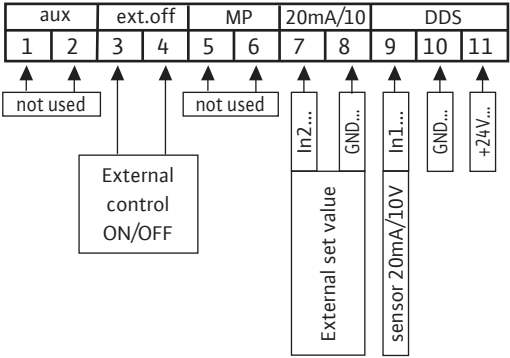
ried out, where all characters on the display are shown (Fig. A5, ref. 6).

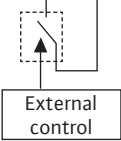
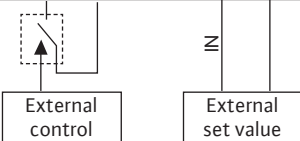

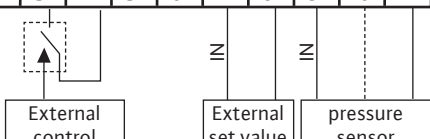
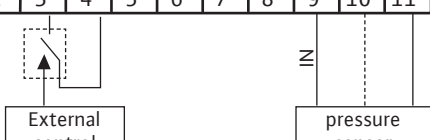
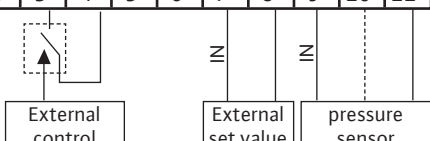
Connection terminal allocation

Designation	Allocation	Notes
L1, L2, L3	Mains connection voltage	Three-phase current 3 ~ 380, 400, 480 V per IEC 38
PE	Earth connection	
IN1	Sensor input	Type of signal: Voltage (0 – 10 V, 2 – 10 V) Input resistance: $R_i \geq 10 \text{ k}\Omega$ Type of signal: 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 setpoint input	Type of signal: Voltage (0 – 10 V, 2 – 10 V) Input resistance: $R_i \geq 10 \text{ k}\Omega$ Type of signal: 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)	Ground connections	For both inputs IN1 and IN2
+ 24 V	DC voltage for sensor	Load max. : 60 mA The voltage is short-circuit proof
Ext. off	Control input (ON/OFF) « Overriding Off » for external potential-free switch	The pump can be switched on/off via the external potential-free contact. In systems with a high switching frequency (> 20 switch-ons/off/day), switching on/off is to be done via « ext. off ».
SBM	« Available transfer » relay 	In normal operating, the relay is activated when the pump runs or is in a position to run. When a first defect appears or by main supply cutoff (the pump stops), the relay is deactivated. Information is given to the control box, regarding the availability of the pump, even temporarily. Can be configured in the « Service » menu <5.7.6.0> Contact load: minimum: 12 V DC, 10 mA maximum: 250 V AC, 24DC, 1 A
SSM	« Failures transfer » relay 	After a series of detection (from 1 to 6 according to significance) of the same type of defect, the pump stops and this relay is activated and requires manual override. Contact load: minimum: 12 V DC, 10 mA maximum: 250 V AC, 24DC, 1 A
PLR	Connection terminals of the interface PLR	The optional IF-Module PLR is to be pushed into the multiplug in the connection area of the converter. The connection is twist-proof.
LON	Connection terminals of the interface LON	The optional IF-Module LON is to be pushed into the multiplug in the connection area of the converter. The connection is twist-proof.

-  • Loosen the screws and remove the converter cover.

NOTE: The terminals IN1, IN2, GND and Ext. Off meet the requirement for “isolated secondary circuits, limited voltage/limited current” (accor-

Network connection	Power terminals
<p>Connect the 4 wires cable on the power terminals (phases + earth).</p>	 <p>A horizontal row of four terminals labeled L1, L2, L3, and an earth symbol. Below each terminal is an upward-pointing arrow.</p>
Connection of inputs / outputs	Inputs / outputs terminals
<ul style="list-style-type: none"> The sensor, external set value and [ext.off] inputs cable must have appropriate electrical shielding and correct terminal installation. 	 <p>A diagram showing 11 terminals in a row, numbered 1 to 11. Above the terminals are labels: 'aux' (1, 2), 'ext.off' (3, 4), 'MP' (5, 6), '20mA/10' (7, 8), and 'DDS' (9, 10, 11). Below terminals 1 and 2 is a box labeled 'not used'. Below terminals 5 and 6 is a box labeled 'not used'. Below terminals 3 and 4 is a box labeled 'External control ON/OFF' with arrows pointing to terminals 3 and 4. Below terminals 7 and 8 is a box labeled 'External set value' with arrows pointing to terminals 7 and 8. Below terminals 9 and 10 is a box labeled 'sensor 20mA/10V' with arrows pointing to terminals 9 and 10. Below terminal 11 is a box labeled '+24V...' with an arrow pointing to terminal 11. Other terminals have 'In2...', 'GND...', 'In1...', and 'GND...' labels with arrows pointing to them.</p>
<ul style="list-style-type: none"> The external control allows for the enabling/disabling of the pump via the free contact. To disable this control, a jumper must be placed between terminals 3 and 4. 	<p>Example: Float switch, pressure gauge for dry-running...</p>

« Speed control » connection	Connection of inputs / outputs																						
Manual Speed Set:	<table border="1" data-bbox="805 218 1305 279"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
1	2	3	4	5	6	7	8	9	10	11													
External Speed Control:	<table border="1" data-bbox="805 491 1305 552"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
1	2	3	4	5	6	7	8	9	10	11													
« Constant pressure » or « Variable pressure » connection																							
Regulation through a pressure sensor: • 2 wires ([20mA/10V] / +24V) • 3 wires ([20mA/10V] / 0V / +24V) Set point determined by manual input via red button or infrared module (IR Stick)	<table border="1" data-bbox="805 842 1305 903"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
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Regulation through a pressure sensor: • 2 wires ([20mA/10V] / +24V) • 3 wires ([20mA/10V] / 0V / +24V) Set point determined via external source	<table border="1" data-bbox="805 1115 1305 1176"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
1	2	3	4	5	6	7	8	9	10	11													
« P.I.D. control » connection																							
Regulation through a sensor (temperature, flow...): • 2 wires ([20mA/10V] / +24V) • 3 wires ([20mA/10V] / 0V / +24V) Set point determined by manual input via red button or infrared module (IR Stick)	<table border="1" data-bbox="805 1444 1305 1505"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
1	2	3	4	5	6	7	8	9	10	11													
Regulation through a sensor (temperature, flow...): • 2 wires ([20mA/10V] / +24V) • 3 wires ([20mA/10V] / 0V / +24V) Setpoint determined via external source	<table border="1" data-bbox="805 1709 1305 1770"> <thead> <tr> <th colspan="2">aux</th> <th colspan="2">ext.off</th> <th colspan="2">MP</th> <th colspan="2">20mA/10</th> <th colspan="3">DDS</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th> </tr> </thead> </table> 	aux		ext.off		MP		20mA/10		DDS			1	2	3	4	5	6	7	8	9	10	11
aux		ext.off		MP		20mA/10		DDS															
1	2	3	4	5	6	7	8	9	10	11													



ding to UL508C and EN 61800-5-1) to the mains terminals, as well as to the SBM and SSM terminals (and vice versa).

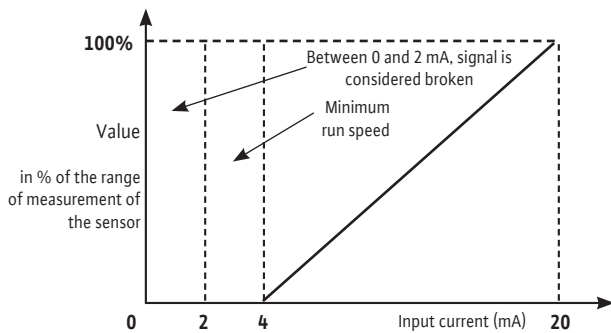
DANGER! Danger of death!

Contact voltage hazardous due to the discharge of the converter capacitors.

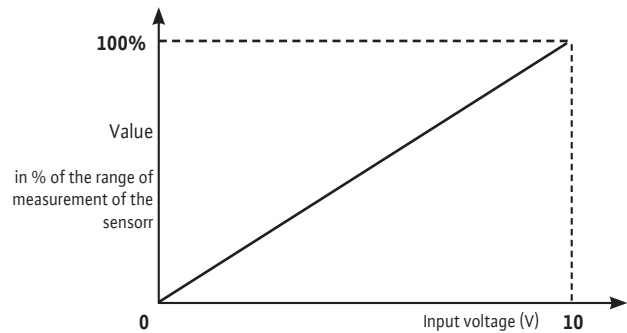
- Before any intervention on the converter, wait for 5 minutes after disconnecting of the supply voltage.
- Check whether all electrical connections and contacts are voltage-free.
- Check the right allocation of the connection terminals.
- Check the right earth connection of the pump and installation.

IN1 : Input signal in « Constant pressure », « Variable pressure » and « P.I.D. control » mode

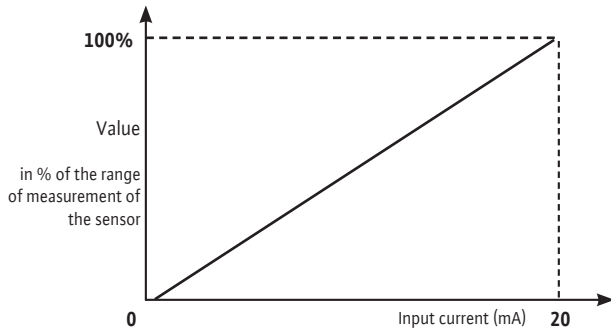
Sensor signal 4-20mA



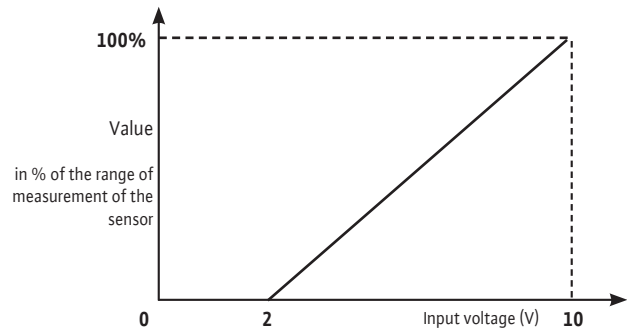
Sensor signal 0-10V



Sensor signal 0-20mA

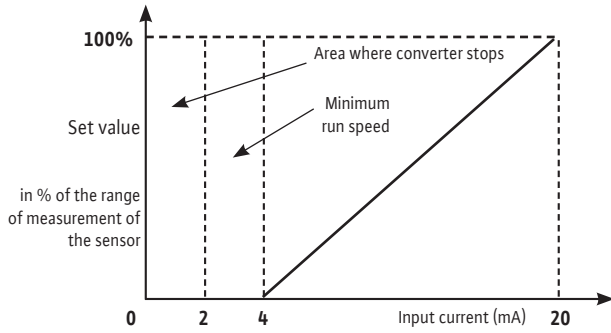


Sensor signal 2-10V

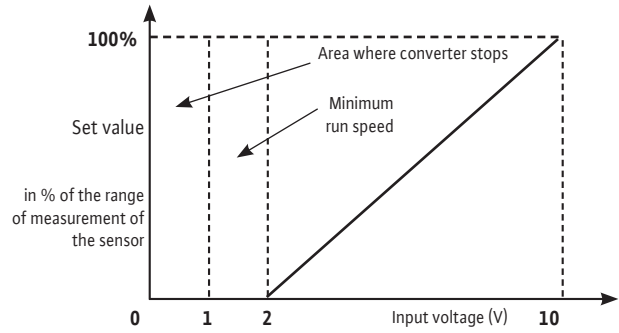


IN2 : Input of the external set value control in « Constant pressure », « Variable pressure » and « P.I.D. control » mode

Set value 4-20mA

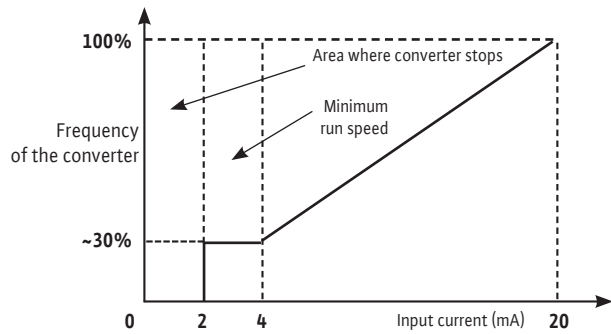


Set value 0-10V

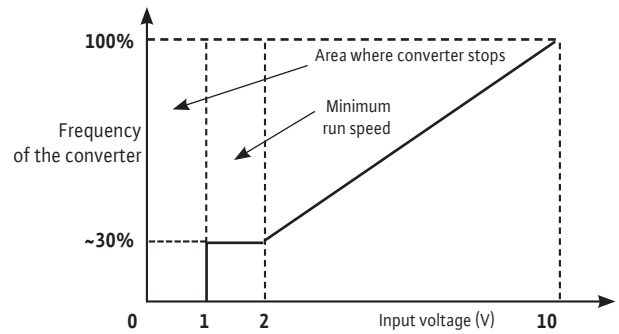


IN2 : Input of external frequency control in « Speed control » mode

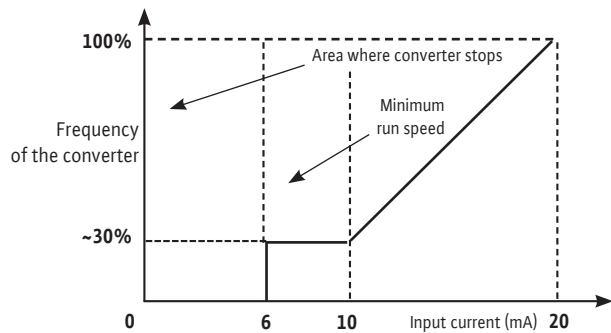
External Signal 0-20mA



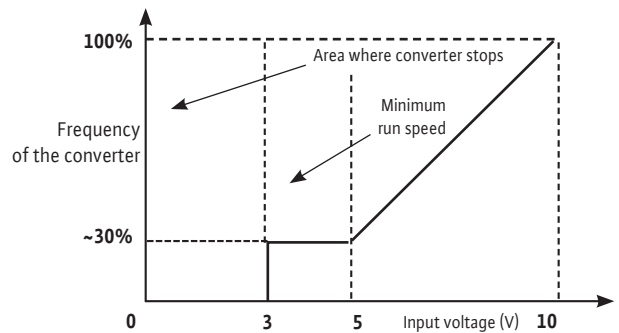
External Signal 0-10V



External Signal 4-20mA



External Signal 2-10V



Control laws

8. Start up



8.1 System filling - Venting

CAUTION! Possible damage of the pump!

Never operate the pump booster package dry. The system must be filled before starting the pumping booster package.

8.1.1 Air evacuation process – Pump with sufficient supply pressure (Fig. 3)

- Close the two guard valves (2, 3).
- Unscrew the air bleed screw from filling plug (6a).
- Slowly open the guard valve on the suction side (2).
- Retighten the air-bleed screw when air escapes at the air bleed screw and the pumped liquid flows (6a).

**WARNING!**

When the pumped liquid is hot and the pressure high, the stream escaping at the air bleed screw may cause burns or other injuries.

- Open the guard valve on the suction side completely (2).
- Start the pump and check if direction of rotation matches the one printed on pump plating.

**CAUTION! Possible damage of the pump!**

A wrong direction of rotation will cause bad pump performances and possibly coupling damage.

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

8.1.2 Air evacuation process – Pump in suction (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 drain plug (5b).
- Fill the pump and the suction pipe with water.
- Make sure that there is no air in the pump and in the suction pipe: refilling until complete removal of air is required.
- Close the filling plug with air bleed screw (6b).
- Start the pump and check if direction of rotation matches the one printed on pump plating.

**CAUTION! Possible damage of the pump!**

A wrong direction of rotation will cause bad pump performances and possibly coupling damage.

- Open the guard valve on the discharge side a little (3).
- Unscrew the air bleed screw from filling plug for air venting (6a).
- Retighten the air-bleed screw when air escapes



at the air bleed screw and the pumped liquid flows.

WARNING! Risk of burning!

When the pumped liquid is hot and the pressure high, the stream escaping at the air bleed screw may cause burns or other injuries.

- Open the guard valve on the discharge side completely (3).
- Close the drain-priming plug (5a).



8.2 Starting up

CAUTION! Possible damage of the pump!

The pump must not operate at zero flow (closed discharge valve).

**WARNING! Risk of injury!**

When the pump runs, coupling guards must be in place, tightened with all appropriate screws.

**WARNING! Important noise!**

Noise emitted by most powerful pumps could be very high : protection must be used in case extended operation in close proximity to the pump.

**WARNING!**

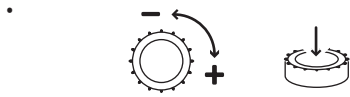
Installation must be designed in order that no one could be hurt in case of fluid leakage (mechanical seal failure ...).

8.3 Operation with frequency converter

8.3.1 Control elements

The converter operates using the following control elements:

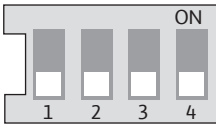
Red Button Encoder (Fig. A5, ref. 5)



The selection of a new parameter is done only with a simple rotation, « + » clockwise and « - » when counterclockwise.

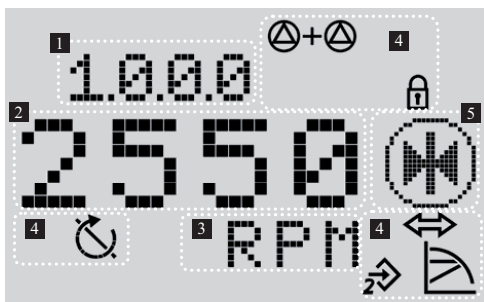
- Pressing the red button confirms the selection.

DIP Switches



- The frequency converter is equipped with a DIP Switch terminal:
- Switch 1 is the Service Switch. On indicates <<SERVICE>>, which disables the pump and allows for parameter input. Off indicates <<OPERATION>> which enables the pump and disables the parameter input.
- Switch 2 is for activating or deactivating the « Access lock », see chapter 8.5.3.
- Dip switch 3 is not used.
- Dip switch 4 is not used.

8.3.2 Display structure (Fig. A5, Ref. 6)



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
	Operating in « Speed control » mode.
	Operating in « Constant pressure » or « P.I.D. control » mode.
	Operating in « Variable pressure » or « P.I.D. control » mode.
	Input IN2 activated (external setpoint).
	Access locked. When this symbol appears, current settings or measurements cannot be changed. Information displayed is only in reading.
	BMS (building management system) PLR or LON is active.
	Pump runs.
	Pump stops.

8.3.4 Display

Display status page

- The status page is shown as the standard view on the display. The current set setpoint is displayed. Basic settings are displayed using symbols.





Example of display status page



NOTE: If the Red Button remains inactive for 30 seconds, the display returns to the status page without saving.

Navigation element

- The menu is a tree-structure, with a subset of menus following a decimal.
- The rotation of the Red Button allows scrolling through the menu (example 4000->5000).
- Any blinking elements (value, menu number, symbol or icon) allow the choice of a new value, a new menu number or a new function.

Symbol	Description
	When the arrow appears: • Pressing the Red Button allows the access to the submenu (example 4000->4100).
	When the arrow « return » appears: • Pressing the Red Button allows the access to the higher menu (example 4150->4100).

8.3.5 Menu description

List (Fig. A7)

<1.0.0.0>

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

- To adjust the setting point, turn the Red button. The display changes to menu <1.0.0.0> and the setpoint begins to blink. The new rotation (or a new action on arrows) allows increasing or decreasing of the value.
- To confirm the change, press the Red button, the display returns to the status page.

<2.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Only on reading for operating modes.
SERVICE	ON	Setting for 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 ON/OFF of the pump.
SERVICE	ON	

<4.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Only reading for the « Information » menu.
SERVICE	ON	

- The « Information » menu displays measuring, device and operating data, see, (Fig. A8).

<5.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Only reading for the « Service » menu.
SERVICE	ON	Setting for « Service » menu.

- The « Service » menu allows access to changing converter parameter settings.

<6.0.0.0>

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

- If one or several errors arise, the error log is displayed. The letter « E » followed by three digit code appears (chapter 10).

<7.0.0.0>

Position	Switch 1	Description
OPERATION	OFF	Display of « Access lock » symbol.
SERVICE	ON	

- The « Access lock » is available when the switch 2 is in the ON position.



CAUTION! Material damage!

- Improper setting changes can lead to pump operation defects, which can lead to material damage on the pump or installation.
- Settings in « SERVICE » mode should only be made during commissioning and only by skilled technicians.

Fig. A7

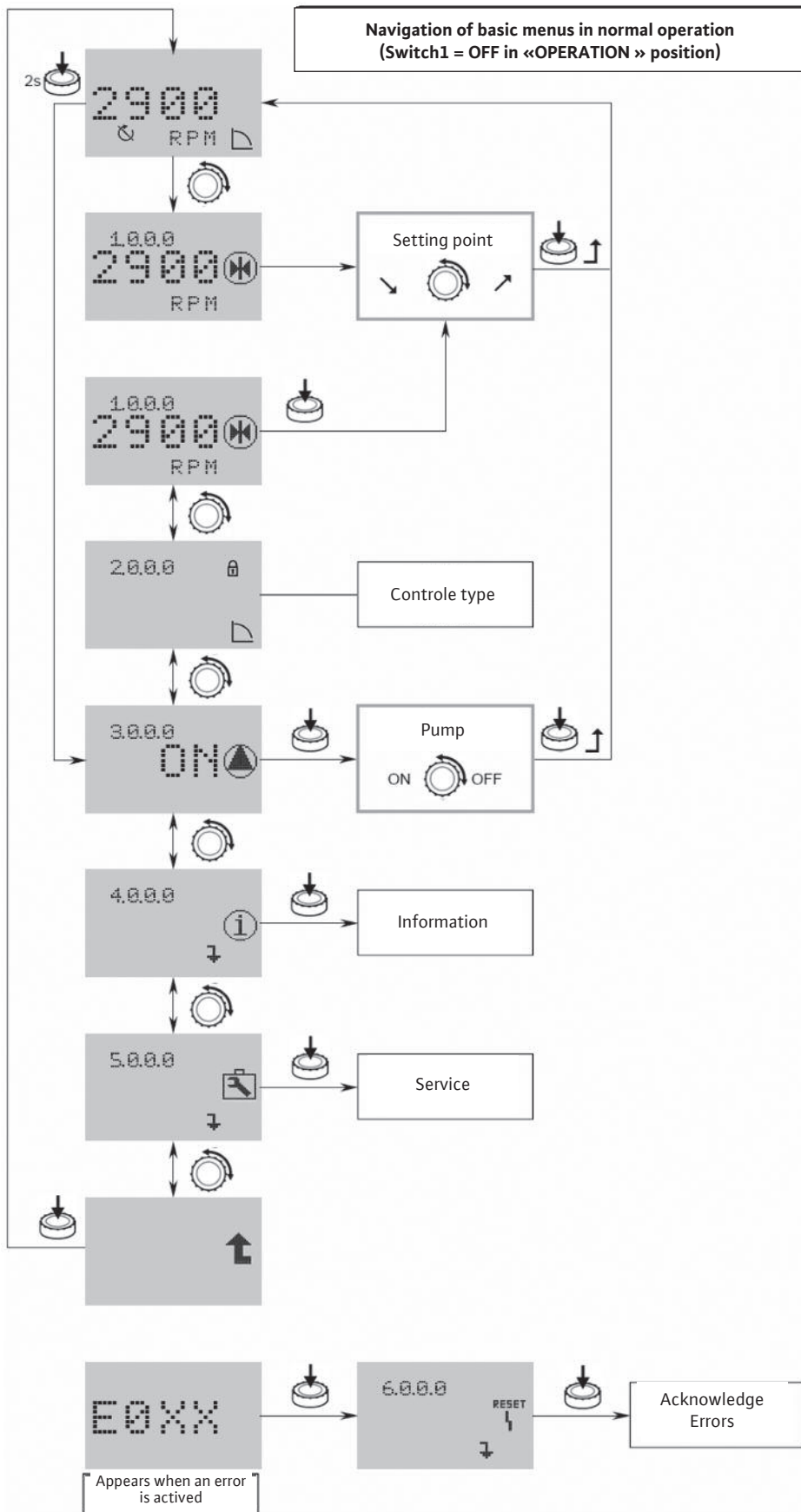
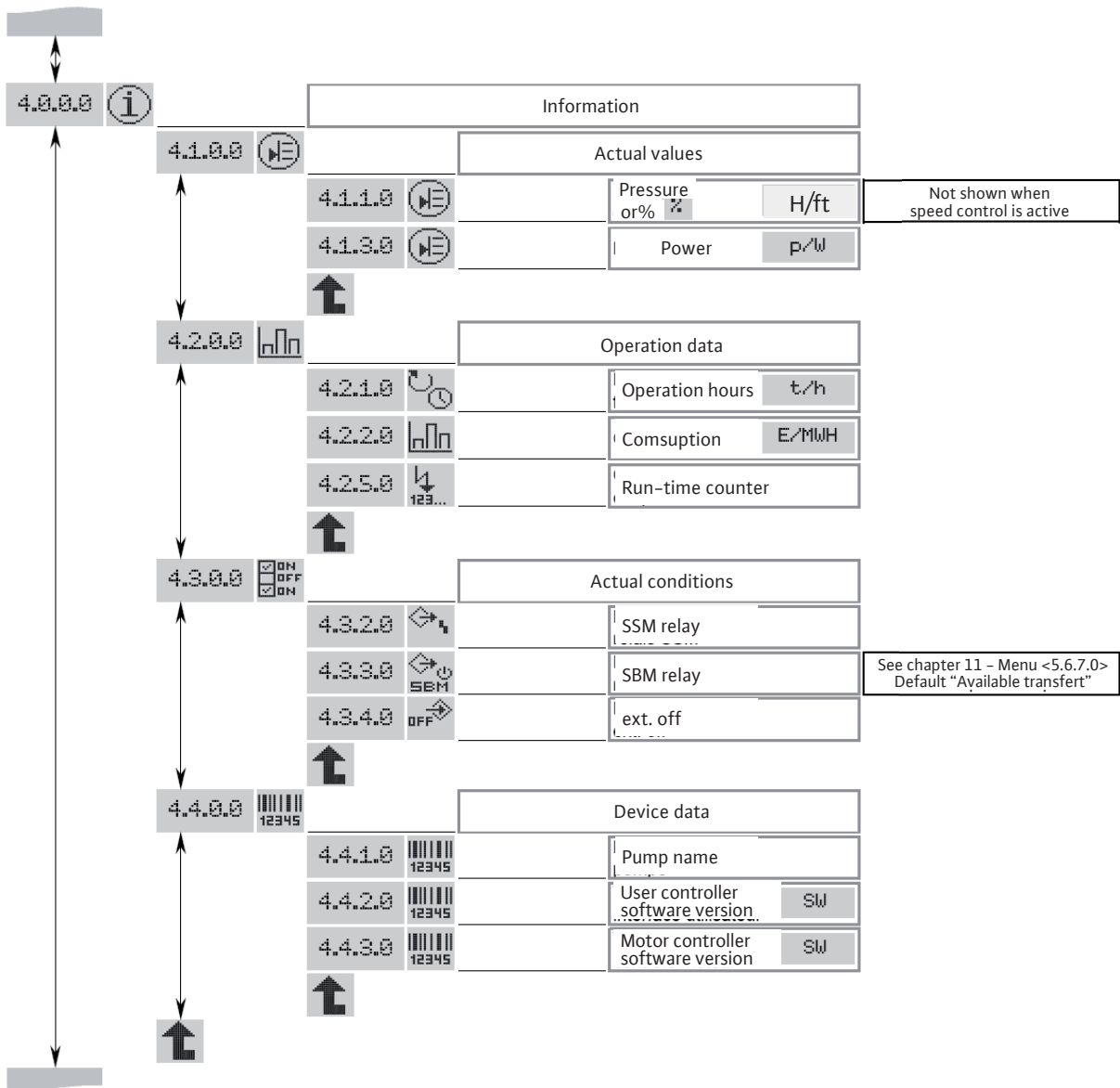


Fig. A8

Navigation of menu <4.0.0.0> « Informations »



Parametrization of <2.0.0.0> and <5.0.0.0> menu

In « SERVICE » mode, the menu parameters <2.0.0.0> and <5.0.0.0> can be modified.

Two setting modes exist:

- The « **Easy Mode** » : fast mode to get access to the 3 operating modes.
- The « **Expert Mode** » : mode to get access to all parameters.

- Put the switch 1 on ON position (Fig. A1, rep. 1).
- The « SERVICE » mode is activated.

This symbol blinks on the status page of the display (Fig. A9).

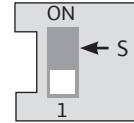
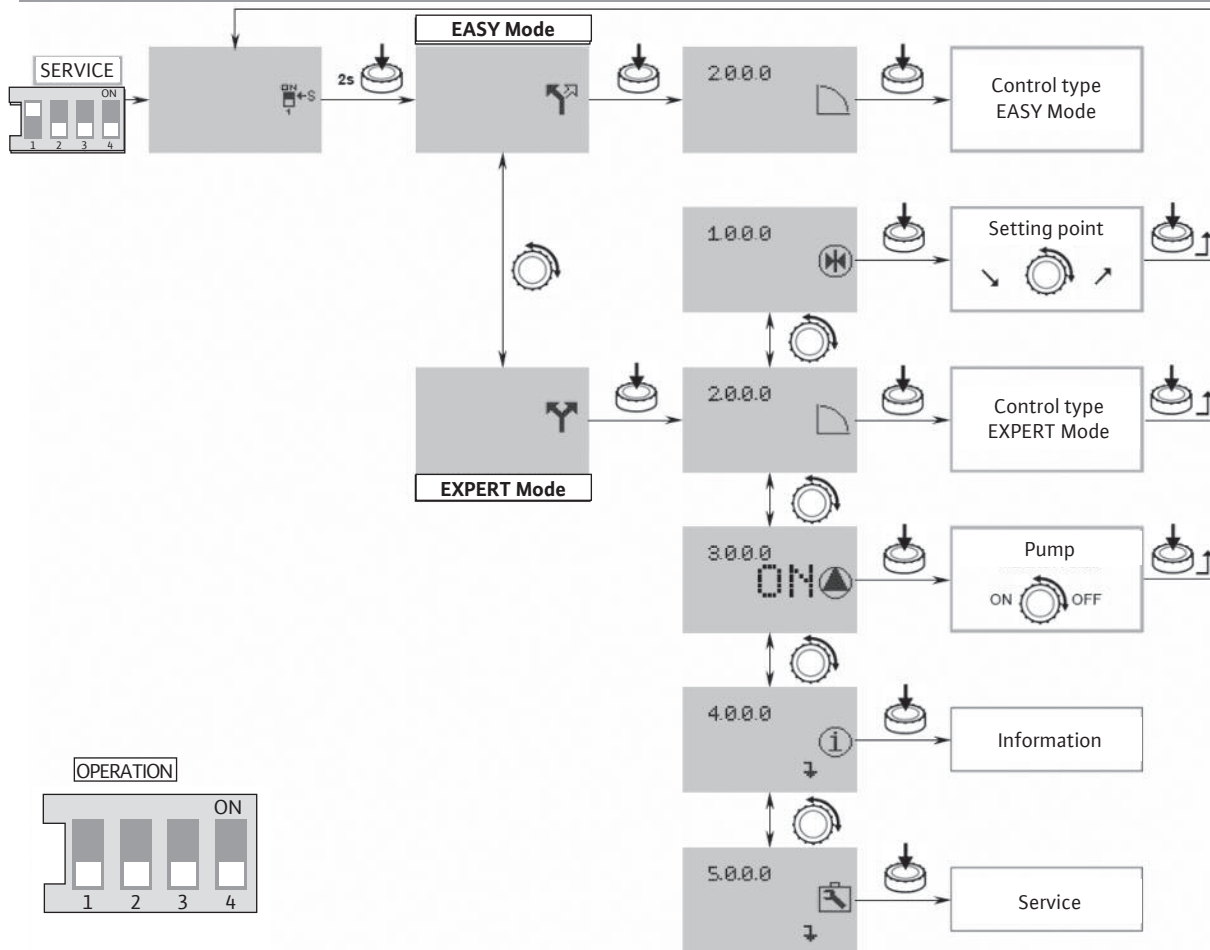
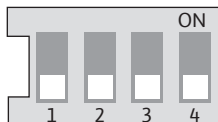


Fig. A9



OPERATION



Easy Mode

- Press the Red button and hold for 2 seconds. The symbol « Easy Mode » appears (Fig. A9).
- Press the Red button to confirm the selection. The display changes to menu number <2.0.0.0>.

The « Easy Mode » allows, quickly, the setting of the 3 operating modes (Fig. A10).

- « Speed control »
- « Constant pressure » / « Variable pressure »
- « P.I.D. control »
- After setting, put the switch 1 on OFF position (Fig. A1, ref. 1).

Expert Mode

- Press the Red button and hold for 2 seconds. Go to the expert mode, the symbol « Expert Mode » appears (Fig. 14).
- Press the Red button to validate this choice. The display changes to menu number <2.0.0.0>.

At 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 gives access to all the converter parameters (Fig. A11).

- After setting, put the switch 1 on OFF position (Fig. A1, ref. 1).



Fig. A10

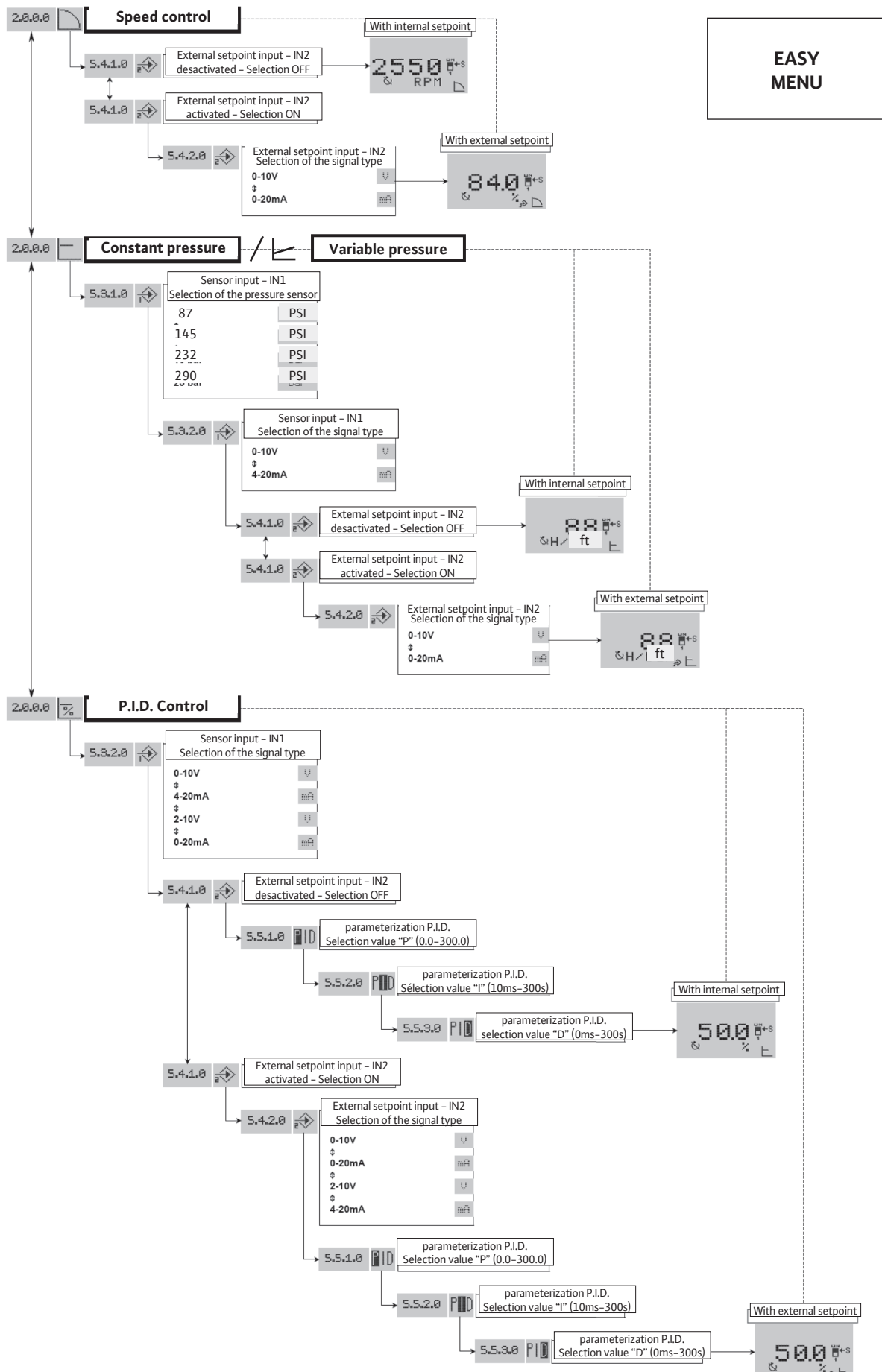
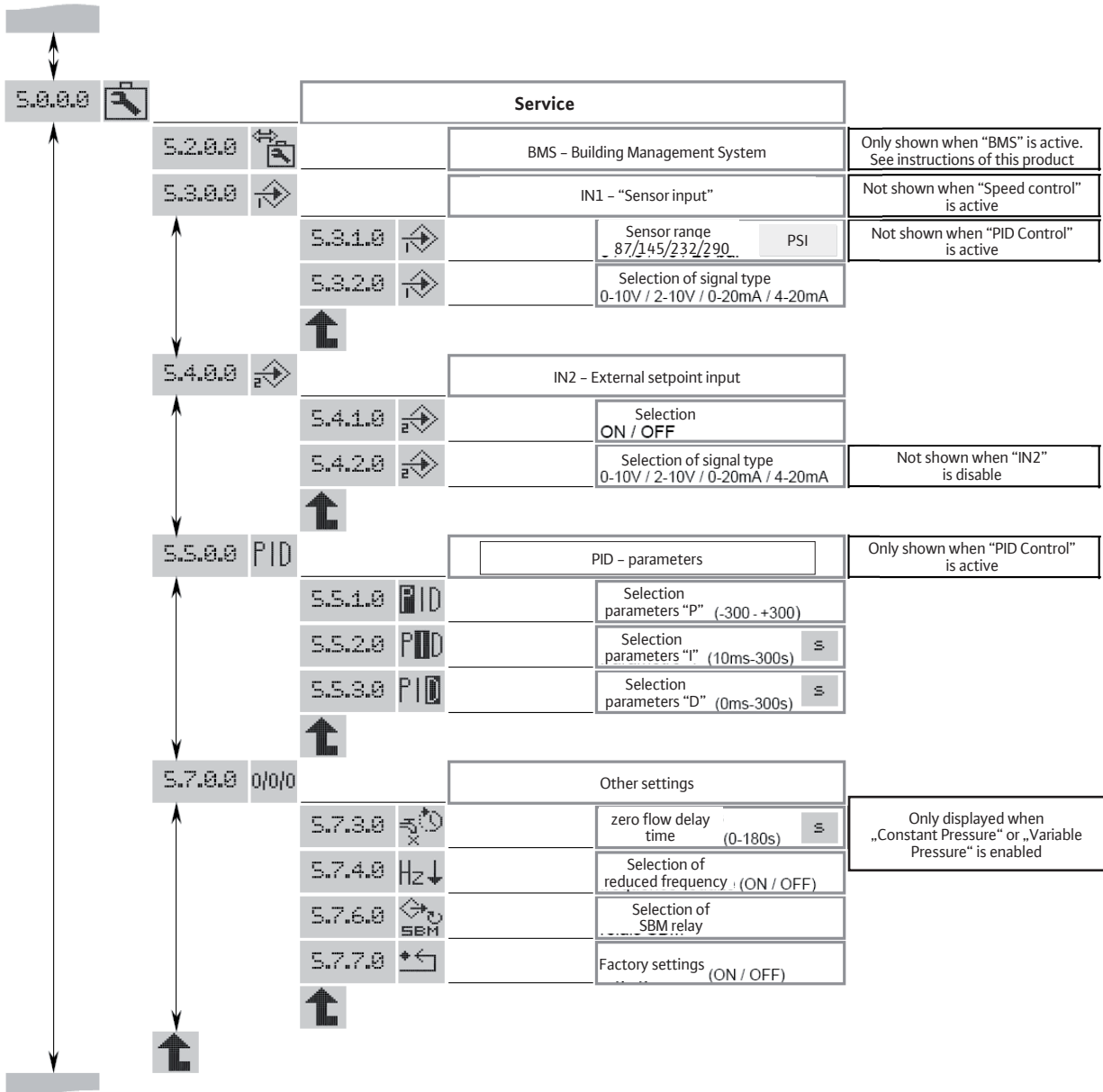


Fig. A11

EXPERT MENU



Access lock

In order to lock the pump settings, it is possible to use the « Access lock ».

To activate or deactivate it, proceed as follows:

- Put the switch 2 on ON position (Fig. A1, ref. 1). The <7.0.0.0> menu is called up.
- Turn the Red button to activate or deactivate the locking. The current state of the locking is represented with the following symbols:



Lock active: Parameters are locked, the access to menus is allowed only on reading.



Lock inactive: Parameters can be changed, the access to menus is allowed for setting.

- Return the switch 2 on OFF position (Fig. 4, ref. S). The display returns to the status page.

8.3.6 Configurations



NOTE: If the pump is delivered as separate part, not integrated into a system we mounted, the standard configuration mode is « Speed control ».

« Speed control » mode (Fig. 1, 2)

Setting of the frequency by hand or external control.

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

« Constant pressure » and « Variable pressure » mode (Fig. A2, A3, A9)

Regulation with a pressure sensor and setting point (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 allows pressure regulation of the pump. The system should have an expansion or compression tank attached to the system, pressurized to 5 PSI less than the minimum maintenance pressure required by the pump.
- The accuracy of the sensor shall be $\leq 1\%$ and it is used between 30 % and 100 % of the measuring scale range. The tank must have a minimum volume of 8L.
- For the starting up, we recommend a pressure set value at 60% of its maximum pressure.

« P.I.D. control » mode

Regulation with a sensor (temperature, flow...) by P.I.D.control and setting point (internal or external).

9. Maintenance

All servicing should be performed by an authorized service representative!



WARNING! Electrical shock hazard!

Dangers caused by electrical energy must be excluded.

All electrical work must be performed after the electrical supply has been switched off and secured against unauthorized switching.



WARNING! Risk of scalding!

At high water temperatures and system pressure close isolating valves before and after the pump. First, allow pump to cool down.

- These pumps are maintenance free.
- Optional cartridge seals allow for rapid field repairs by avoiding motor replacement during seal exchanges.
- Always keep the pump perfectly clean.
- Pumps which are not being used in conditions where condensation can occur should be drained to avoid damage: Close the guard valves, open completely the drain-priming plug and the air bleed screw.



DANGER! Danger of death !

The pump has a strong magnetic field in operation. If you have a pacemaker, this presents a severe danger and may cause death or serious injury.

- Don't open the motor!
- Repairs to the electronic controls and motors are to be handled only by Authorized agents.

10. Faults, causes and remedies



WARNING! Electrical shock hazard!

All electrical work must be performed after the electrical supply has been switched off and secured against unauthorized switching.



WARNING! Risk of scalding!

Pressurized water can easily turn into steam when venting, creating a condition where scalding may occur.

Defaults	Possible causes	Remedies
Pump fails to operate	No current	Check the fuses, the wiring, and the connectors
	Thermistor tripping device has tripped out, cutting off power	Eliminate any cause of overloading of the motor
Pumps runs but delivers too little	Wrong 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 pipe
	Air in suction pipe	Make the suction pipe airtight
	Suction pipe too narrow	Install a larger suction pipe
	The valve is not open far enough	Open the valve properly
Pump delivers unevenly	Air in pump	Evacuate the air in the pump; check that the suction pipe is airtight. If required, start the pump 20-30s – open the air bleed screw in order to move air away – close the air bleed screw and repeat it several times until no more air is going out of the pump
	In « Constant pressure » mode, the pressure is incorrect	Put a sensor with conforming pressure scale and accuracy
Pump vibrates or is noisy	Foreign bodies in pump	Remove the foreign bodies
	Pump not properly attached to ground	Retighten the screws
	Bearing damaged	Call Wilo Customer Service
Motor overheats, its protection trips out	A phase is open-circuit	Check the fuses, the wiring, and the connectors
	Ambient temperature too high	Provide cooling
Mechanical seal is leaking	Mechanical seal is damaged	Replace the mechanical seal
Irregular flow	In « Constant pressure » mode, the pressure sensor is incorrectly set	Ensure the pressure sensor and scale of pressure conform
In « Constant pressure » mode, the pump does not stop if the flow is zero	The non-return valve is not tight	Clean it or change it
	The non-return valve is not adequate	Replace it by an adequate non-return valve
	The tank has low capacity due to the installation	Change it or add an other one on the installation

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

Faults should only be remedied by qualified personnel!

Observe the safety instructions, see chapter 9 Maintenance.

If the operating defect can't be remedied, contact an after-sales service technician or representative office.

Relays

The converter is fitted with 2 output relays aimed for an interface to centralized control.
ex.: control box, pumps control.

SBM relay:

This relay can be configured in the « Service » menu < 5.7.6.0 > in 3 operating states.



State: 1

« Available transfer » relay (normal operating for this pump type).

The relay is activated when the pump runs or is in a position to run.

When a first defect appears or by mains supply cutoff (the pump stops), the relay is deactivated. Information is given to the control box, regarding the availability of the pump, even temporarily.



State: 2

« Run transfer » relay.

The relay is activated when the pump runs.



State: 3

« Power on transfer » relay.

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

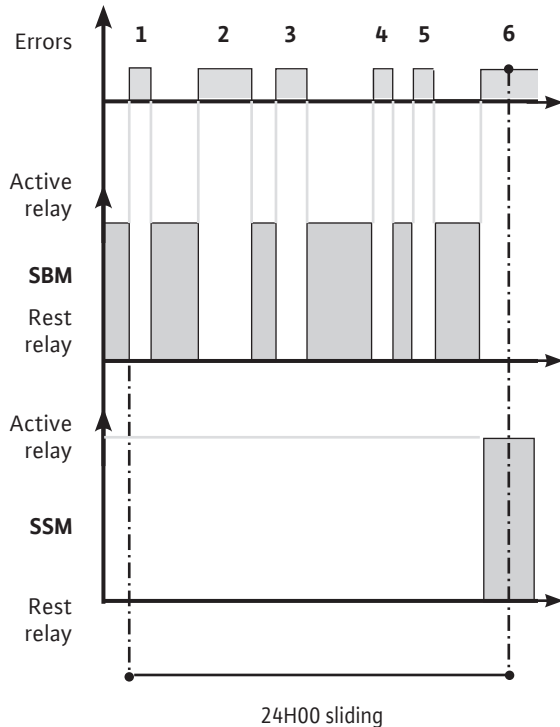
SSM relay:

« Failures transfer » relay.

After a series of detection (from 1 to 6 according to significance) of the same type of defect, the pump stops and this relay is activated (up to manual action).

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

State of SBM relay is « Available transfer ».



10.1 Error table

All incidents hereafter mentioned give rise to:

- The deactivation of the SBM relay (When this one is parametrized in « available transfer » mode).
- The activation of the SSM relay « failure transfer » when the maximum quantity of one type of defect is reached over a 24-hour range.
- Lighting of a red LED.

Error N°	Reaction time before error signal	Time before consideration of the defect, after signal	Waiting time before automatic restart	Max defects over 24 hours	Faults Possible causes	Remedies	Waiting time before reset
E001	60s	immediate	60s	6	The pump is in overload, defective.	Density and/or viscosity of the conveyed fluid exceed capacity.	300s
					The pump is obstructed by particles.	Dismantle the pump and replace the defective components or clean them.	
E004 (E032)	~5s	300s	Immediate if defect deleted	6	The converter supply is in under voltage.	Check the converter terminals: • error if network < 330V	0s
E005 (E033)	~5s	300s	Immediate if defect deleted	6	The converter supply is in over voltage.	Check the converter terminals: • error if network > 480V	0s
E006	~5s	300s	Immediate if defect deleted	6	A supply phase is missing.	Check the supply.	0s
E007	immediate	immediate	Immediate if defect deleted	no limit	The converter runs like a generator. Warning, pump continues to operate.	Inspect the check valve, and check for reverse flow.	0s
E009	immediate	immediate	Immediate if defect deleted	no limit	The converter runs like a generator, pump OFF.	Inspect the check valve, reverse flow.	0s
E010	~5s	immediate	no restart	1	The pump is locked.	Dismantle the pump, clean it and replace the defective parts. It may be a mechanical failure of the motor (bearings).	60s
E011	15s	immediate	60s	6	Dry running condition.	Prime the pump (see chapter 8.3). Check the tightness of the foot valve.	300s
E020	~5s	immediate	300s	6	Excessive motor heat.	Clean the cooling ribs of the motor.	300s
					Ambient temperature higher than 104 F (40 °C).	The motor is foreseen to run at an ambient temperature less than 104 F (40 °C).	
E023	immediate	immediate	60s	6	The motor is in short-circuit.	Dismantle the motor-converter of the pump, check it or replace it.	60s
E025	immediate	immediate	no restart	1	Missing phase of the motor.	Check the connection between motor and converter.	60s
E026	~5s	immediate	300s	6	The thermal sensor of the motor is defective or has a wrong connection.	Dismantle the motor-converter of the pump, check it or replace it.	300s
E030 E031	~5s	immediate	300s	6	Excessive power converter heating.	Clean the cooling ribs rearside and under the converter as well as the fan cover.	300s
					Ambient temperature higher than 104 F (40 °C).	The converter is foreseen to run at an ambient temperature less than 104 F (40 °C).	
E042	~5s	immediate	no restart	1	The cable of the sensor (4-20mA) is cut.	Check the correct supply and the cable connection of the sensor.	60s
E050	60s	immediate	Immediate if defect deleted	no limit	BMS communications time-out.	Check the connection.	300s
E070	immediate	immediate	no restart	1	Internal communication error.	Call the after-sales technician.	60s
E071	immediate	immediate	no restart	1	EEPROM error.	Call the after-sales technician.	60s
E072 E073	immediate	immediate	no restart	1	Problem inside converter.	Call the after-sales technician.	60s
E075	immediate	immediate	no restart	1	Inrush current relay defect.	Call the after-sales technician.	60s
E076	immediate	immediate	no restart	1	Current sensor defect.	Call the after-sales technician.	60s
E077	immediate	immediate	no restart	1	24V defect	Call the after-sales technician.	60s
E099	immediate	immediate	no restart	1	Unknown pump type.	Call the after-sales technician.	Power off/on

E110	immediate	immediate	Immediate if defect deleted	no limit	Loss of synchronization	The pump restarts automatically	0s
E111	~5s	300s	Immediate if defect deleted	6	The motor currents exceeds the limit of the maximum converter output current	Density and/or viscosity of the conveyed fluid exceed pump limits. Check if the pump is not obstructed by particles	0s
E112	immediate	immediate	Immediate if defect deleted	no limit	Motor speed exceeds 120% of the rated speed	Regulation to normal motor limits	0s
E119	immediate	immediate	Immediate if defect deleted	no limit	The pump tried to start without success while it veers	Check the tightness of the non-return valve	0s

10.2 Acknowledging errors



CAUTION! Material damage!

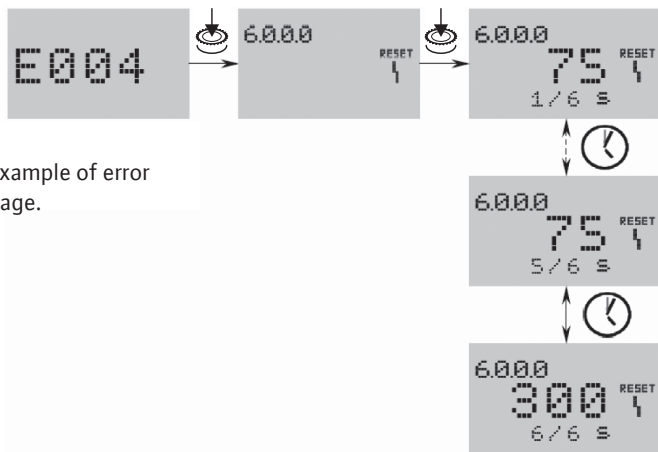
Only acknowledge defect when they have been remedied.

- Only skilled technicians are allowed to remedy the defect.
- If in doubt, contact the manufacturer.
- In the event of an error, the error page is displayed instead of the status page.

To acknowledge, proceed as follows.

- Press the Red button.

It appears on the display:



Example of error page.

- The menu number <6.0.0.0> .
- The defect number and the maximum number over 24 hours of the concerned defect (example: 1/6).
- The remaining time before auto reset of the defect, in seconds.
- Wait for the auto reset time.

Example of status page



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

- When the maximum number of the defect is reached and the last timer has elapsed, press the encoder to acknowledge.

The system returns to the status page.



NOTE: When there is a time before considering of the defect, after signalling (example: 300s), the defect must always be manually acknowledged. The auto reset timer is inactive and “- -” is displayed.

11. Spare parts

Spare parts may be ordered via local approved technicians and/or the Wilo after-sales service.

To avoid any questions or wrong orders, all data of the name plate should be mentioned when ordering. Including date codes, software versions and firmware versions



CAUTION! Danger of material damage!

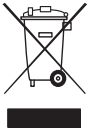
Perfect pump function can only be guaranteed when original spare parts are used.

- Only use original spare parts.

12. Disposal

Information on the collection of used electrical and electronic products.

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



NOTICE: Disposal in domestic waste is forbidden!

This symbol can appear on the product, the packaging or the accompanying documentation. It means that the electrical and electronic products in question must not be disposed of along with domestic waste.

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

- Only hand over these products at designated, certified collecting points.
- Observe the locally applicable regulations! Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal.

Subject to technical alterations!



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