

# Operating Instructions

## Pump Controls with dual-line display

Status: 15/07/2016

version: 907 300 – V1.5

GLP: from HW 1.11

SW: from V 1.16



**These operating instructions refer exclusively to the electronic control system and contain important information and safety comments. These operating instructions must be read and followed before installation, electrical connection and commissioning are completed.**

**Descriptions and instructions in these operating instructions refer to the standard version of the control system. These operating instructions do not include all design details and variants, nor all possible coincidences and events that could possibly occur during installation, operation or maintenance. Improper use, any modifications or combination with non-original parts could cause damage to the equipment and/or bodily injury.**

**The use of skilled personnel is a prerequisite for operating the controls. Please contact the manufacturer if you find that you are missing any information or instructions in these operating instructions.**

**In the case of failure to comply with these operating instructions, the manufacturer assumes no responsibility for the control system.**



CONDOR Pressure Control GmbH  
Warendorfer Str. 47 - 51  
D-59320 Ennigerloh / Germany

Phone +49 (0)25 87 -89-0  
Fax +49 (0)25 87 -89-140

[www.condor-cpc.com](http://www.condor-cpc.com)

## CONTENTS

	Page
<b>1. Miscellaneous information</b>	<b>3</b>
<b>2. Safety warnings</b>	<b>3</b>
2.1 Identifying instructions in the operating instructions	3
2.2 Personnel qualifications	3
2.3 Risks in case of non-observance of these safety warnings	4
2.4 Safety awareness at work	4
2.5 Safety warnings for the operating company/operator	4
2.7 Safety warnings for installation and maintenance work	4
2.8 Unauthorised modification and production of spare parts	5
2.9 Unallowable operating modes	5
2.10 Use in Ex - hazardous (potentially explosive) environments	5
<b>3. Transport and in-transit storage</b>	<b>6</b>
3.1 Transport	6
3.2 In-transit storage	6
<b>4. General description of the control system</b>	<b>6</b>
<b>5. Mechanical layout of the control system</b>	<b>7</b>
5.1 Overview of the control system components in the standard version	7
5.2 Overview of the control system components with optional accessories	8
<b>6. Installation/assembly</b>	<b>9</b>
6.1 Surrounding conditions	9
6.2 Assembly notes	9
6.3 Drilling pattern	9
6.4 Retrofitting a dynamic pressure gauge module*	10
6.5 Retrofitting batteries*	11
<b>7. On-site fuse protection</b>	<b>14</b>
7.1 Main switch*	14
7.2 Overload relay (motor protection relay)*	14
7.3 Current transformer*	14
<b>8. Electrical connection</b>	<b>15</b>
8.1 Terminal allocation	15
8.2 Tightening torque of the screws	15
8.3 Operating on a 3-phase network (400V)	16
8.4 Operating on an alternating current network (230V)	16
8.5 400V connection diagram – standard design	17
8.6 400V connection diagram – including main switch and overload relay	18
8.8 230V connection diagram – including main switch and overload relay	20
8.9 Thermo contacts/winding protection contact as Klixon or bi-metal	21
8.10 Thermo contacts as positive temperature coefficient resistors (PTC)	21
8.11 Leak monitoring/humidity sensors	21
8.12 Connection diagram Thermo contact/AUX (examples)	21
8.14 Mini compressor or heater connection diagram (examples)	22

<b>9.</b>	<b>Electrical connection for level detection (measuring system)</b>	<b>23</b>
9.1	External level sensor	23
9.2	Internal dynamic pressure sensor	24
<b>10.</b>	<b>Operation and display</b>	<b>27</b>
10.1	Overview	27
10.2	Control system main screen with dual-line display	29
10.3	Operating mode of the pump	30
10.4	Messages after the system boots up	30
10.5	Pump controls	30
10.6	Fault messages and alarms	31
10.7	Switching behaviour of the pumps	31
<b>11.</b>	<b>System menu/parameter settings</b>	<b>34</b>
11.1	Main screen	34
11.2	Service menu	34
11.3	Languages	34
11.4	Date/time	34
11.5	Network monitoring	34
11.6	Start delay	35
11.7	Thermo/AUX	35
11.8	Brief start-up	35
11.9	Pumping off	36
11.10	Maximum runtime	36
11.11	Measuring system	36
11.12	Zero balance	36
11.13	STOP level	37
11.14	START level	37
11.15	Alarm level	37
11.16	Lag time	37
11.17	Current measurement	38
11.18	Display fault memory	38
11.19	Audible alarm	38
11.20	Alarm relay	38
11.21	Flashing alarm	39
11.22	Operating hours	39
11.23	Switching cycles	39
11.24	Maintenance due	39
11.25	Service telephone number	39
11.26	Battery operation *Page 11	39
<b>12.</b>	<b>Commissioning/recommissioning</b>	<b>40</b>
<b>13.</b>	<b>Decommissioning</b>	<b>40</b>
<b>14.</b>	<b>Maintenance</b>	<b>41</b>
<b>15.</b>	<b>Technical Data</b>	<b>41</b>
<b>16.</b>	<b>List of faults and declaration</b>	<b>42</b>

## 1. **Miscellaneous information**

The control system has been developed according to the state of the art, was manufactured with the greatest of care and is subject to continuous quality controls.

The purpose of these operating instructions is to make it easier to get to know the device and to make full use of its intended applications.

These operating instructions contain important information for a safe, proper and economical operation of the devices. You must follow these operating instructions to ensure a reliable, long service life for the devices and to avoid hazards.

The operating instructions do not take into account any location provisions, which are the responsibility of the operating company, as well as the installation personnel.

The devices must not be operated above the values stated in the technical documentation regarding operating voltage, nominal frequency of the network, ambient temperatures, switching performance and other instructions contained in the operating instructions.

Should there be additional information or instructions required, or in the event of a claim, please contact the manufacturer.

## 2. **Safety warnings**

This documentation refers exclusively to the control system and contains basic instructions that must be observed during the installation, operation and maintenance thereof. Therefore it is essential that these operating instructions are read by the technician and other responsible specialist personnel/operators before installation and commissioning; it must be available at the system's operating site at all times.

You must not only observe the general safety warnings given in the main "Safety" section, but also the special safety warnings included in the following main items.

### 2.1 **Identifying instructions in the operating instructions**

The safety information given in these operating instructions, which can cause danger to individuals upon failure to observe, are specially marked with the following symbols.



**Warning of common hazards**



**Warning of high voltage**

### 2.2 **Personnel qualifications**

The operation, maintenance, inspection and installation personnel must have the appropriate qualifications for their specific work. The scope of responsibility, competence and supervision of the personnel must be defined in detail by the operating company. Should the staff not have the proper knowledge, additional training and instructions must be scheduled. Furthermore, the operating company carries the responsibility that the content of these operating instructions is fully understood by the staff.

### 2.3 Risks in case of non-observance of these safety warnings

Non-observance of the safety warnings may lead to hazards for personnel, as well as for the system itself. Non-observance of safety warnings will result in loss of any rights to claim damages.

In particular, non-observance may lead to incidents such as the following:

- Failure of key functions of the device
- Failure of prescribed methods for monitoring
- Danger to personnel by electrical forces



### 2.4 Safety awareness at work

The safety warnings listed in these operating instructions, the existing national regulations for the prevention of accidents, as well as any additional internal work, operating and safety instructions by the operating company must be observed.



**It is essential to switch off all power before opening the device!**

### 2.5 Safety warnings for the operating company/operator

Any electrical energy hazards are to be prevented (for details, please refer to the country-specific regulations and the regulations of your local energy companies). The operating company is to make sure that the control system is secured against access by unauthorised personnel.

### 2.6 Operation by electrotechnical laypeople

Devices that can only be operated by trained electricians are to be placed in a separate area that can only be accessed with special tools.

To achieve this, the hinged lid of the control unit is to be interlocked with a suitable screwdriver.

### 2.7 Safety warnings for installation and maintenance work

The operating company has to ensure that all maintenance, inspection and assembly work is performed by trained and qualified personnel adequately informed through intensive study of these operating instructions.

As a rule, work on the device may only be performed in a de-energised state. Immediately after completion of this work, the safety and protective system must be attached again or their function restored. Before a restart, the points listed in the commissioning section must be observed.

The currently applicable regulations (EN, VDE, ...) as well as all regulation of the local energy suppliers must be observed. Commissioning may only be completed once these have been met.



**It is essential to follow the documentation of all accessory parts, such as the pump, before all follow-up work.**

Before the system is put into service and the mains voltage is switched on, the following must be ensured.

- The controls and connection cables must not show any noticeable defects.
- All connection bolts and terminals must be checked for a tight fit before commissioning and re-tightened if necessary.
- Routing and design of all cables and lines has to comply with the current regulations. Particular attention must be paid to avoiding increased mechanical stresses on cable entry plates, e.g. caused by insufficiently fixed or improperly strain-relieved cables.

- The mains connection and the connection of all accessory components, like the pump, for instance, have to be done by professionals.
- On-site protection has to be done in accordance with valid regulations and particular circumstances.
- All miscellaneous connections are carried out correctly and professionally.
- The device is properly closed and unused cable glands are covered.
- The system is properly protected.



**Gases escaping from the bay must under no circumstances reach the control system. This is why the cable/air hose entry from the container to the control system must be closed airtight.**

## **2.8 Unauthorised modification and production of spare parts**

Any modifications or changes to the control system are permitted only after consultation with the manufacturer. Original spare parts are provided for safety reasons. The use of other parts can make void the liability for the consequences arising from this.

## **2.9 Unallowable operating modes**

The reliable operation of the control system can only be guaranteed if used as intended only. The limit values given in the documentation must in no case be exceeded.

## **2.10 Use in Ex - hazardous (potentially explosive) environments**

In some cases, certain areas of the overall system could be subjected to explosion hazards. It must be ensured that the electronic control system will be installed outside the explosion hazard zone.

If equipment is operated in the potentially explosive area, it must be suitable for the respective application.

The applicable regulations and/or specific conditions for the operation of industrial equipment in a hazardous area must be observed.

It is expressly pointed out that it is the responsibility of the operating company to make sure

- that compliance with the applicable regulations is ensured.
- that installation was carried out in accordance with the applicable regulations.
- that the required inspections are carried out and corresponding documentation has been provided.
- that only suitable and approved assemblies (like pumps, level sensors, ...) are used.



**If sensors are used in an Ex - hazardous area, these must have an intrinsically safe circuit, such as a Zener barrier. When using a level sensor, it must have ATEX approval. Any float switches do not require specific approval**

**Closed or open dynamic pressure gauge for zone 2:** A dynamic pressure gauge can be used without problems for zone 2, since this measuring system is considered safe for normal operating conditions.

**Closed or open dynamic pressure gauge for zone 1:** A generalised statement about possible uses cannot be made. A distinction must be made in this context between the individual components of dynamic pressure measuring:

**Open dynamic pressure gauge with “measuring bell relief” and closed dynamic pressure gauge for zone 1:** This is not generally recommended, since for normal faults (e.g. damage to the pneumatic hose) explosive gases may potentially reach the control system and this would result in a shift in zone classification.

**Open dynamic pressure gauge with “air bubbling system” for Zone 1:** Following the state of the art, this measuring system is often used in zone 1. During this procedure two faults must occur (e.g. air compressor is defective **and** pneumatics hose damaged) for potentially explosive gases to reach the control system, which would then result in a shift in zones. Since the air compressor may fail during querying of the minimum level and this is reported as a fault, the chance that a fault goes undetected and the second fault occurring is much lower.

**Dynamic pressure gauge for Zone 0:** A dynamic pressure gauge does not provide adequate protection for Zone 0, as it is considered unreliable with two independent faults registering.

### **3. Transport and in-transit storage**

#### **3.1 Transport**

Professional transport of the device is required. The control system was checked for compliance with all specified data before shipment. The control system is therefore known to be in good electrical and mechanical condition upon receipt. Please check the control system for transport damage upon acceptance. In the event of a complaint, a damage report must be drawn up together with the supplier.

#### **3.2 In-transit storage**

In-transit storage must be in a dry place, without jolting and, whenever possible, in the original packaging. The ambient temperatures must not be outside the range of -20°C to +70°C.

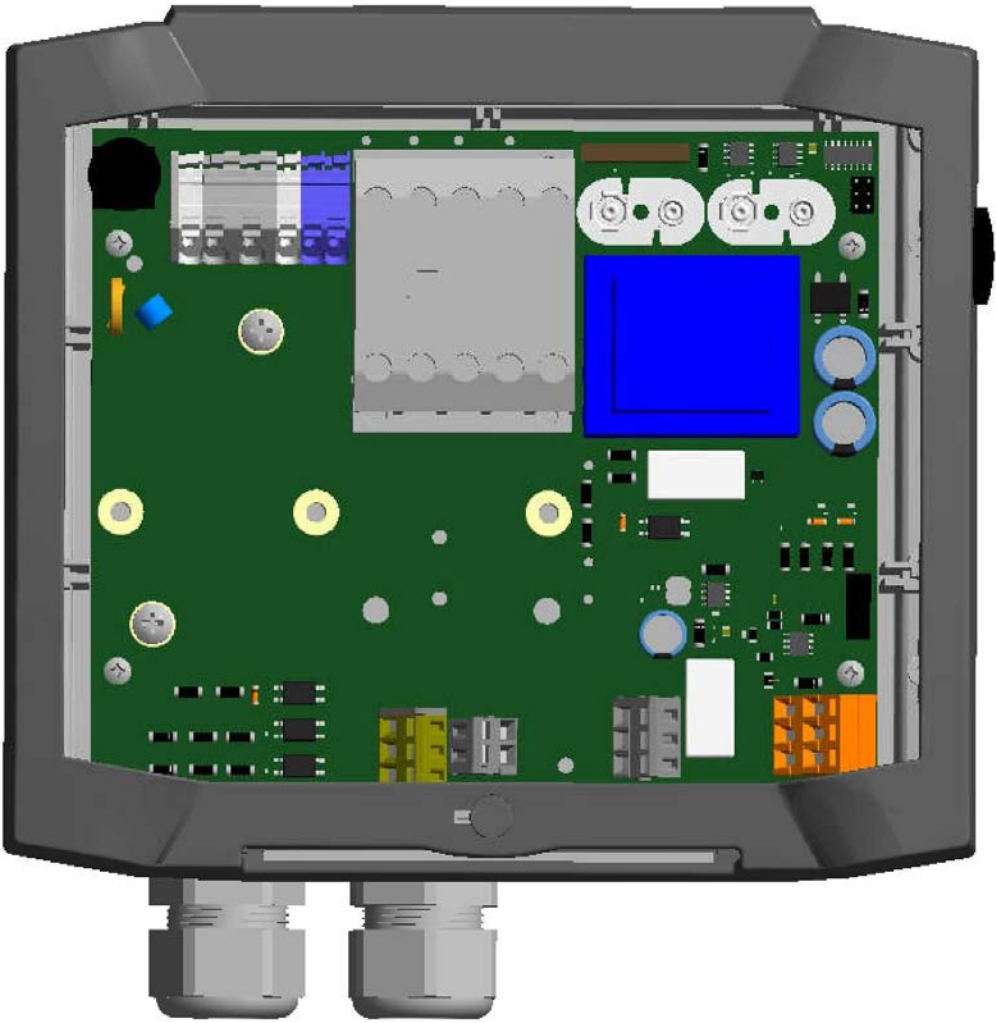
### **4. General description of the control system**

The control unit has been specifically designed for use with domestic waste water, dirty water and rainwater pump stations. The control unit records and monitors levels of the medium and switches a pump, depending on the particular level. The motor overload switch and Thermo contact of the pump are monitored by the control unit, just like the level measuring system. The control system also includes an integrated counter for operating hours and switching cycles, as well as a flexible alarm notification system.

These operating instructions describe the steering and control functions in particular. Various functions, as described in these operating instructions, may not be available, depending on the actual configuration of your control system.

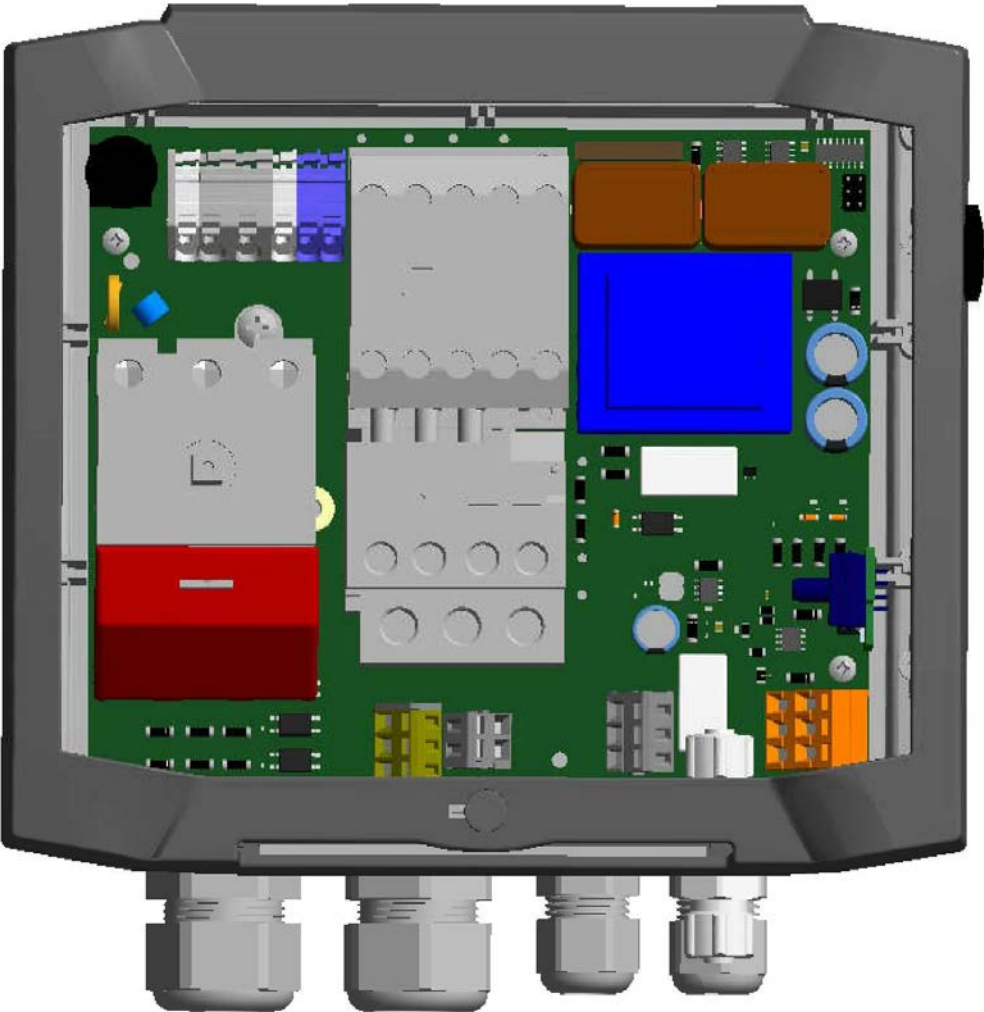
**5. Mechanical layout of the control system**

**5.1 Overview of the control system components in the standard version**





5.2 Overview of the control system components with optional accessories



## 6. Installation/assembly

### 6.1 Surrounding conditions

- Dry and frost-proof
- Adequate ventilation
- The control system installation must be flood-proof
- The technical data, especially the maximum permissible ambient temperature must be observed.
- The control system must not be exposed to direct sunlight.



**The control system is not explosion proof and may therefore only be operated outside of potentially explosive zones.**

### 6.2 Assembly notes

The device is intended for wall mounting. Open the lid to mount and wall-fasten the device with 4 screws e.g. of the type Spax 4.0 – 4.5 x 35 – 55 mm and 4 – 6 mm dowel screws. Make all the necessary electrical connections after assembly.

#### **Attention!**

You must be careful to not let any moisture into the control system during any kind of work on the system. Ingress of moisture must be prevented during assembly and/or as long as the electrical connections of the control unit are exposed through an open door, even with only light precipitation, e.g. by covering it with a tarpaulin. After completed installation and also in case of longer breaks, close and screw-fasten the cover.

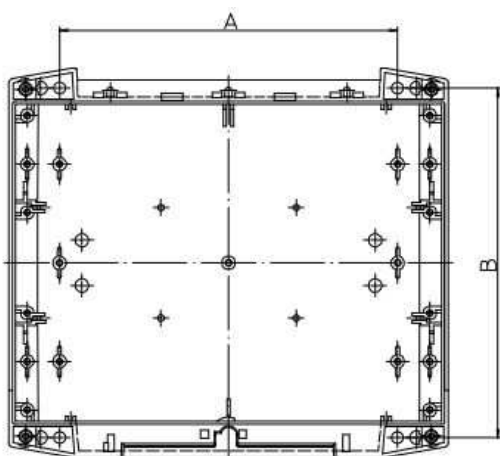


**The cover must be closed tightly to be in compliance with the respective protection rating! Unused fittings must be closed off with a blind plug!**

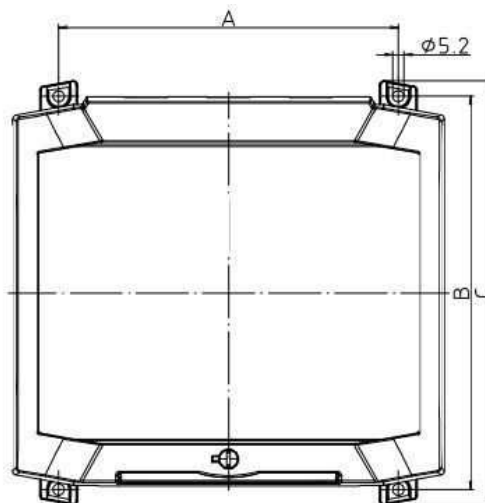
Should the electrical connection not be completed immediately after the mechanical installation, possible ingress of moisture via open cable fittings must be prevented with temporary bungs.

### 6.3 Drilling pattern

Without wall strap



With optional wall strap



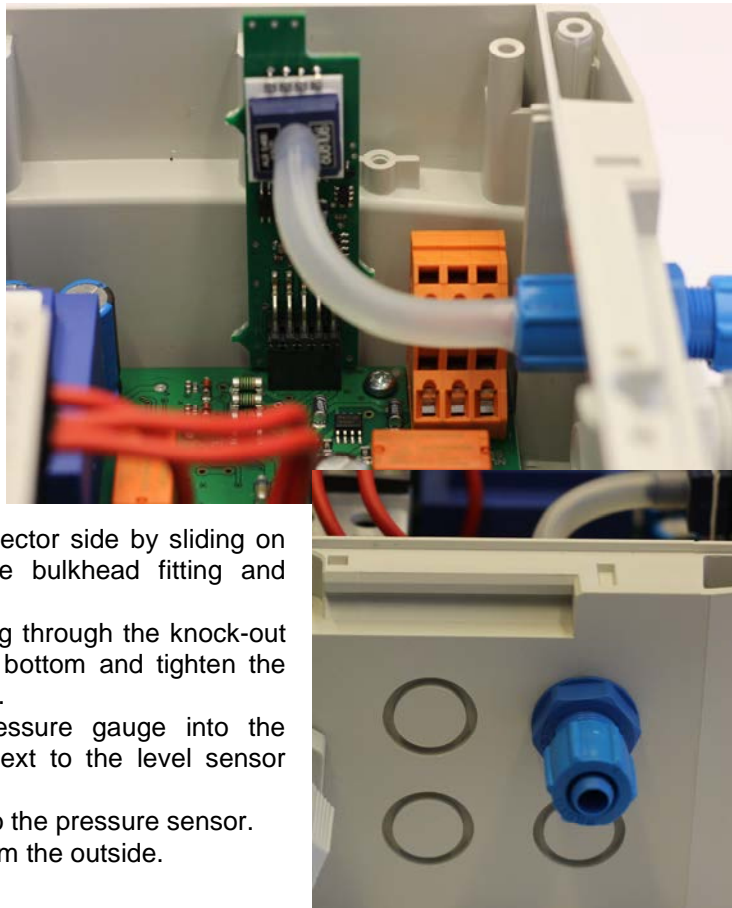
	A	B
BCD 160	150	155

	A	B	C
BCD 160	156,5	181	195,3

## 6.4 Retrofitting a dynamic pressure gauge module\*

The dynamic pressure gauge module may be installed at any time following these directions.

- Turn off the main switch and disconnect the control system on the building side from the mains supply.
- Open housing cover.
- Test for zero-potential.
- Remove upper (M12) circular punch on the bottom side of the housing. Punch out the circular mark with a screwdriver by hitting it from the outside against the inside mark.
- Tightly attach the silicon hose at the connector side by sliding on the short thread of the bulkhead fitting and tightening the collar nut.
- Insert the bulkhead fitting through the knock-out opening in the housing bottom and tighten the lock nut from the outside.
- Insert the dynamic pressure gauge into the “Pressure” connector (next to the level sensor intakes).
- Attach the silicon hose to the pressure sensor.
- Screw on the cap nut from the outside.



**Before commissioning the static pressure measuring module, double check that the “Pressure” plug is correctly connected!  
A faulty connection can destroy the device!**


\*optional accessories

## 6.5 Retrofitting batteries\*

The control system can be retrofitted with two Lithium 9V batteries. **Attention! Do not use rechargeable batteries (battery packs).**

In the event of a power failure, the control system will set off an alarm sound and the fault “No network” appears in the LCD display. The date and time settings are backed up by batteries for the event of a mains failure.

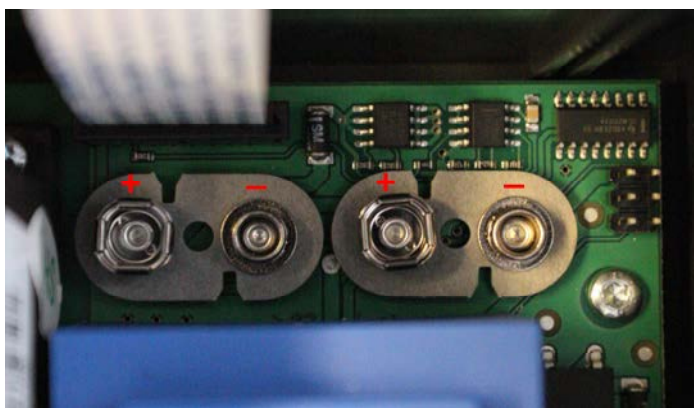
Faults are stored with a date and time stamp.

In the event of a mains failure, battery operation can be turned off by pressing the  button twice.

Fully charged Lithium batteries can bridge a mains failure of up to 48 hours.

If the battery voltage is too low and the network is connected, a “Battery” message will show in the LCD display of the control system.

- Turn off the main switch and disconnect the control system from the on-site mains supply.
- Open housing cover.
- Test for zero-potential.
- The two plug-in bases for the 9V Lithium batteries are located in the upper right corner of the control unit.
- Press the batteries into the plug-in bases, minding correct polarities, until they snap into position.
- Close housing cover.
- Switch on supply voltage
- The supply voltage must be switched off again to be able to test proper function.



### Law pertaining to putting batteries into operation, returning and environmentally sound disposal of batteries and accumulators (battery law – BattG [*Batterieggesetz*])



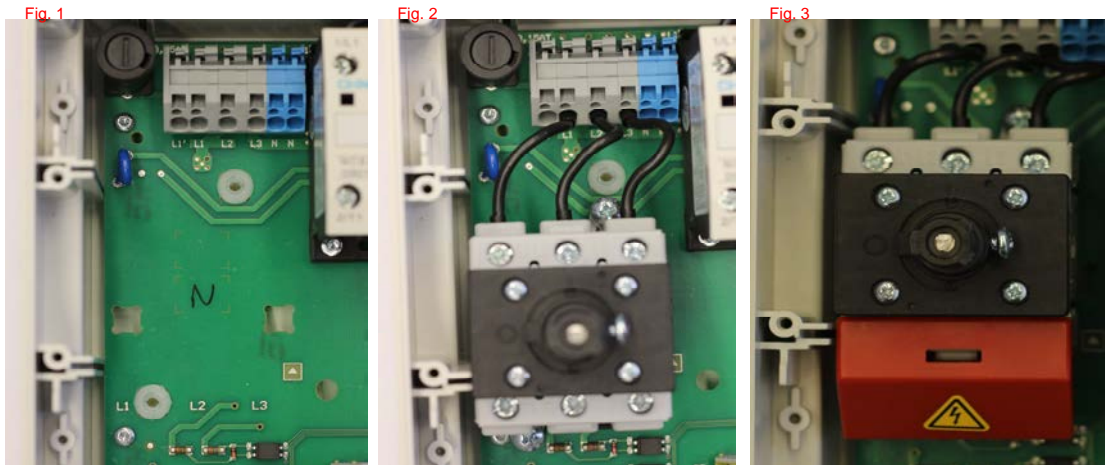
Each operating company is obligated to accept used batteries from the end user in his area at his place of operation free of charge. The take-back obligation is limited to waste batteries of the type that the distributor sells or has sold as new batteries in his product range, as well as to quantities that are ordinary and usual for an end user.

\*optional accessories

## 6.6 Retrofitting an Emergency-OFF switch (main switch)\*

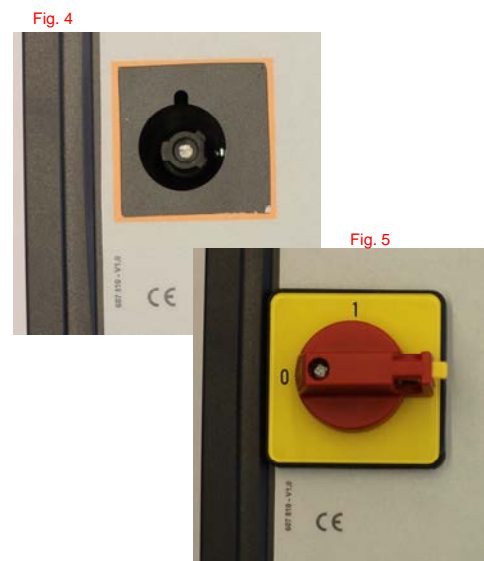
It is possible to retrofit the control system with an Emergency-OFF switch.  
Should retrofitting become necessary, please follow the prescribed installation as follows.

- Disconnect the control system from the on-site mains supply.
- Open housing cover
- Test for zero-potential!
- If necessary, remove the mains connection from the feed-in terminals and put it aside
- Insert the two expanding nuts in the indentations designed for it on the earthing board (Fig.1)
- Connect the connection clamps L1-L3 of the switch, using the wires included, according to the connection diagram (chapter 6) with the feed-in terminals (Fig.2)
- Fasten the load switch to the expanding nuts by using sheet metal screws.
- Where appropriate, clamp the mains supply cable according to the connection diagram (Chapter 6) onto terminals T1-T3 of the switch.  
Add red wire nuts (Fig.3)



Because of the safety warning label, the drilled hole for the switch handle on the left of the front foil panel is covered.

- Remove the orange part of the safety warning label carefully with a suitable sharp instrument (Fig.4)
- Insert the handle through the now exposed opening and fasten it with a lock nut. (Fig. 5) (Picture 5)
- Close the housing cover, turn the mains voltage back on and test the switch function



\*optional accessories

## 6.7 Retrofitting an overcurrent relay (motor overload relay)\*

In order to protect an electric motor's operation against overload, an overload relay can be retrofitted to monitor its current consumption (motor overload relay).  
The adjustment range of the relay has to be matched with the rated current of the motor.

- Turn off the main switch and disconnect the control system from the mains supply.
- Open housing cover
- Test for zero-potential!
- Separate the two lines on terminal "22NC" from the contactor and push it to the right. Refasten the terminal screw to prevent it from falling out and getting lost (Fig.1)
- For easier connection work, remove the front cover of the main power contactor
- Unscrew connection clamps T1, T2, T3 at the contactor

**Attention!** Only unscrew far enough to NOT let the screws fall out

**Tip:** To make the connecting work easier, the three terminal screws may be disconnected from the contactor temporarily.

- Insert the contacts of the overload relay slightly tipped towards the top into the terminal clamps T1-T3 at the contactor. Snap in the retaining collar at the bottom of the relay housing into the appropriate opening at the contactor. (Fig.2)
- Tighten the screws at terminals T1-T3 at the contactor with the approved torque.
- Reinstall the cover at the contactor where appropriate.
- In the next step, the two previously loosened connections at terminals 95 and 96 of the overload relay must be connected. You must pay attention to the line labelling on the motherboard (Fig.3).
- Press down the blue RESET button with a suitable screwdriver and turn it into position "A".
- Set the nominal motor current at the adjusting wheel under the cover.
- The next connection now follows the corresponding connection diagrams in Chapter 6



\*optional accessories

## 7. **On-site fuse protection**

The power supply of the control system has to have an all-pole protection on-site via a suitable pre-fuse that is appropriate for the current ratings of the control system. Maximum permissible values are listed on the rating plate. The tripping characteristics have to match the current conditions.

### 7.1 **Main switch\***

An optional main switch can be retrofitted in the control system. This will make it possible to shut down the control system via a main ON/OFF switch. The main switch is equipped with an Emergency-OFF function and turns off the pumps. The main switch can be locked in the OFF position with an auxiliary lock.



**Terminals in front of the main switch will carry voltage, even when the main switch is turned off!**



**When the control system is equipped with batteries, the control electronics will be operational, even when the main switch is switched off; as long as the batteries are charged, the pumps will not be operating.**



**Important for ATEX areas!**  
**In compliance with DIN EN 60079-14, a system has to be set up at a suitable location outside of the explosion risk area to shut down the electrical supply in case of an emergency.**  
**The use of a main switch will meet these compliance requirements.**

### 7.2 **Overload relay (motor protection relay)\***

The control system may optionally be retrofitted with a motor protection relay. Power values setup is done directly at the motor protection relay and must be coordinated with the respective pump (rating plate).

*Approved for motor protection according to IEC/EN 60947-4-1.*

If the motor overload switch is triggered as a result of an overload, the fault will register on the control system. The motor overload switch will reset itself after the fault has been cleared.

### 7.3 **Current transformer\***

Monitoring of motor currents can also be done via the current measurements in the control system menu. Current is measured via two optional current transformers in the phases L1 and L3 and is then compared to the rated current entered into the control system menu. A fault message will be initiated if any over or under currents values are present.

*Not approved as motor protection according to IEC/EN standard 60947-4-1!*

\*optional accessories

## 8. Electrical connection

The electrical hook-up to the control system depends on the equipment and the desired functionalities.

### 8.1 Terminal allocation

Designation		Short description	
Max. 3.15AT		Control fuse for the control circuit and the 230V outflow	
<b>Power supply/lead-in wire 1.0 – 2.5mm<sup>2</sup></b>			
L1/L2/L3/N/PE	400V 50Hz	max. fuse protection16A ( <b>400V Version</b> )	
e.g. L1/N/PE	230V 50Hz	max. fuse protection16A ( <b>230V Version</b> )	
PE	On-site potential equalisation/earth conductor connections 2.5 mm <sup>2</sup>		
<b>Connecting the pump to the contactor, 1.0 - 2.5 mm<sup>2</sup> line</b>			
(2/T1, 4/T2, 6/T3)	400V outflow	Connecting the motor line of the respective pump <b>400V variant</b>	
e.g. (4/T2, 6/T3)	230V outflow	Connecting the motor line of the respective pump <b>230V variant</b>	
<b>Pump connection at the overload relay, 1.0 – 4.0 mm<sup>2</sup> line</b>			
(2/T1, 4/T2, 6/T3)	400V outflow	Connecting the motor line of the respective pump <b>400V variant</b>	
e.g. (4/T2, 6/T3)	230V outflow	Connecting the motor line of the respective pump <b>230V variant</b>	
PE	Earth conductor connection	Connection of the protective conductor of the motor cable	
<b>THERMO / AUX contact, 0.5 – 2.5mm<sup>2</sup> line</b>			
THERMO (ATEX)	Pump Thermo contact	Selectable switching behaviour Hardware switch-off with start-up protection / power failure protected (ATEX) or	
AUX	AUX contact	Hardware switch-off with start-up Hardware switch-off ON/OFF	
L'N'/PE	230V outflow, max.2A	Connecting an optional alarm light or a mini-compressor	
<b>Alarm contact, 0.5 – 2.5 mm<sup>2</sup> line</b>			
11 / 14 / 12	1 potential free relay	Selectable switching behaviour Collective fault or flood alarm	
<b>Level detection intakes, 0.5 – 2.5 mm<sup>2</sup> line</b>			
HW	+ / - separate high water float		
SW 2	+ / - Float switch 2	Upper switching level	
4-20mA; SW 1	+ / - Analogue intake or float switch 1	Intake for level sensor 4-20 mA or Lower switching level	
Pressure	Pressure sensor slot	Optional retro-fit of dynamic pressure detection 0-2 mWS	

### 8.2 Tightening torque of the screws

The terminal screws of the standard devices contained in the control system are to be fastened with a predetermined tightening torque (Nm).

Item	Connection	Screw	Dimensions	Torque
NC6 power circuit breaker	2x2.5 mm <sup>2</sup>	PH2 pan head	M3	0.5 Nm
NR2-11.5 overload relay (motor overload switch)	2x0.5-2.5 mm <sup>2</sup> 2x1.0-4.0 mm <sup>2</sup>	PH2 pan head	M3.5 M4	1.2 Nm
NLT32 Emergency-OFF switch (main switch)	1.0-4.0 mm <sup>2</sup>	PZ2 pan head	M4	2.5 Nm



### 8.3 Operating on a 3-phase network (400V)

By default, the control system is designed to operate on a 3-phase network.

- Turn off the main switch and disconnect the control system on the building side from the mains supply.
- Open the housing cover and test for zero potential.
- The connection of the power supply line is done at the input terminals L1, L2, L3, N. In this, it is important to make sure that a right-hand rotary field has been set up.
- The motor cable is connected to terminals T1, T2, T3 of the power circuit breaker or the optional overload relay. The user manual of the pump manufacturer must also be observed.
- The connection of the earth connection (PE) carried along in both lines is done in the corresponding PE-terminal block in the lower area of the control unit.

### 8.4 Operating on an alternating current network (230V)

A jumper set included with the supply simplifies modifying the control unit for operation of 1~ motors on an alternating current network (230V).

- Turn off the main switch and disconnect the control system on the building side from the mains supply.
- Open the housing cover and test for zero potential.
- Use the jumper comb (included) to connect the feed-in terminals L3 and N. (Fig.1).
- Connecting the supplied jump wire is done between the feed-in terminal L2 and the 2/T1 contact of the power circuit breaker or the optional overload relay (Fig.2).
- Connection of the mains power supply is done at terminals L1 (out wire = L) and L3 (neutral wire = N) of the feed-in terminal or the optional load switch.
- The pump line is connected to terminals T2 (L) and T3 (N) of the power circuit breaker or the optional overload relay. The user manual of the pump manufacturer must also be observed.
- The connection of the earth connection (PE) carried along in both lines is done in the corresponding PE-terminal block in the lower area of the control unit.

Fig. 1

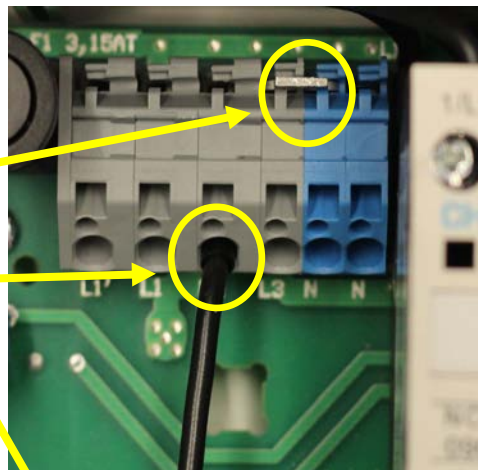
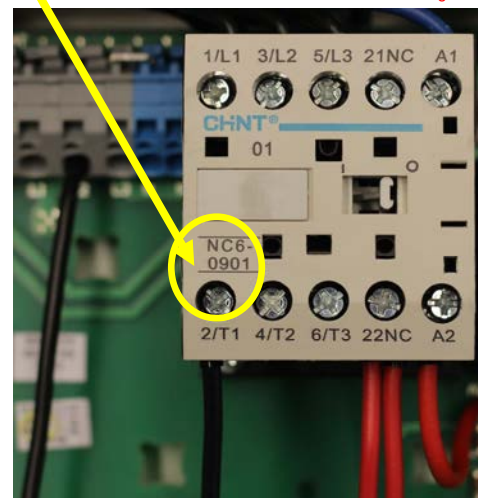
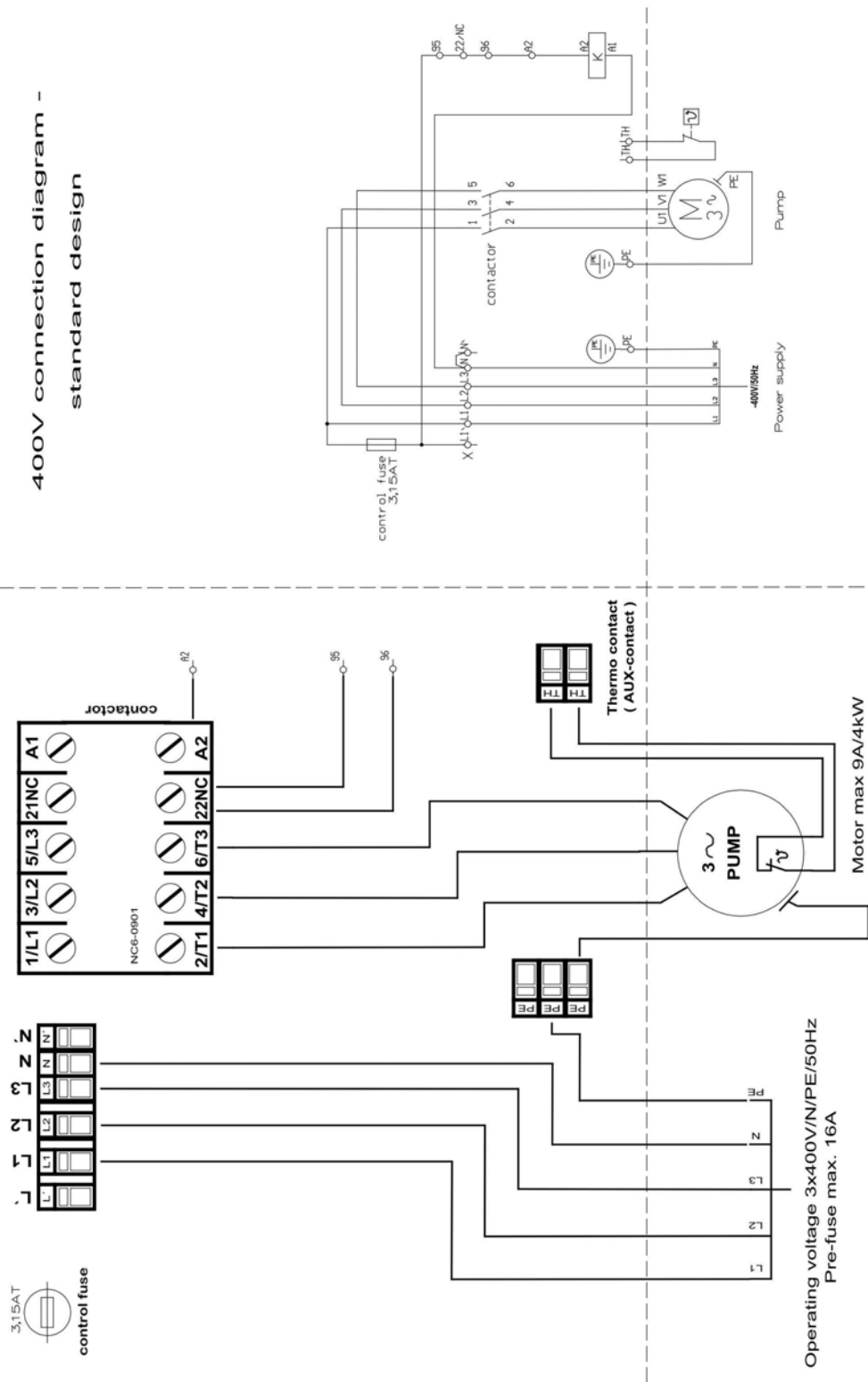


Fig. 2

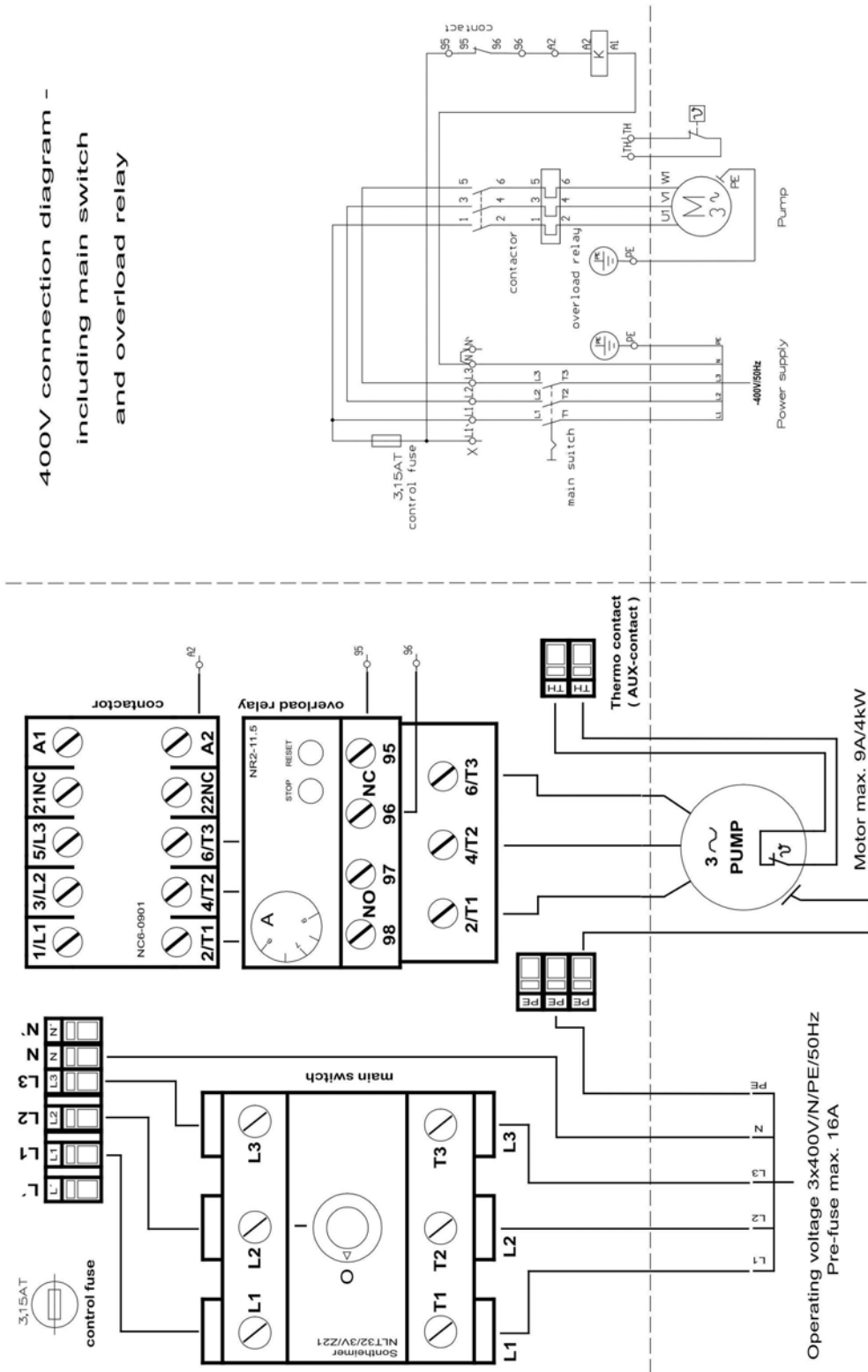


**Attention!** When operating the control system on the 1~ network, the network monitoring must be switched off in the service menu!

### 8.5 400V connection diagram – standard design

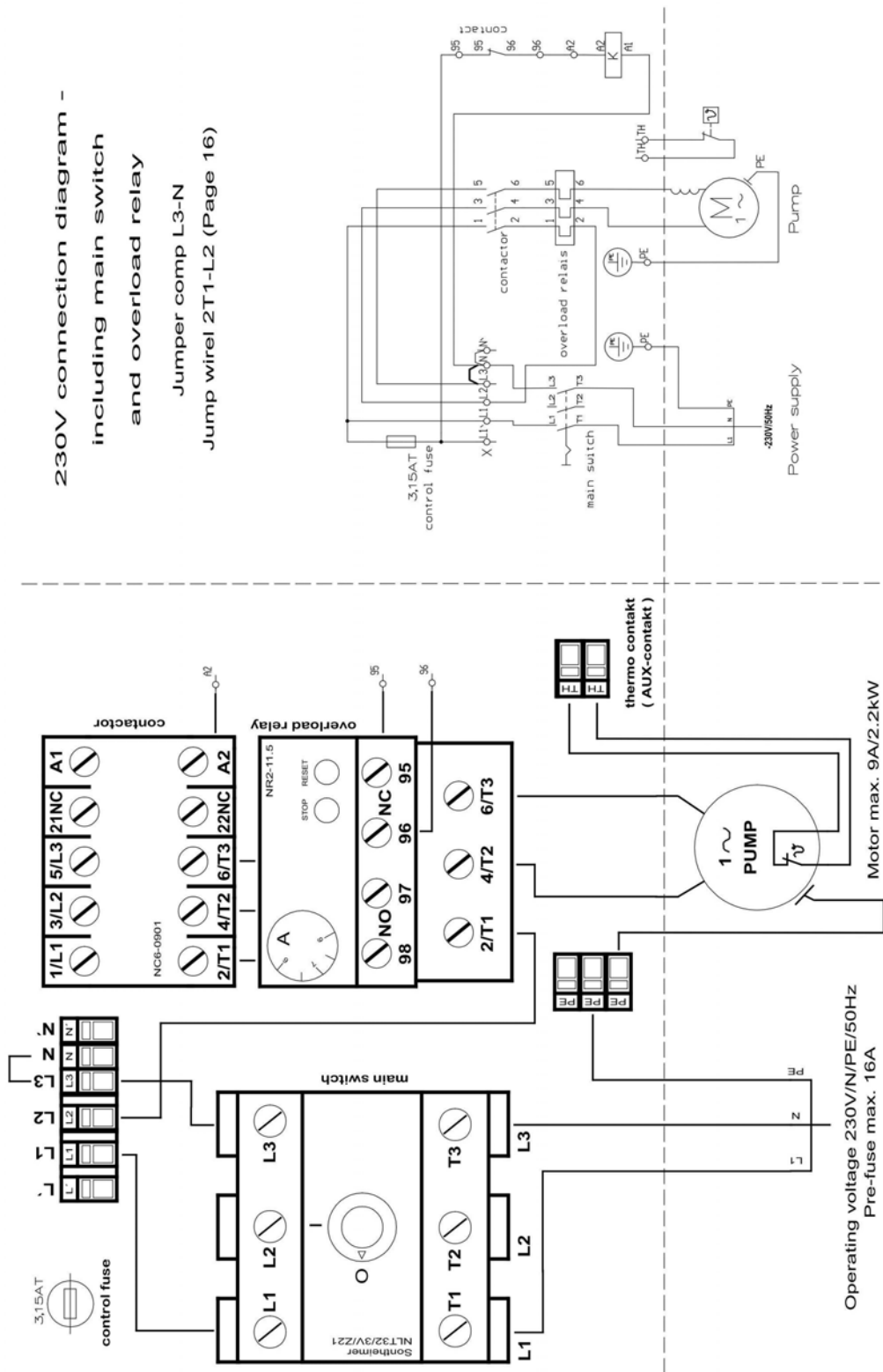


### 8.6 400V connection diagram – including main switch and overload relay





### 8.8 230V connection diagram – including main switch and overload relay



**8.9 Thermo contacts/winding protection contact as Klixon or bi-metal**

Typically, waste water pumps have one or two (Klixon) Thermo contacts that will actuate at different temperatures. Triggering the Thermo contact results in a fault and will stop the pump. This alarm will remain active and has to be cleared by the user manually, even if the pump has been cooling off in the meantime. The fault stays stored, even after a complete failure of the power supply.

The control system offers the option of evaluating a Thermo contact. If it should become necessary to evaluate two Thermo contacts per pump, the two contacts must be series connected.

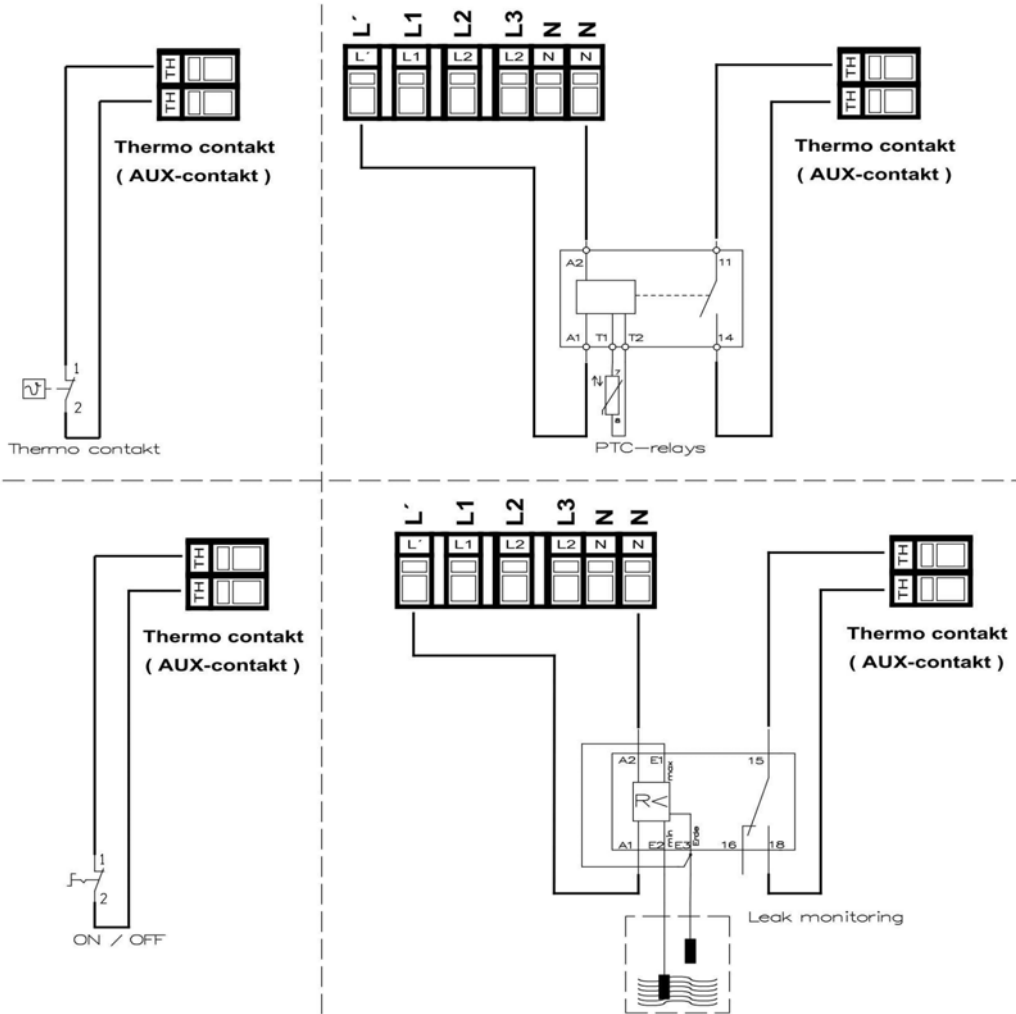
**8.10 Thermo contacts as positive temperature coefficient resistors (PTC)**

If the pump(s) are equipped with PTCs for monitoring the maximum allowable temperature rise, they cannot be connected directly to the control unit. This will require the installation of in-line PTC interpretation relays.

**8.11 Leak monitoring/humidity sensors**

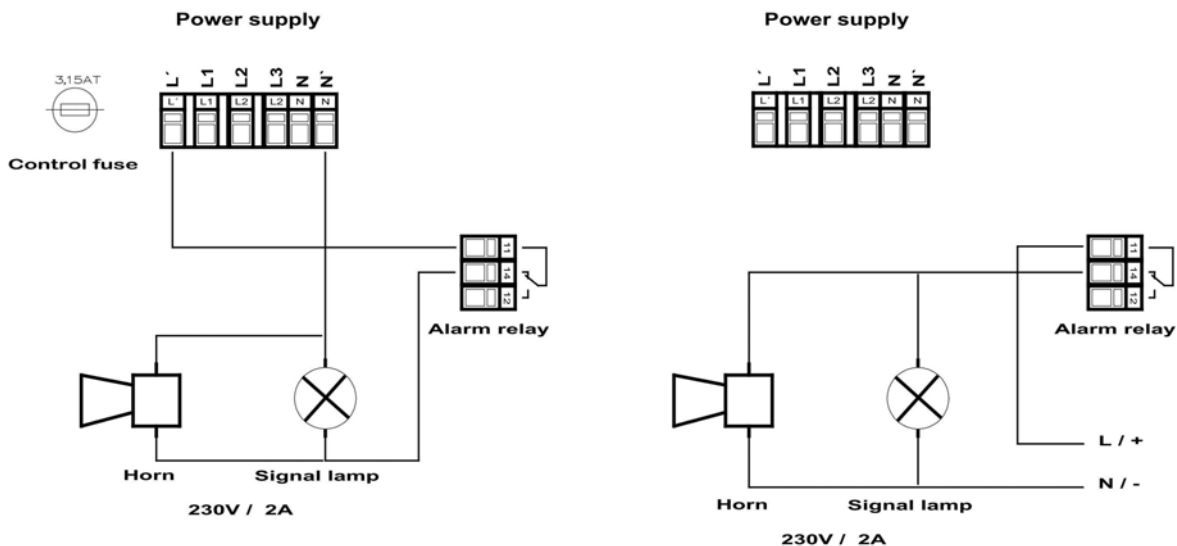
Should the pump(s) be equipped with leak monitoring, they may not be connected directly to the control unit. This requires the insertion of in-line leak evaluation units (electrode relays).

**8.12 Connection diagram Thermo contact/AUX (examples)**



### 8.13 Alarm relay connection diagram (examples)

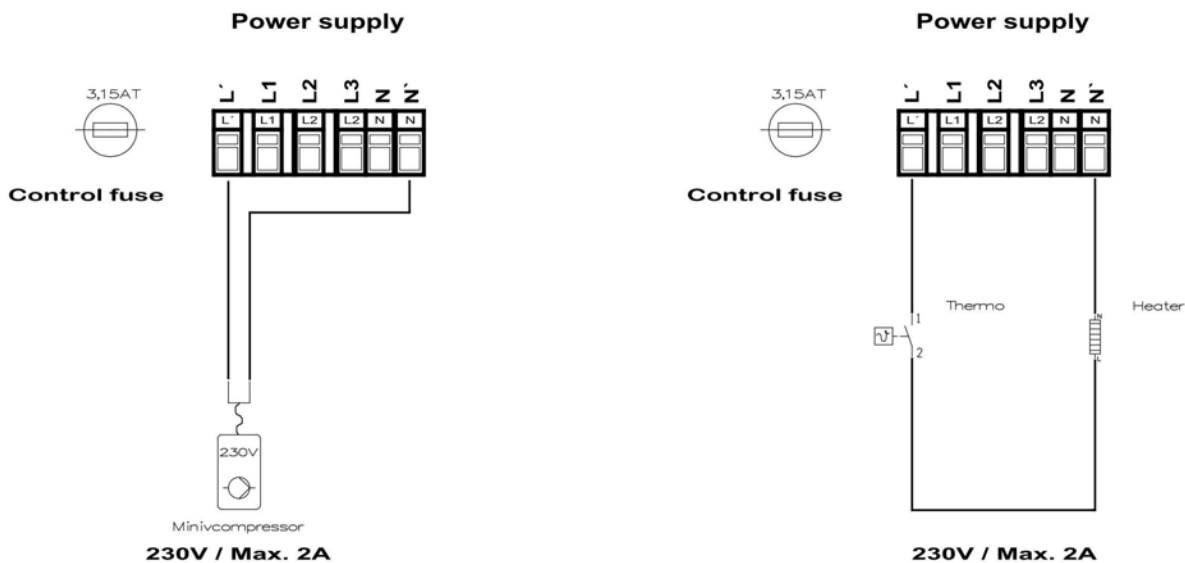
The electronic controls are equipped with a potential free alarm relay that makes the operation of a signal lamp or a horn possible (230V AC).



### 8.14 Mini compressor or heater connection diagram (examples)

A separate 230V connection to the control system may be used to operate a mini compressor for an air bubbling device, when using the open dynamic pressure measuring approach, or an enclosure heater.

**Attention!** When selecting the heating, the starting current must be taken into consideration!



## 9. Electrical connection for level detection (measuring system)

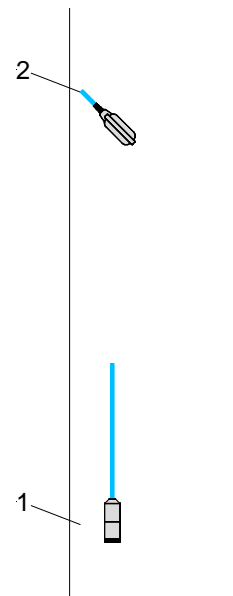
The control system can be operated with different level measuring systems:

### 9.1 External level sensor

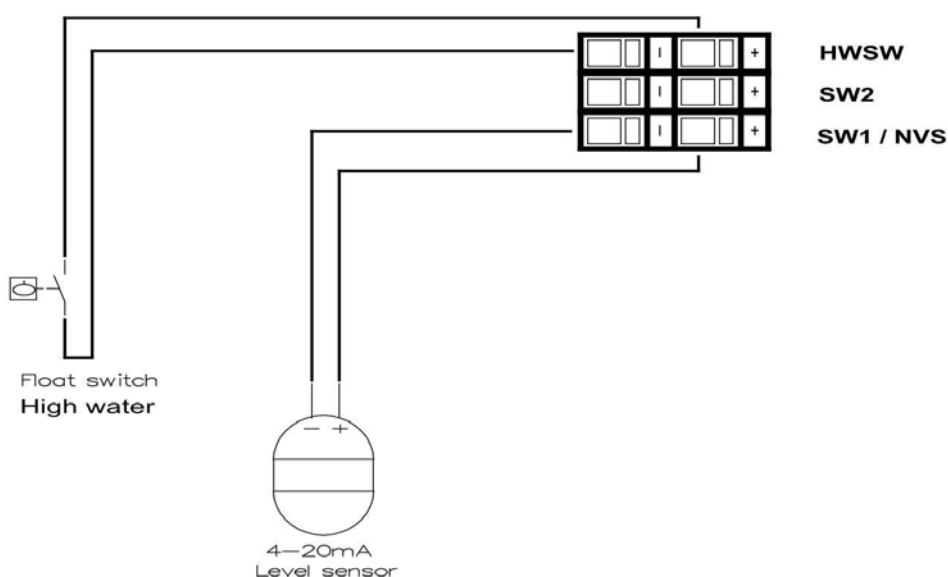
- Measurement range from between 0 ... 1m WS to 0 ... 10mWS
- (adjustable);
- 4... 20mA norm signal
- plus a floater switch as a high water monitor

During this procedure, a pressure gauge is inserted into the medium via a sealed housing. The fill level pressure affects the Piezo sensor directly and is transferred in the line via an analogue electrical signal in the form of 4-20 mA. To increase security, a high water float should always be added that switches on the pump in the event of a level sensor failure, or when a certain high water level has been reached; or reversely that shuts the pump back off when the level falls below a certain line.

1. Level sensor
2. Float switch High water



**External level sensor  
plus a floater switch as a high water monitor**



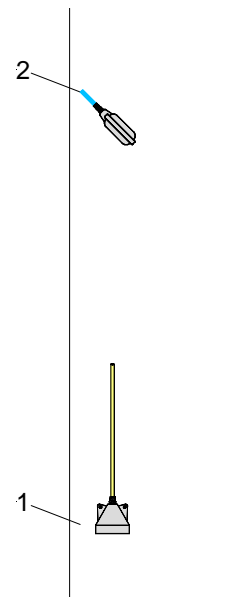


## 9.2 Internal dynamic pressure sensor

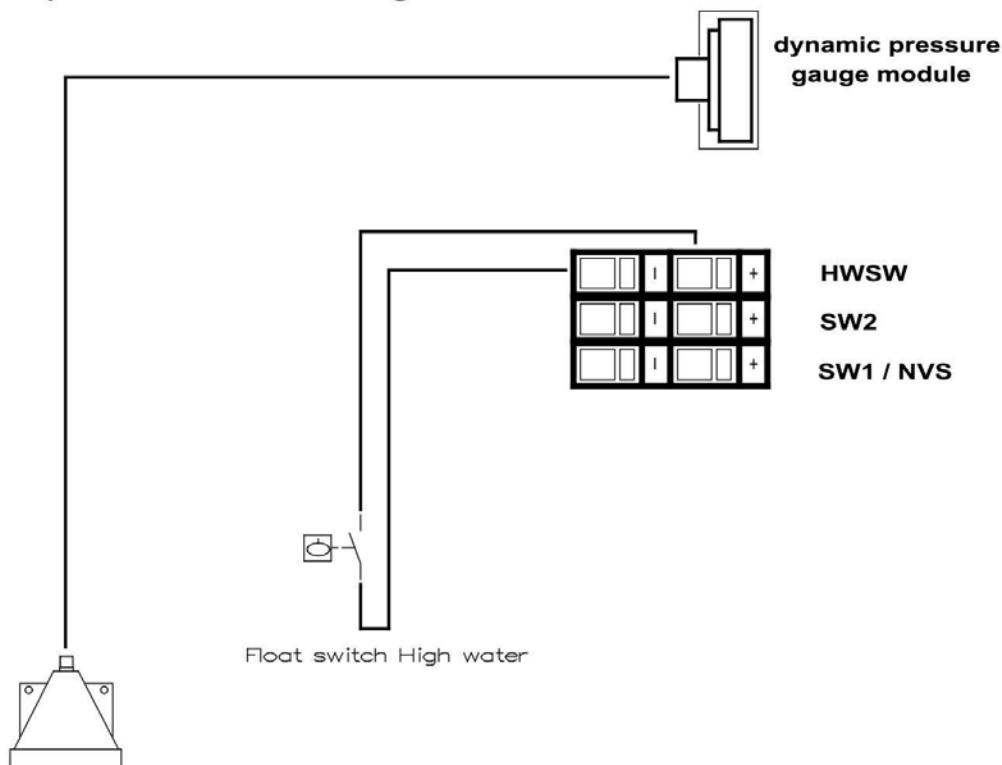
- measuring range 0 ... 2 m WS
- for connecting a diving bell on a pneumatic hose
- plus a floater switch as a high water monitor

When applying the dynamic pressure measuring method, a water level change always takes place along with the pressure change in the measuring system. This change in pressure is detected by the control system sensors which can then determine a water level height. For added security, a high water float that switches on the pump in the event of a level sensor failure, or when a certain high water level has been reached, should always be used; or reversely, that shuts the pump back off when the level falls below a certain line.

1. Diving bell
2. Float switch High water



### Internal dynamic pressure sensor plus a floater switch as a high water monitor



### 9.3 Float switch

Depending on the water level and actuation of the float switch, the pump will either be turned on or off. A high water float that will turn on the pump should always be added for increased security, acting independently from the general float switch settings when the water reaches a certain height.



**Due to the use of low-voltage, only float switches with gold contacts should be used!**  
**Should the float switches be used in an ATEX area, these must also have an intrinsically safe circuit, e.g. using a Zener barrier for proper operation.**

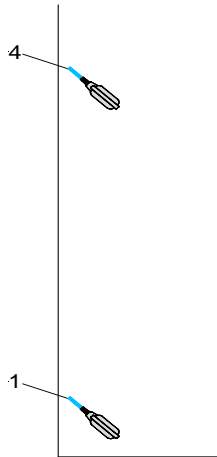


Fig. Pump controls with one float switch

- 1. Float switch 1
- 2. Float switch 2
- 4. Float switch

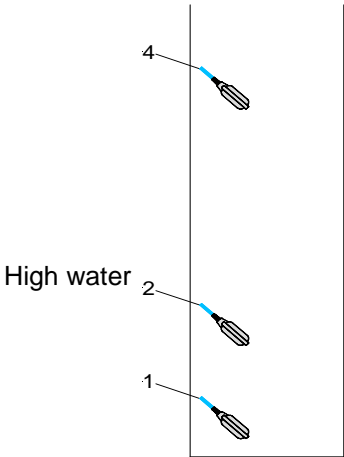
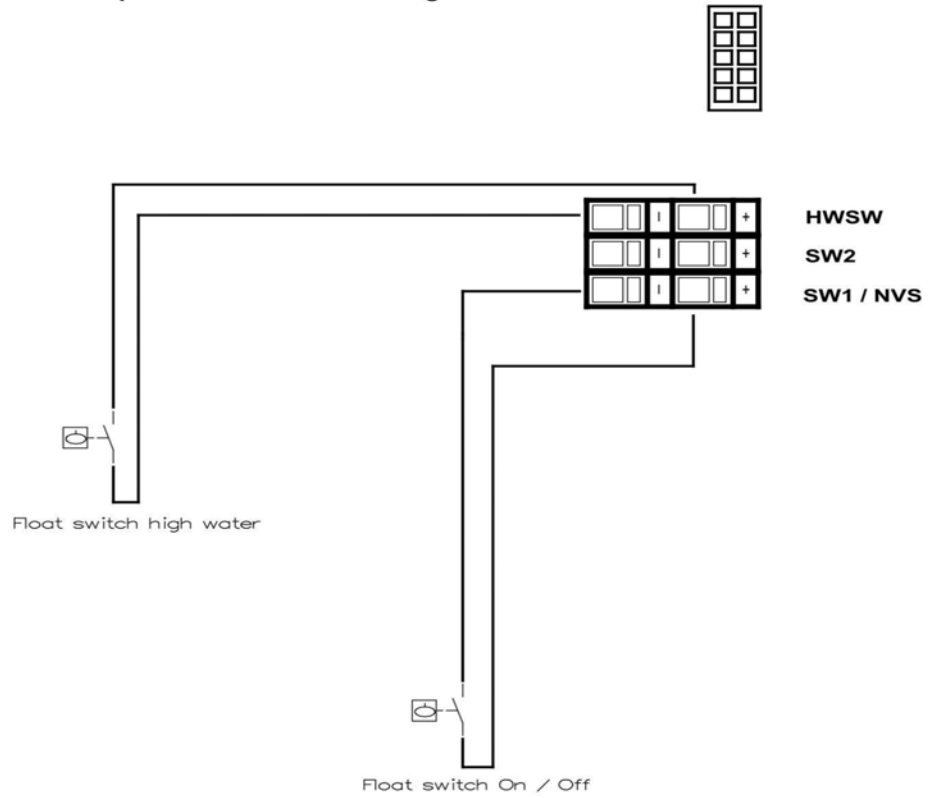
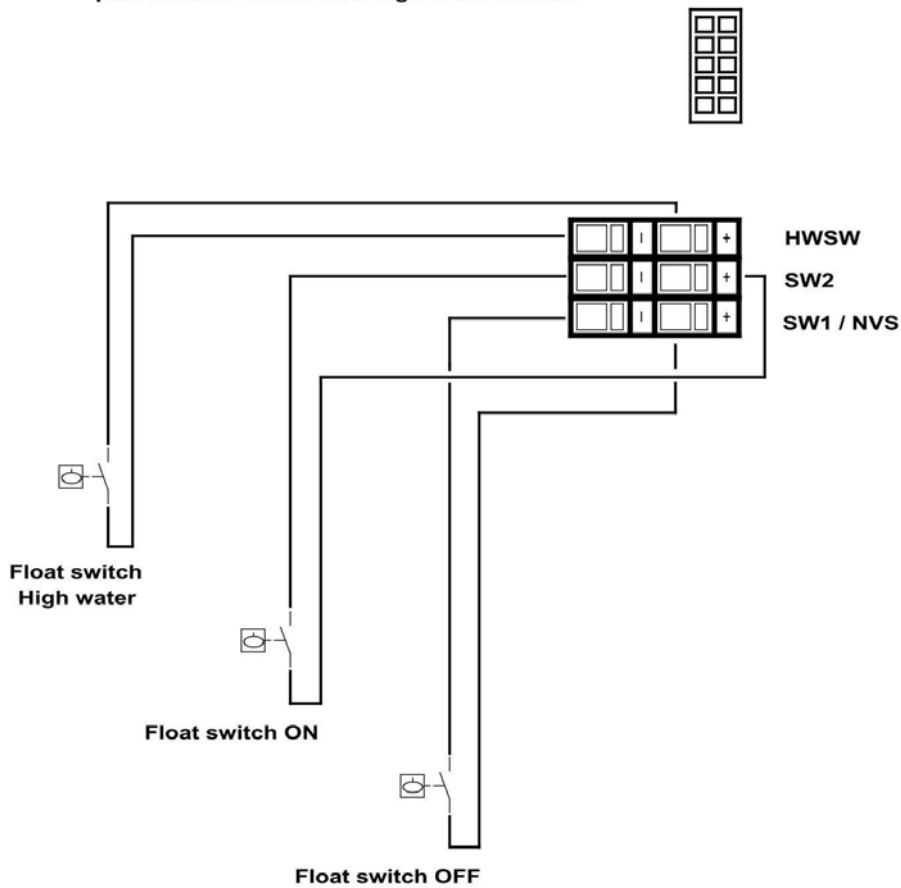


Fig. Pump controls with two float switches

**With one float switch  
plus a floater switch as a high water monitor**



**Two float switches  
plus a floater switch as a high water monitor**

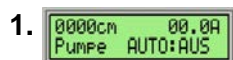
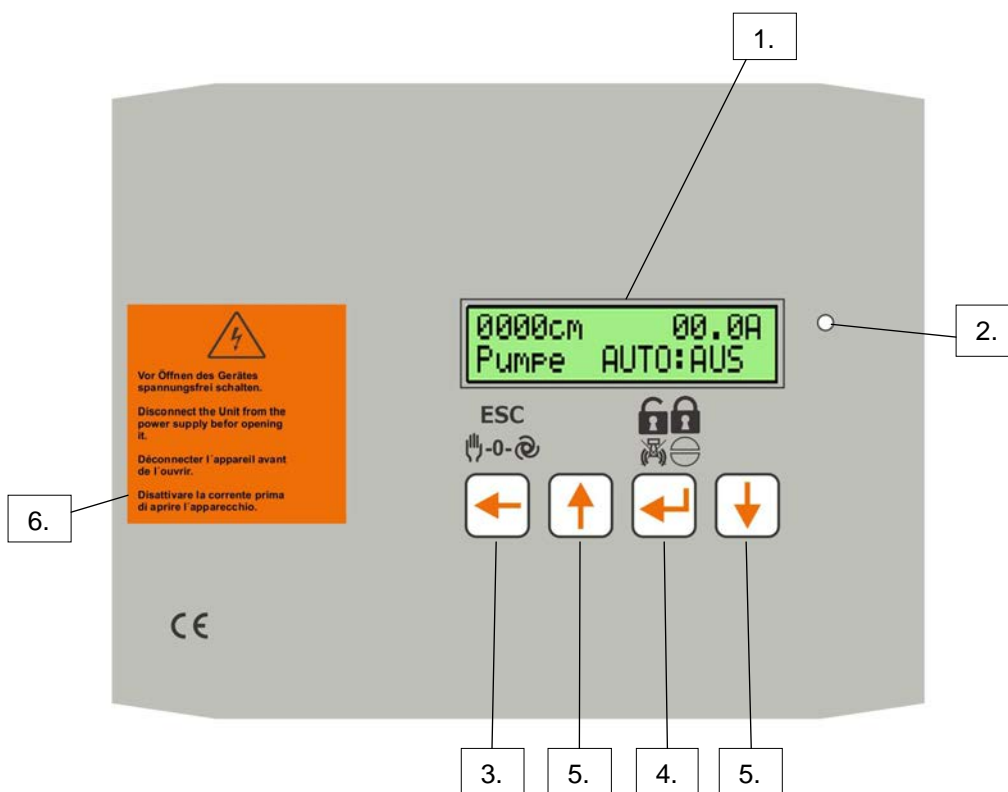


## 10. Operation and display

### 10.1 Overview



**Attention!** After the power is switched on, an automatic calibration of the touch sensitive keys will take place. The touch keys must not be actuated while the control system is booting up.



Representation on a dual-line display: Messages are rendered in plain text on a dual-line LCD display with 16 lines each and each in the language selected.




#### LED green/red

- LED constant green = operational
- LED green flashing = pump has been turned on, either automatically or manually
- LED constant red = fault message
- LED red flashing = pump has been manually turned off



### ESC function key and manual-0-automatic

**ESC** By touching the key, you will be taken directly from a sub-menu onto the main screen, or in the event of a new entry, input will be cancelled at that point.


 If you are on the main screen, you can change the mode of operation at this point by simply touching the appropriate key:


- MANUAL ON – pump will be on continuous operation; Attention - the pump may run dry - operation is limited to 120sec.
- MANUAL OFF – pump is out of service. Caution - danger of overflow!
- AUTO – pump will start up automatically if a certain level is reached.


Attention! Watch the display.



### Function key; Alarm OFF, Acknowledge/Reset

 Attention! Operation is only possible when the key lock is deactivated. To do this, hold down the key for 3 seconds. The lock symbol will disappear from the display when the time is up. The key lock activates automatically if there is no input for a longer period.

 If you are on the main screen, you can change the alarm relays by touching the key once and by touching the key twice, the internal acoustic alarm will be deactivated.

 You can reach the desired sub-menu by touching the Acknowledgement (Reset) key, which would for example, acknowledge a parameter change. Resolved faults will be reset.



You can scroll through the menu by touching the Arrow key. You can also use this to make changes to number values in a menu item, or execute parameter functions.



### Warning message

The warning is not applicable when a load-break Emergency OFF switch has been retrofitted.



**After changing parameters/menu settings, it could be the case that these will not be immediately processed by the control unit. A reboot of the control system is necessary for the changes to take effect. This means that the power supply voltage must be turned off and if batteries have been installed, they must be removed. After a successful restart, all the parameters will have been overwritten with the new data.**

## 10.2 Control system main screen with dual-line display

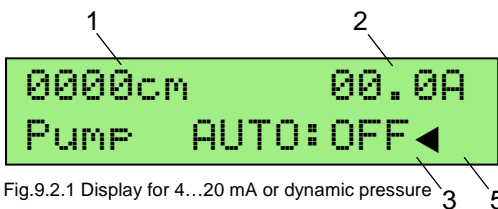


Fig.9.2.1 Display for 4...20 mA or dynamic pressure

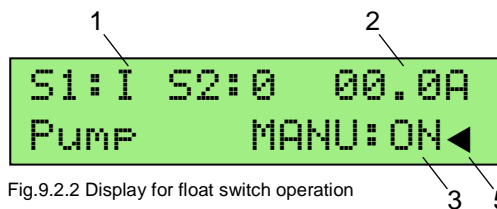


Fig.9.2.2 Display for float switch operation

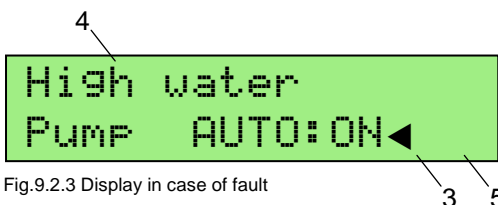
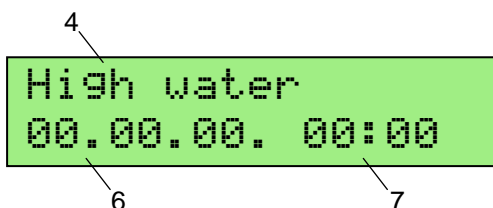


Fig.9.2.3 Display in case of fault

1. Height level in cm (when measuring level: 4...20 mA or dynamic pressure)  
or  
Float switch 1 to 2 (during level control: Float switch)
2. Motor power indicator (with current transformer option)
3. Motor operational state indicator:
  - AUTO:ON Motor is controlled in automatic operating mode
  - AUTO:OFF Motor is not controlled in automatic operating mode
  - MANUAL:ON Motor is switched on in manual mode
  - MANUAL:OFF Motor is switched off in manual mode
4. Fault indicator  
In the event of a fault, the display will cycle between the main display and the fault display.
5. Symbols
 

◀	flash	Controls ON
🔒	Flashing	key lock is ON
↕		Change of numeric values and parameters is possible
🔋		Control system is operating in battery mode
?		Check plausibility of the levels input



Display in failure or fault memory

4. Type of fault
6. Date of fault
7. Time the fault occurred

### 10.3 Operating mode of the pump

The operating mode of the pump can be switched with the respective sensor key between Automatic, Manual ON and Manual OFF.



If the pump is in the Manual ON mode, it will only be operational if there are **NO** pump faults indicated.



**Manual operation, default settings:** If in the Thermo/AUX menu item the Default function has been selected and the system is operating in Manual mode, the system will shut down automatically in 120 sec. and the operating mode will switch to AUTO mode. The operator holds the responsibility of making sure that the pump will never run dry. The Thermo contact function will still be maintained. That means no manual operation will be possible when the Thermo contact is open (over temperature).



**Manual operation, ATEX mode:** If in the Thermo/AUX menu item the ATEX mode is selected, the pump will only run until the lowest shut-off point has been reached. After that, the operating mode will switch back to the AUTO mode. If a time has been entered into the Lag time menu item and the shut-off point has been passed, you may manually pump below the shut-off point by using the Manual operating mode. Manual operation is cancelled after 120 sec. and the operating mode will change to AUTO operation. If you should see in the display “ATEX: OFF-below level”, a manual operation will not be possible until the shut-off point has been exceeded again.



Should you select the MANUAL:OFF operating mode, the pump will be completely turned off.  
**Attention! High water/flood hazard! The pump will not switch on in case of a high water alarm.**

### 10.4 Messages after the system boots up

Once the control system is switched on, a program memory check will be performed. Various messages regarding the internal configuration, the software status etc. will be displayed. Afterwards the control system will run a self-test. After this start-up delay has passed, the control system will boot up automatically.

### 10.5 Pump controls

#### **Pump controls in normal operation**

In general, the following work processes apply: Should the level rise above a (pre-set) level value, the pump will start up. Should the level fall below a (pre-set) value, the pump will shut down.

#### **Pump controls during high water operation**

##### **a) Analysis using the level measuring system:**

When the pre-set high water levels have been exceeded (alarm level), the pump will switch on. An optical and acoustic alarm will be set off. Depending on the settings, an alarm can also be set up to actuate via a potential-free contact. After falling below the ALARM level and the STOP level, the pump will turn itself on again.

**b) Analysis using a separate high water float and a functioning level measuring system:**

If the separate high water float should actuate, the pump will switch on. An optical and acoustic alarm will be set off. Depending on the settings, an alarm can also be set up to actuate via a potential-free contact. After switching off the float switch and falling below the STOP level, the pump will turn itself off.

**c) Analysis using a separate high water float and a fault registering in the level measuring system:**

If the separate high water float should actuate, the pump will switch on. An optical and acoustic alarm will be set off. Depending on the settings, an alarm can also be set up to actuate via a potential-free contact. After switching off the float switch, the pump will be turned off again.



**We recommend fitting an overflow float to every system, as a fault in the normal level detection system can lead to an overflow. If a control system is operated without an overflow float, we will not be liable for the costs arising from any consequential losses due to faulty level detection.**

## 10.6 Fault messages and alarms

The control system monitors whether the following faults have occurred, in addition to the fault messages already allocated to the pump (see separate chapter “List of faults”

- High water
- Faults registering in the measuring technology (short circuit or open circuit in the supply line or level sensor, inconsistent switching states of the float)
- Removal of the control voltage, incorrect rotary field of the mains supply infeed
- Battery voltage is too low

Faults are signalled via a red LED, a built-in buzzer and with a potential free alarm relay.

The control system is equipped with an alarm relay, which can be set either to Summary Alarm or High Water setting.

## 10.7 Switching behaviour of the pumps

The switching levels determine when the pumps will be turned on or off. Should the controls be steered with a continuous level sensor system (level sensor or dynamic pressure system), the measured levels will be processed and analysed directly. If the control system is activated by float switches, the switching states of the floats will determine if the pump switches or not. The following conditions must be met for consistent level values:

- a) The largest level setting must be smaller than the pre-set measuring range of the level measuring system
- b) STOP level pump switch < START level pump switch < Alarm level

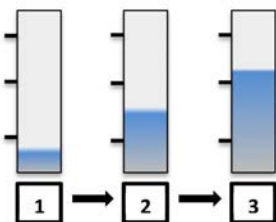
If during operation a level higher than the alarm level would be measured, a high water alarm will be set off.



**The rule is: If a STOP signal is actuated via a level change or via a change of the float status, the pump will not shut off immediately, but rather after a pre-set optional lag time setting has expired!**

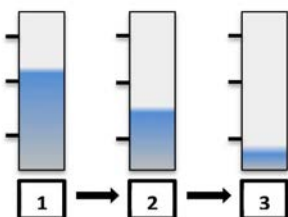


**10.7.1 Level increase with dynamic pressure or 4...20 mA:**



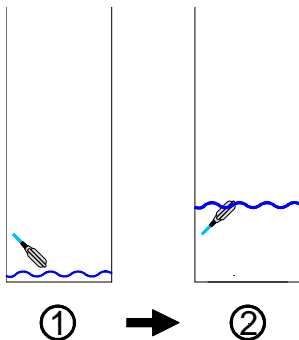
Item	Description	State Pump
①	Level is below the STOP point	OFF
②	Level has risen above the STOP point	OFF
③	Level has risen above the START point	ON

**10.7.2 Falling level with dynamic pressure or 4...20 mA:**



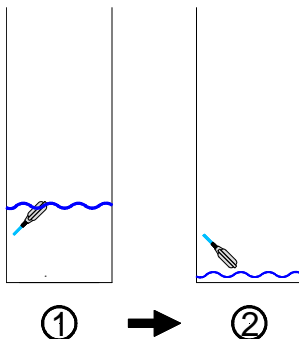
Item	Description	State Pump
①	Level above the START point	ON
②	Level falls below the START point	ON
③	Level falls below the STOP point	OFF

**10.7.3 Level increase during pump operation with a float switch:**



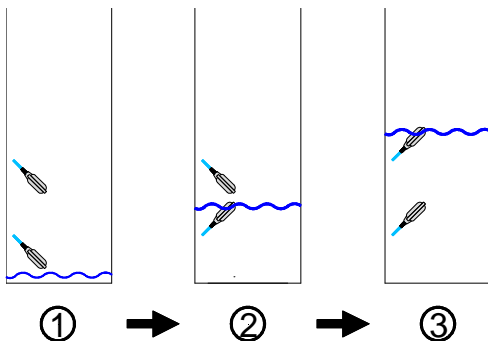
Item	Float switch	State Pump
①	not enabled	OFF
②	enabled	ON

**10.7.4 Falling level during pump operation with a float switch:**



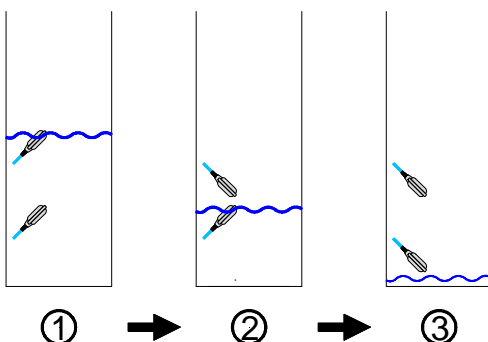
Item	Float switch	State Pump
①	enabled	ON
②	not enabled	OFF

**10.7.5 Level increase during pump operation with two float switches:**



Item	1. Float switch	2. Float switch	State Pump
①	not enabled	not enabled	OFF
②	enabled	not enabled	OFF
③	enabled	enabled	ON

**10.7.6 Falling level during pump operation with two float switches:**



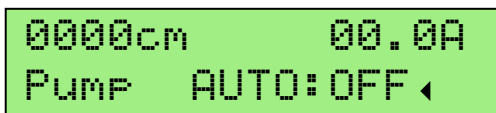
Item	1. Float switch	2. Float switch	State Pump
①	enabled	enabled	ON
②	enabled	not enabled	ON
③	not enabled	not enabled	OFF

## 11. System menu/parameter settings

↳ Note!

Various functions may not be available, depending on the actual configuration of the control system. Menu items not specified for the settings will be greyed out.

The information on the respective screen pages are in accordance with factory settings!



```
0000cm      00.00A
PUMP AUTO: OFF ←
```

### 11.1 Main screen

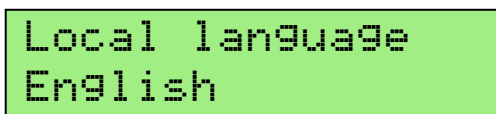


```
Service menu
OFF
```

### 11.2 Service menu

**OFF:** All settings will be displayed; modifications are only in the menu items  
Local language and date/time settings are possible.

**ON:** All settings in the menu can be changed

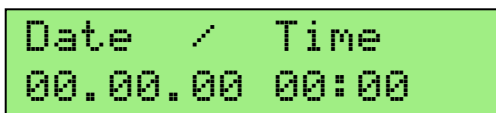


```
Local language
English
```

### 11.3 Languages

**German/English/French/Italian/Dutch**

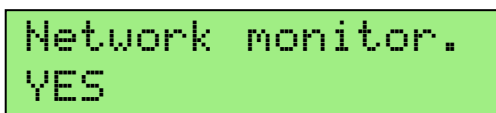
This menu allows you to select the user interface language.  
All text will appear in the language selected.



```
Date / Time
00.00.00 00:00
```

### 11.4 Date/time

Enter the current date and time in this menu



```
Network monitor.
YES
```

### 11.5 Network monitoring

**YES:** Should an incorrect phase sequence be determined at the input terminals or phases L2 or L3 should be missing, an alarm will be triggered: (phase fault).

The motor cannot be activated.

Monitoring of the missing phase L1 can be done on battery power if necessary

**NO:** When the control system is operating on a 1-phase network, the network monitoring must be OFF (no network).



START delay  
03sec

11.6 **Start delay**

After a mains failure, the control system will only start up after the set time has elapsed. A zero value turns off the function.

**Settings of 00 – 99sec are possible**



Thermo / AUX  
Standard

11.7 **Thermo/AUX**

**Standard:**

If the Thermo contact is interrupted or stopped, the motor and an alarm will be actuated (Thermo contact). After the motor has cooled down, the fault will be cancelled automatically. Should the fault occur three times in a row, the motor will be turned off (4x Thermo contact). After the removal of the malfunction, a manual acknowledgement/clearing must be done at the control system.

**ATEX:**

If the Thermo contact is interrupted or stopped, the motor and an alarm will be actuated (Thermo contact). After the motor has cooled down the fault will not be automatically acknowledged/reset. The fault will still be stored even after a complete network failure, with power failure protection. After the malfunction has been corrected, a manual acknowledgement/reset of the fault must be done at the control system.

Manual mode and forced emptying is only possible to the STOP level, after which the motor will be switched off and the operating function switches to AUTO mode.

If a value has been entered in the Lag time menu item and the STOP level has been surpassed, you can pump off below the STOP level operating in the manual mode. The manual mode will be interrupted when the pre-set value of max. 120 sec has been reached; the operation switches to AUTO mode.

The message "below STOP level" in the display indicates that the motor can only be switched back on after the STOP level has been surpassed.

**ON / OFF:**

Should the AUX-contact have been interrupted, the motor will stop and an alarm will actuate (Thermo/AUX). This function can be used to lock the system from the outside.



Short run  
NO

11.8 **Brief start-up**

**YES:** In order to prevent the motor from freezing up, it is programmed to briefly start up automatically for 3 seconds after an idle time of more than 36 hours.

**NO:** This function is turned off.

```
PUMP out
NO
```

**11.9 Pumping off**

**YES:** If for a period of 72 hours the START level has not been exceeded, the pump shaft will be pumped out to below the STOP level.

**NO:** This function is turned off.

```
Max.running time
00min Alarm
```

**11.10 Maximum runtime**

**00min Alarm:** If the motor runs longer than the pre-set time without interruption (max. 99min), the (maximum runtime) alarm is actuated. The motor continues to run. Should the motor stop running, the alarm will stop as well.

**00min Stop:** If the motor runs longer than the pre-set time without interruption (max. 99min), the alarm (maximum runtime) is actuated. The motor is halted. The motor will be able to run again once the fault has been acknowledged manually at the control system.

```
Measuring system
2x float
```

**11.11 Measuring system**

**4...20mA:** Level measuring system via external analogue sensor (4...20 mA). After selecting the measuring system, the measuring range of the sensor (1 to 1000 cm water column) must still be entered.

**Dynamic pressure:** Level measuring system via dynamic pressure with/without air bubbler (Defined measuring range 1...200 cm water column)

**1x float** level recording via a float switch

**2x floats** level recording via two float switches

```
Zero balance
NO
```

**11.12 Zero balance**

**YES:** This item will cover a zero balance of the measuring system used. When calibrating the measuring system, it must not be in the medium to be measured. You must also ensure that the measuring system is at rest during the calibration procedure. The zero balance calibration can be repeated at any time.

**NO:** A calibration to zero balance will not take place.

```
STOP level  
0010cm
```

**11.13 STOP level**

You can set the STOP level in cm with this menu item. The values must be adapted to the respective local conditions.

**Caution:** The STOP level must always be lower than the START level (“OFF” < “ON”). The input value will automatically be checked for plausibility by the control system against the START level. Should the value not be plausible, the sub-menu will display the message “Level measurement “?”” The entered value must be corrected.



The lowest STOP level must be set at least to 001 cm, because the control system only turns off the motor when the value is lower than the pre-set value. To ensure that the motor will be turned off, in case of a slight drift of the analogue measurement system (zero value may not be able to be achieved => see also zero balance), the STOP point should be set at a few cm and the measuring system should be able to be freed up with a specified and appropriate lag time.



```
START level  
0030cm
```

**11.14 START level**

The START level can be set up in cm in this menu item. The values must be adapted to the respective local conditions.

```
Alarm level  
0050cm
```

**11.15 Alarm level**

The ALARM level can be set up in cm in this menu item. The values must be adapted to the respective local conditions.

```
Lag time  
000sec
```

**11.16 Lag time**

In this menu item the lag time of the motor is set up in second increments that will restart the motor after the STOP level had been previously reached.

The settings range may be freely selected in the range of 000 – 120 seconds.

The value 000sec. turns off the function.



Current measure.  
00.0A NO

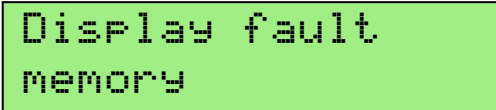
**11.17** Current measurement

**00.0A NO:** Function is switched off. No motor current is displayed on the main screen.

**00.0A YES:** Function is switched on without input of rated current. The main screen displays the measured motor current.

**XX.XA YES:** Function is switched on with motor current input. The main screen displays the motor current.  
Should the measured current exceed the rated current, an overvoltage alarm will be triggered after a certain time span.  
Should the measured current be less than half of the rated current, an undervoltage alarm will be triggered. In order to secure a guaranteed function the pre-set value should be at least ca. 10% above the current displayed on the screen (under normal conditions).

↳ Note! Function is only possible with optional current transformers.




Display fault  
memory

**11.18** Display fault memory

The twenty last registered faults will be displayed in this menu item including a date and time stamp.

This menu item does not accept any entries.



Alarm tone  
ON

**11.19** Audible alarm

**ON:** The internal audible buzzer is turned on.

**OFF:** The internal audible buzzer is turned off.



Alarmrelay  
Alarm summary

**11.20** Alarm relay

**Alarm summary:** If the alarm summary is selected, all fault messages will be reported to the alarm relay.

**High water:** If High Water is selected, and the alarm level is crossed, or a switched high water float switch is actuated, a fault message is sent to the alarm relay.

```
Alarm flash  
OFF
```

**11.21 Flashing alarm**

**OFF:** Depending on the alarm relay connection, the relay contact will either open or close.

**ON:** The alarm relay cycles. A permanently-on lamp can be used e.g. as a flashing lamp.

```
Operating hours  
P: 0h00min
```

**11.22 Operating hours**

Displays the current operating hours of the motor. No entries possible.

```
Switching cycles  
P: 0
```

**11.23 Switching cycles**

Indicates the number of motor starts. No entries possible.

```
Maintenance due  
in 000 days
```

**11.24 Maintenance due**

You can specify in this menu item when and after how many days maintenance service will be due again.(1-999 days); the service telephone number will display on the screen and an audible warning will be heard. If no entry is made, the function will shut off.

```
Service number
```

**11.25 Service telephone number**

You may input a service telephone number here. It will appear on the screen when the time set in the "Maintenance due" menu has expired.

```
Battery operat.  
NO
```

**11.26 Battery operation \*Page 11**

**NO:** no batteries used

**YES:** used two 9V batteries



## 12. Commissioning/recommissioning

Please also refer to the applicable User Manual of the motor.

- The control system is installed in a dry, frost-proof and flood-proof area.
- The connections are carried out in accordance with the associated wiring diagram.
- The on-site pre-fusing meets the specifications of the respective associated wiring diagram.
- The power supply corresponds to the requirements stated in the respective associated wiring diagram.
- Compare the settings value of the overload relay (if installed) with the rated current of the motor (rating plate of the motor) and make corrections as needed.
- Before the mains voltage is switched on, you must make sure that there will not be an unintended start-up of the system.



### **Only then turn on the mains voltage!**

- Set the parameters to your requirements.
- Check the rotation direction of the connected motor. Position the motor operating mode temporarily to “**Manual operation**”. It is important that the connected motor is not damaged by accidentally running dry.
- Then switch the operating mode to “**Automatic**” by selecting that mode of operation.
- Finally carry out a function test.

## 13. Decommissioning

You must ensure during the decommissioning of the system that no unintentional consequential losses occur (i.e. like an accidental overflow, etc.). When working on the control system and/or components of the control system, the 5 safety rules of electrical engineering, among others, must be observed.



1. **Disconnecting (turning off the power supply)**
2. **Securing against re-connection.**
3. **Testing for zero-potential (use the appropriate instrument).**
4. **Earthing and short-circuiting.**
5. **Covering adjacent live parts (potential-free contacts can carry external voltage).**

When working on the motor and/or the measuring system, or on the entire system for that matter, the possibility of an unintentional motor start-up must be prohibited.



**It is important to note that when working on the control system, the motor and/or the measuring system, or even on the system as a whole, you must prevent personnel hazards.**

## 14. Maintenance

We recommend checking the control system and all its accessory parts (or also the complete system) at regular intervals, depending on application and environmental influences.

- Visual inspection of the system and the removal of any contaminants.
- Visual inspection of the system and replacement of any damaged components.
- Perform an operational check.
- Inspect measuring systems.
- Batteries must be changed no later than every 2 years.

## 15. Technical Data

Operating voltage	230V/400V 50 Hz +/- 10%
Pre-fuse	3x16A G
Maximum power for motor connection 400V	4000W
Maximum power for motor connection 230V	2200W
Dimensions (WxHxD)	200x180x110 mm
Power consumption of control system (without power unit)	max. 5.8VA
Control fuse	Miniature fuse 5 x 20 mm 3.15AT (EN 60127-2/III)
Level sensor entry	4 ..20 mA (two-wire)
Level sensor supply voltage	Type. 24V=
Measuring accuracy at level sensor entry	± 1% v.E. ± 1cm WS per 100cm WS
Measurement range Entry Level sensor	adjustable between .0... 1000cm WS
Measuring accuracy of dynamic pressure	Type. ±1.5% v.E. ± 3cm
Measurement range of dynamic pressure	0 ... 200 cm WS
Display resolution for Level sensors	1 cm
Short-circuit current at float switch entry 2, HW	< 1.5 mA
Switching voltage at float switch entry 2, HW	Type. 24V=
Short-circuit current at float switch entry 1/analogue entry	< 25 mA
Switching voltage at float switch entry 1/analogue entry	24V=
Short-circuit current Entry Thermo contact	ca. 35 mA (current draw of motor protection)
Switching voltage Entry Thermo contact	230V AC
Maximum switching voltage for potential-free alarm relay	max. 230V AC / 24V DC
Switching voltage of potential free alarm relay	max. 2A
Measuring accuracy of operating hours counter	< 0.06% of the actual value
Operating accuracy of the software clock	±20 ppm - 0.04 ppm/°C
Required ext. fuse protection for potential-free alarm relay	max. 2A
Temperature range during operation	0 ... 50°C
Storage temperature range	-20 ... 70°C
Humidity	0 – 90% RH (non-condensing)
Battery	2x 9V alkaline or Lithium
Degree of protection	IP54 (with lid closed)

## 16. List of faults and declaration

Bit	Fault	Fault declaration
00	High water	If the measured level is above the set up alarm level or if the high water alarm float switch is actuated at the entry, this fault message is triggered. The pump will switch on immediately with the entry of high water, if there is not a fault on the pump itself.
01	Measuring system	A fault has occurred in the level measuring system. (Short-circuit or interruption at the lines of the level sensor, inconsistent switching states of the float switch, level at dynamic pressure measuring procedure higher than 220 cm). The pump is switched off. But should the high water float switch actuate, the pump will be turned on, unless there is a fault at the pump itself.
02	Bi-metal relays	The overload relay has been triggered because of an excessive current draw.
03	Battery	Battery voltage is too low. The two 9V batteries should be replaced.
04	Phase fault	Network or phase fault. This fault occurs when the phase angle is incorrect at the control system connection, or if at least one of the phases fails.
05	No network	There is no control voltage at the control system; the control system is running on batteries if available.
06	Maximum runtime	The maximum runtime of the pump has been exceeded. Depending on the selection, the pump will be turned off, or will continue to run.
07	Thermo contact	The Thermo contact at the pump has been triggered. The pump will be switched off. This fault should be acknowledged at the control system.
08	4x Thermo contact	The Thermo contacts at the pump have been triggered 4x. The pump will be switched off. This fault should be acknowledged at the control system.
09	Thermo/AUX	The AUX contact at the control system has been interrupted. The pump will be switched off. This fault can be cleared by closing the AUX contact.
10	Min. current	The motor current measured at the pump reads less than half of the prescribed nominal current. The pump will be switched off.
11	Max. current	The measured motor current of the pump has been exceeded. The pump will be switched off. After a certain waiting period, it will turn back on automatically.

