

Level Control Unit

## LevelControl Basic 2

### Installation/Operating Manual



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Installation/Operating Manual LevelControl Basic 2

Original operating manual

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## Glossary

### **ATEX**

The acronym ATEX is the French abbreviation for "Atmosphère explosible" and refers to the two European Union (EU) directives covering the area of explosion protection: ATEX Equipment Directive 2014/34/EU (also referred to as ATEX 95) and ATEX Workplace Directive 1999/92/EC (also referred to as ATEX 137).

### **Bubbler control with compressor**

The air compressor is integrated in the measuring system in addition to the pneumatic level measurement. Condensation can be discharged.

### **DOL starting**

For low power ratings (usually up to 4 kW), the three-phase motor is connected directly to the mains voltage.

### **Pneumatic level measurement**

Determining the liquid level in the tank by means of a pressure sensor integrated in the control unit.

### **Soft starting**

Measures taken to limit the output of a power supply unit or electric motor, to limit the starting current, and avoid excessive acceleration and torques.

### **Star/delta starting**

For starting large three-phase squirrel-cage motors (5.5 kW and above). Prevents voltage dips and fuses from tripping. Used if direct starting would result in a high starting current.

### **Thermal circuit breaker**

The thermal circuit breaker or bimetal element tripping the pump in the event of excessive heat build-up in the motor is connected to the control unit. When the thermal circuit breaker opens, the control unit trips the pump. As the motor cools down, the thermal circuit breaker closes again. In the monitoring circuit, also called lower circuit, the alert is automatically acknowledged after the motor has cooled down. The pump is operational again. In the limiting circuit, also called upper circuit, the alert must be acknowledged manually.

## 1 General

### 1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series, the main operating data and the serial number. The serial number uniquely describes the product and is used as identification in all further business processes.

In the event of damage, immediately contact your nearest KSB service facility to maintain the right to claim under warranty.

### 1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

### 1.3 Other applicable documents

**Table 1:** Overview of other applicable documents

Document	Contents
Pump operating manual	Proper and safe use of the pump in all phases of operation
Wiring diagram	Description of electrical connections
Supplementary operating manual <sup>1)</sup>	Description of the proper and safe use of supplementary product components

For accessories and/or integrated machinery components, observe the relevant manufacturer's product literature.

### 1.4 Symbols

**Table 2:** Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇔	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

<sup>1</sup> If included in agreed scope of supply

### 1.5 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
	<b>DANGER</b> This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
	<b>WARNING</b> This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
	<b>CAUTION</b> This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	<b>Explosion protection</b> This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with the UK regulation titled Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016.
	<b>General hazard</b> In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	<b>Electrical hazard</b> In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	<b>Machine damage</b> In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.



## 2 Safety

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

### 2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
  - Markings for connections
  - Name plate
- The operator is responsible for ensuring compliance with all local regulations not taken into account.

### 2.2 Intended use

The values specified in the technical product literature for the mains voltage, mains frequency, ambient temperature and motor current must not be exceeded. The control unit must only be operated in accordance with the instructions provided in the operating manual and other applicable documents (⇒ Section 1.3, Page 6) .

### 2.3 Personnel qualification and personnel training

All personnel involved must be fully qualified to install, operate, maintain and inspect the equipment this manual refers to. The responsibilities, competence and supervision of all personnel involved in installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the control unit must always be supervised by specialist technical personnel.

### 2.4 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
  - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
  - Failure of important product functions
  - Failure of prescribed maintenance and servicing practices
  - Hazard to the environment due to leakage of hazardous substances

### 2.5 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

### 2.6 Software changes

The software has been specially created for this product and thoroughly tested. Making changes or additions to the software or parts of the software is prohibited. This does not, however, apply to software updates supplied by KSB.

### 3 Transport/Storage/Disposal

#### 3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

#### 3.2 Transport

	<p style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></p> <p><b>Improper transport</b> Damage to the device!</p> <ul style="list-style-type: none"> <li>▷ Always transport the device properly and in its original packaging.</li> <li>▷ For transport, observe the transport instructions on the original packaging.</li> <li>▷ Do not throw the device.</li> </ul>
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1. Upon receipt, unpack the device and check for in-transit damage.
2. Report any in-transit damage to the manufacturer immediately.
3. Dispose of packaging material in accordance with local regulations.

3.3 Storage

	<b>CAUTION</b>
	<p><b>Damage during storage due to humidity, dirt or vermin</b> Corrosion/contamination of the control unit!</p> <p>▸ For outdoor storage cover the (packed or unpacked) control unit and accessories with water-proof material.</p>

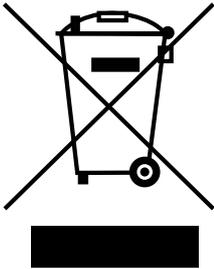
If the ambient conditions for storage are met, the function of the control unit is safeguarded even after a prolonged period of storage. If properly stored indoors, the equipment is protected for a maximum of 12 months.

- Store the control unit in dry, vibration-free conditions and, if possible, in its original packaging.
- Store the control unit in a dry room at constant atmospheric humidity.
- Prevent excessive fluctuations in atmospheric humidity.

**Table 4:** Ambient conditions for storage

Ambient condition	Value
Relative humidity	Max. 85 % (no condensation)
Ambient temperature	-10 °C to + 70 °C

3.4 Disposal



Electrical or electronic equipment marked with the adjacent symbol must not be disposed of in household waste at the end of its service life.

Contact your local waste disposal partner for returns.

If the used electrical or electronic equipment contains personal data, the operator is responsible for deleting it before the equipment is returned.

	<b>NOTE</b>
	<p>Due to certain components it contains, the device is classified as special waste and meets RoHs 2011/65/EC requirements.</p> <p>Once decommissioned, the device must be properly disposed of in accordance with local regulations.</p>

## 4 Description

### 4.1 General description

- Level-dependent control unit with display for controlling and monitoring either 1 or 2 pumps.
- Control unit for tank drainage and tank filling<sup>2)</sup>.
- ATEX-compliant version for pumps in potentially explosive atmospheres. Installation of the control unit outside the potentially explosive atmosphere.

### 4.2 Product information as per Regulation No. 1907/2006 (REACH)

For information as per European chemicals regulation (EC) No. 1907/2006 (REACH) see <https://www.ksb.com/en-global/company/corporate-responsibility/reach>.

### 4.3 Designation

Example: BC 2 400 D F N O 100

Table 5: Designation key

Code	Description	
LevelControl	Type series	
BC	Type	
	BC	Basic Compact (plastic housing)
	BS	Basic control cabinet (sheet steel housing)
2	Number of pumps	
	1	Single-pump lifting unit
	2	Dual-pump lifting unit
400	Voltage, number of wires	
	230	230 V, 3-wire connection
	400	400 V, 4-wire connection / 5-wire connection
D	Starting method	
	D	DOL starting up to 4 kW <sup>3)</sup>
	S	Star-delta starting up to 30 kW <sup>3)</sup>
	W	Soft start
	X	3-wire connection capacitor motor 25 µF
	Y	3-wire connection capacitor motor 40 µF
	Z	3-wire connection capacitor motor 40 µF, start capacitor 66 µF
F	Sensors	
	F	Float switch
	P	Pneumatic level measurement 3.5 m
	M	Pneumatic level measurement 10.5 m
	L	Bubbler control 2 m
	H	Bubbler control 3 m
	U	Analog input 4 - 20 mA
	V	Voltage input 0.5 - 4.5 V
	D	Digital level switch
N	ATEX	
	N	Without ATEX functions
	E	With ATEX functions
O	Installation variants	

<sup>2)</sup> Using float switches, digital level switches or 4 - 20 mA analog sensors

<sup>3)</sup> Higher ratings on request.

Code	Description	
O	O	Standard
	A	With rechargeable battery
	M	With motor protection switch (if not included in standard version)
	N	With rechargeable battery and motor protection switch (if not included in standard version)
	P	With PTC relay (if not included in standard version; standard for 5.5 kW and above)
	Q	With rechargeable battery and PTC relay (if not included in standard version; standard for 5.5 kW and above)
	R	Without PTC relay for versions > 4 kW (standard for 5.5 kW and above)
	S	Without PTC relay for versions > 4 kW (standard for 5.5 kW and above), with rechargeable battery
100	Nominal current	
	010	1,0 A
	016	1,6 A
	025	2,5 A
	040	4,0 A
	063	6,3 A
	100	10 A
	140	14 A
	180	18 A
	230	23 A
	250	25 A
	400	40 A
	630	63 A
	> 63 A available on request	

4.4 Name plate

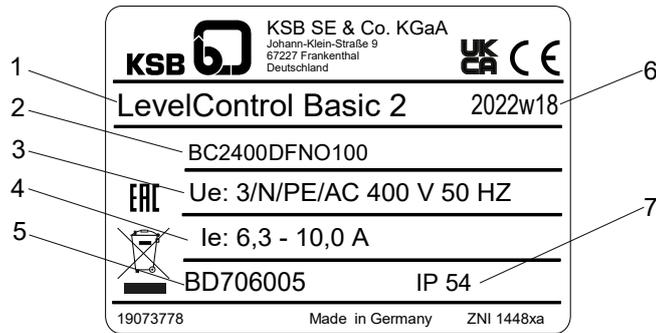


Fig. 1: Name plate (example)

1	Type series	5	Circuit diagram number
2	Product code	6	Year of construction / calendar week
3	Nominal voltage	7	Enclosure
4	Nominal current		

4.5 Technical data

	<b>NOTE</b>
	LevelControl Basic 2 can only be used with TN mains and TT mains as standard. On request, special versions can be supplied for IT mains.

Table 6: Technical data

Characteristic		Value	
		Type Basic Compact (BC)	Type Basic Control Cabinet (BS)
Nominal operating voltage	U [V AC]	3~400: +10 %-15 % 1~230: +10 %-15 %	
Mains frequency	F [Hz]	50 / 60 Hz ± 2 %	
Nominal insulation voltage	U [V AC]	500	
Nominal current per motor	I [A]	1 to max. 10	1 to max. 63
Rated power per motor	P [kW]	DOL starting: up to max. 4	DOL starting / star-delta starting: 0.35 to 30
Enclosure		IP54	
Material		Plastic (polycarbonate) Colour: RAL 7035, light grey	Sheet steel Colour: RAL 7035, light grey
Operating temperature	T [°C]	-10 to +50	
Bearing temperature	T [°C]	-10 to +70	

4.5.1 Technical specifications for sensors

**4 float switches / digital level switches, 12 - 25.2 V DC or 230 V AC**

For ATEX with float switches:

- ATEX-compliant versions in BS housing
- Single-pump station: 2 intrinsic safety barriers, type Stahl 9002/13-280-093-001
- Dual-pump station: 3 intrinsic safety barriers, type Stahl 9002/13-280-093-001

For ATEX with digital level switches (selected via KSB EasySelect):

- ATEX-compliant versions in BS housing
- Single-pump station: incl. 3 intrinsic safety barriers, type Stahl 9002/13-280-093-001
- Dual-pump station: incl. 4 intrinsic safety barriers, type Stahl 9002/13-280-093-001

**4 - 20 mA**

- 2-wire connection and 3-wire connection
- Input resistance ≤ 300 Ω
- ATEX-compliant versions in BS housing
- For ATEX-compliant version incl. 1 intrinsic safety barrier, type Stahl 9002/13-280-110-001

**Integrated pneumatic pressure sensor**

- For open pressure bell or closed pressure bell
- Up to 3 metres of water
- Optional: up to 10 metres of water

**Integrated pressure sensor with compressor for bubbler control**

- For open pressure bell
- Compressor up to 2 metres of water
- Optional: up to 3 metres of water

**Motor protection sensors**

- Maximum of two (thermal circuit breaker) bimetal switches for each pump, 24 V, motor monitoring
- From 5.5 kW star-delta starting: PTC thermistor for motor monitoring for each pump (optionally available for < 5.5 kW)<sup>4</sup>
- Max. one leakage monitor for each Amarex / Amarex N / Amarex KRT pump

**Process inputs**

- 1 external alarm input, 24 V
- 1 remote acknowledgement, 24 V

**Process outputs**

- 1 volt-free signalling output changeover contact (250 V, 1 A, NO/NC contact)
- 1 signalling output (12.6 to 13.2 V, max. 200 mA), e.g. for connecting a horn, alarm combination or alarm strobe light (12 V)

**Rechargeable battery**

Connection for rechargeable battery, for mains-independent power supply of:

- Electronics
- Sensors
- Alarm equipment

Battery life:

- Approx. 10 hours when supplying the integrated piezo buzzer 85 dB(A), electronics, and sensors
- Approx. 4 hours when supplying external alarm equipment (e.g. horn, alarm combination, or alarm strobe light)

Charging time:

- Approx. 11 hours (if rechargeable battery is fully discharged)

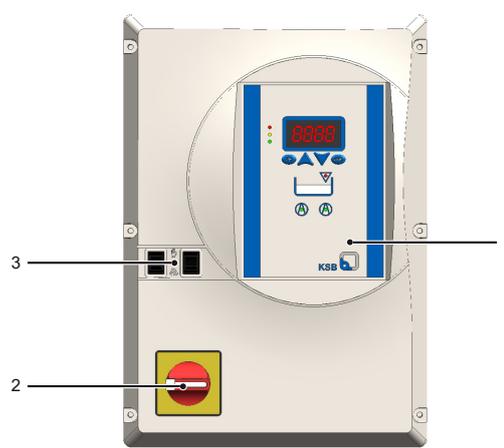
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<sup>4</sup> Not for installation variants R and S

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### 4.6 Configuration and function

#### Type Basic Compact (BC)

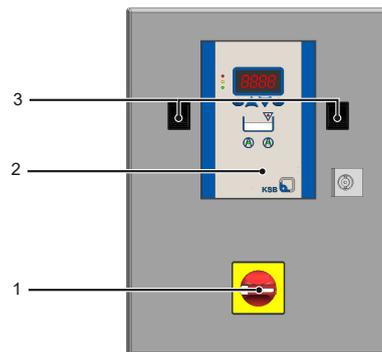


**Fig. 2:** Type Basic Compact (BC)

1	Control panel	3	Manual-0-automatic selector switch
2	Master switch (optional)		

- Pump control and monitoring unit in compact plastic housing
- For either one or two pumps
- With display
- Level detection via:
  - Float switches/digital level switches
  - Analog sensor (4-20 mA)
  - Integrated pressure sensor (pneumatic)
  - Special version: with bubbler system up to 2 metres of water (no further built-in components possible)
- DOL starting

#### Type Basic Control Cabinet (BS)



**Fig. 3:** Type Basic Control Cabinet (BS)

1	Master switch	3	Manual-0-automatic selector switch
2	Control panel		

- Pump control and monitoring unit in sheet steel housing
- For either one or two pumps
- With display
- Level detection via:
  - Float switches/digital level switches
  - Analog sensor (4-20 mA)

- Integrated pressure sensor (pneumatic or bubbler control)
- DOL starting or star-delta starting

**ATEX devices**

	<b>NOTE</b> The control units are not explosion-proof, and therefore must only be operated outside potentially explosive atmospheres.
---	--

Both variants (types BC and BS) are available as ATEX versions for pumps to be used in potentially explosive atmospheres. In ATEX mode, the pump is reliably prevented from being activated, depending on the after-run period, if the fluid level drops below the minimum level (to prevent dry running and, therefore, sources of ignition). This also applies to manual mode or forced start-up via a telecontrol system.

The control unit is installed outside the potentially explosive atmosphere.

#### 4.7 Dimensions and weights

**Table 7: Dimensions and weights**

Type	Nominal current per pump	H × W × D	[kg]
	max.		
	[A]	[mm]	
BC	10	400 × 281 × 135	4,5 - 4,7
BS1	10	400 × 300 × 155	12
BS1 <sup>5)</sup>	10	600 × 400 × 200	12
BS1	14	600 × 400 × 200	20
BS1	18	600 × 400 × 200	20
BS1	23	600 × 400 × 200	20
BS1	25	600 × 400 × 200	20
BS1	40	800 × 600 × 200	30
BS1	63	800 × 600 × 200	30
BS2	10	400 × 300 × 155	13
BS2 <sup>5)</sup>	10	600 × 400 × 200	13
BS2	14	800 × 600 × 200	30
BS2	18	800 × 600 × 200	30
BS2	23	800 × 600 × 200	30
BS2	25	800 × 600 × 200	30
BS2	40	800 × 600 × 200	33
BS2	63	800 × 600 × 200	33

<sup>5)</sup> ATEX-compliant version with float switch or digital switch

## 5 Installation at Site

### 5.1 Safety regulations

	<b>DANGER</b>
	<p><b>Incorrect installation</b>            Danger to life!</p> <ul style="list-style-type: none"> <li>▷ The control unit must be installed in a flood-proof location.</li> <li>▷ Never install the control unit in potentially explosive atmospheres.</li> <li>▷ Integration in external control system: observe the directives for low-voltage switchgear and controlgear assemblies.</li> </ul>

### 5.2 Checks to be carried out prior to installation

	<b>NOTE</b>
	<p>Contact the manufacturer if the product is to be used under conditions other than those stated above.</p>

Before beginning with the installation check the following:

- The data on the control unit name plate has been checked. The control unit must be suitable for operation on the available power supply network.
- The place of installation is dry.
- The place of installation is frost-free.
- The place of installation is protected against flooding.
- The place of installation is well-ventilated.
- The place of installation is not potentially explosive.
- The specified ambient conditions are met.

**Table 8:** Ambient conditions

Characteristic	Value
Temperature during operation	-10 °C to +50 °C
Relative humidity	Non-condensing
Installation altitude	1000 m above MSL (max.)

### 5.3 Installing the control unit

The control unit must be handled with care to prevent damage to the components.

- ✓ The place of installation meets the requirements indicated.
  1. Remove the control unit from its original packaging.
  2. Install the control unit on a stable base (e.g. wall, bracket, etc.).

### 5.4 Electrical connection

	<b>DANGER</b>
	<p><b>Unintentional contact with live parts</b>            Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ De-energise the mains connection.</li> <li>▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.</li> </ul>

	<p style="background-color: #FFD700; margin: 0;"><b>CAUTION</b></p> <p><b>Nominal current of the pump too high</b> Damage to the control unit!</p> <ul style="list-style-type: none"> <li>▷ Do not exceed the nominal current.</li> </ul>
	<p style="background-color: #FFD700; margin: 0;"><b>CAUTION</b></p> <p><b>Improper electrical connection</b> Damage to the control unit / control cabinet!</p> <ul style="list-style-type: none"> <li>▷ Check the type of current and voltage of the mains.</li> <li>▷ For connecting pump power cables with flexible cores, attach wire end sleeves to the core ends that are to be connected to the control unit.</li> <li>▷ Observe the wiring diagrams..</li> </ul>

**Lightning protection**

- Electrical installations must be protected against overvoltage (binding since 14 December 2018) (see DIN VDE 0100-443 (IEC 60364-4-44:2007/A1:2015, modified) and DIN VDE 0100-534 (IEC 60364-5-53:2001/A2:2015, modified)). Whenever modifications are made to existing installations, retrofitting a surge protective device (SPD) in accordance with VDE is mandatory.
- The associated lightning protection concept must be provided by the operator or by a suitable provider commissioned by the operator. Surge protective devices can be found in the extended accessories range (type series booklet 4041.51) as optional control unit components.

**Indoor installation:**

- A maximum cable length of 10 metres should not be exceeded between the surge protective device (usually type 1, internal lightning protection) installed at the service entrance and the equipment to be protected. For longer cables, additional surge protective devices (type 2) must be provided in the sub-distribution board upstream of the equipment to be protected or directly in the equipment itself.
- Sensor cables that cross the boundaries between lightning protection zones must be additionally protected by suitable surge protective devices (e.g. when using a 4 - 20 mA immersion probe).

**Outdoor installation:**

- Control units installed outdoors (e.g. in outdoor cabinets) should always be equipped with Type 1 surge protective devices (lightning protection), as they will not normally be protected by a suitable upstream service entrance SPD.

**Electrically connecting the control unit**

- ✓ The mains voltage matches the nominal voltage specified on the name plate.
1. Route the cables through the cable glands.
  2. Make sure that the sealing elements are properly positioned. Tighten the cable glands (strain relief).
  3. Connect the control unit/cabinet in accordance with the wiring diagram (⇒ Section 11.1, Page 70) and in line with the application.

### 5.5 Connecting the pneumatic pressure measuring equipment



#### CAUTION

##### Condensate accumulation in connecting tube

Incorrect pressure reading!

- ▷ Always install the connecting tube with a continuously falling slope.
- ▷ Shorten the connecting tube, if necessary, to allow condensate to drain at all times.

1. Run the connecting tube of the measuring device into the control unit through an unused cable gland (M16).
2. Push the connecting tube onto the connecting element and make sure that it is secure.
3. Make sure that the seal is properly positioned and tighten the cable gland (strain relief).

## 6 Operation

	<p style="background-color: #e67e22; color: white; padding: 5px;"><b>⚠ DANGER</b></p> <p><b>Unintentional starting of pumps</b>              Risk of injury: Limbs can be pulled into or crushed by machinery!</p> <ul style="list-style-type: none"> <li>▷ Make sure that nobody is within the immediate, hazardous vicinity of the pumps.</li> <li>▷ Make sure that all piping is properly installed and that the fluid handled cannot escape.</li> </ul>
	<p style="background-color: #2980b9; color: white; padding: 5px;"><b>NOTE</b></p> <p>For dual-pump lifting units all instructions refer to both the pump sets. For single-pump lifting units the steps only have to be carried out for one pump set.</p>

Operation via:

- Manual-0-automatic selector switch (⇒ Section 6.2, Page 24)
- Control panel (⇒ Section 6.1, Page 22)
- Service interface (connector inside control unit) (⇒ Section 6.3, Page 25)

### 6.1 Control panel (LevelControl Basic 2)

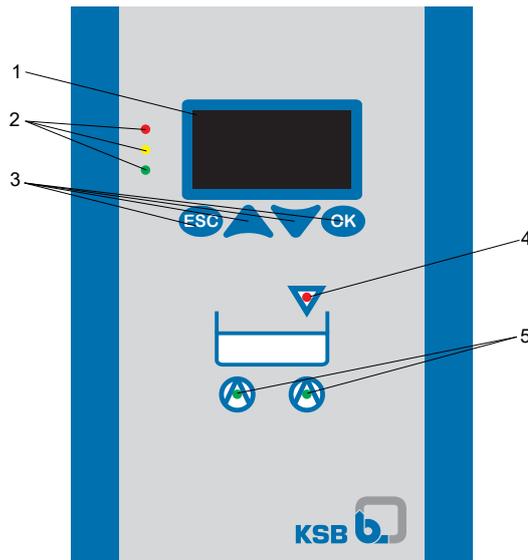


Fig. 4: Control panel

1	Display
2	Traffic light LEDs
3	Navigation keys
4	"High water" LED
5	LED for pump set information

### 6.1.1 LED display

#### Traffic light LEDs

These LEDs provide information about the operating status of the control unit.

**Table 9:** LED description

LED	Description
Green	Trouble-free operation
Yellow	One or more warnings are active.
Red	One or more alerts are active.

#### LEDs for pump set information

These LEDs provide information about the operating status of each pump set.

**Table 10:** LEDs per pump set

LED	Description
Green	Pump set is ready for operation.
Flashing green	Pump set is in operation.
Yellow	Pump set is OFF (manual-0-automatic selector switch set to 0).
Flashing yellow	Pump set is in manual mode (manual-0-automatic selector switch set to manual).
Red	Pump set is locked because an alarm is active or no enable signal is received.

#### "High water" LED

This LED signals high water. Fault messages with a higher priority overwrite the high water alert.

**Table 11:** LEDs per pump set

LED	Description
Red	High water <ul style="list-style-type: none"> <li>▪ Forces a start-up of the pump sets.                             <ul style="list-style-type: none"> <li>– Exception: units for potentially explosive atmospheres with defective sensor. Check that the sensors function properly.</li> </ul> </li> </ul>

### 6.1.2 Display

The following information is displayed:



**Fig. 5:** Display

1	Parameter
2	Parameter/measured value
3	Alert

### 6.1.3 Navigation keys

**Table 12:** Control panel: Navigation keys

Key	Description
	<b>Arrow keys:</b> <ul style="list-style-type: none"> <li>▪ Move up/down in the menu options.</li> <li>▪ Increase/decrease a numerical value.</li> </ul>
	<b>Escape key:</b> <ul style="list-style-type: none"> <li>▪ Cancel an entry without saving it.</li> <li>▪ When entering numbers: Go to the previous digit.</li> <li>▪ Move up one menu level.</li> </ul>
	<b>OK key:</b> <ul style="list-style-type: none"> <li>▪ Confirm entries.</li> <li>▪ Confirm a menu selection.</li> <li>▪ When entering numbers: Go to the next digit.</li> </ul>

### 6.2 Manual-0-automatic selector switch

Each pump can be operated as follows by means of a manual-0-automatic selector switch:

**Table 13:** Switch positions of manual-0-automatic selector switch

Switch position	Function
	Function allowing the pump to be operated manually for a short period
	Switch locks in place. The pump is switched off.
	Switch locks in place. The pump is started/stopped by the control unit as a function of demand.

### 6.3 Service interface

	<p><b>⚠ DANGER</b></p>
	<p><b>Unintentional contact with live parts</b>            Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ De-energise the mains connection.</li> <li>▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.</li> </ul>
	<p><b>NOTE</b></p>
	<p>The KSB Service Tool software can be downloaded from the KSB web site or obtained as Service CD (see price list).</p>

Connect a computer to the control unit's service interface by means of an RS232 cable to enable operation via the service interface. The service interface can only be accessed when the control unit is open.

#### Type Basic Compact (BC)

1. Remove 6 hexagon socket head cap screws from the front of the cover.
2. Connect the RS232 cable to the service interface (see the below drawing).
3. Connect it to the computer by means of the RS232 cable.
4. Start the KSB Service Tool. Refer to the KSB Service Tool manual for more information.
5. After having configured all settings, disconnect the RS232 cable from the control unit's service interface and properly fasten the cover using the 6 hexagon socket head cap screws.

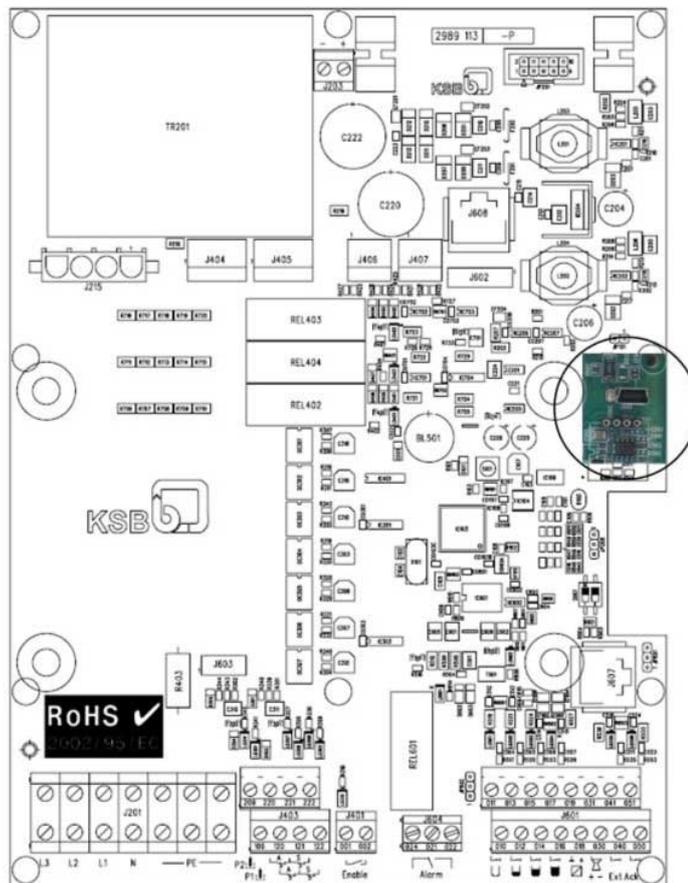


Fig. 6: Service interface for type BC

Type Basic Control Cabinet (BS)

	<b>NOTE</b>
<p>The KSB Service Tool software can be downloaded from the KSB web site or obtained as Service CD (see price list).</p>	

- ✓ Cabinet key (included in the scope of supply) is on hand.
  1. Open the control cabinet door using the cabinet key.
  2. Connect the RS232 cable to the service interface (see the below drawing).
  3. Connect it to the computer by means of the RS232 cable.
  4. Start the KSB Service Tool. Refer to the KSB Service Tool manual for more information.
  5. After having configured all settings, disconnect the RS232 cable from the control unit's service interface and lock the control cabinet using the cabinet key.

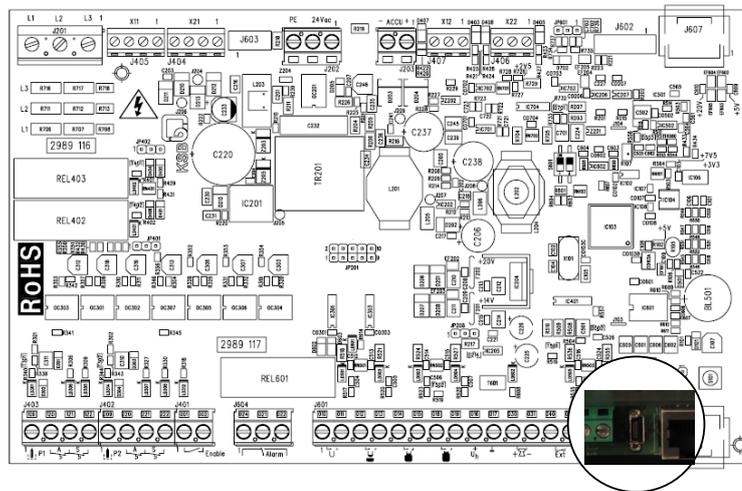
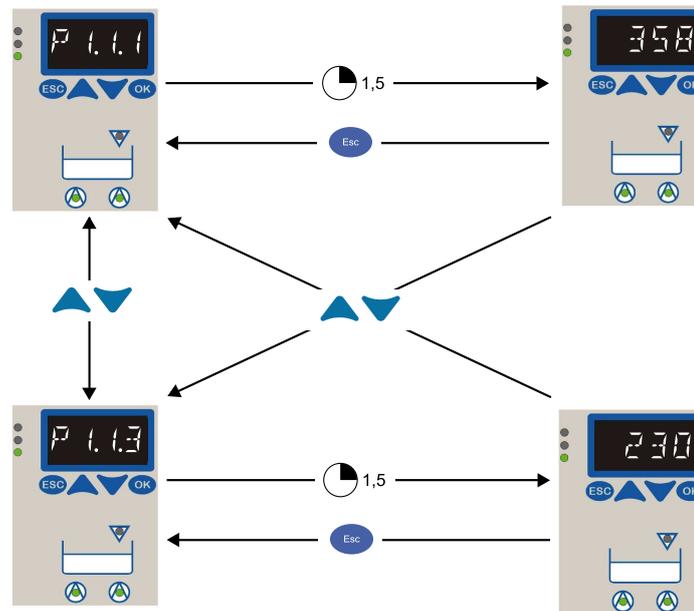


Fig. 7: Service interface for type BS

### 6.4 Functions

#### 6.4.1 Displaying measured value parameters



**Fig. 8:** Displaying measured value parameters

1. Press ESC (several times if necessary) to call up the measured value parameters.
2. Use the arrow keys to select the required parameter number.
  - ⇒ The relevant measured value is displayed automatically after 1.5 seconds.
3. Use the arrow keys to select the next parameter number.

The following measured value parameters can be displayed:

**Table 14:** Measured values:

Parameter		Description	Single-pump station	Dual-pump station
1-1-1	Level (Analog)	Fill level in millimetres (if analog sensors are used): pneumatic, bubbler system, 4 .. 20 mA	X	X
1-1-2	Level (Digital)	Switching levels if float switches or digital level switches are used	X	X
1-1-3	Line Voltage	Line voltage in volts	X	X
1-2-1	Operating Hours Pump 1	Operating hours of pump 1	X	X
1-2-2	Start Count Pump 1	Number of starts of pump 1	X	X
1-3-1	Operating Hours Pump 2	Operating hours of pump 2	-	X
1-3-2	Start Count Pump 2	Number of starts of pump 2	-	X
2-1-1	Pending Messages	List of acknowledged alerts	X	X

6.4.1.1 Digital level indicator

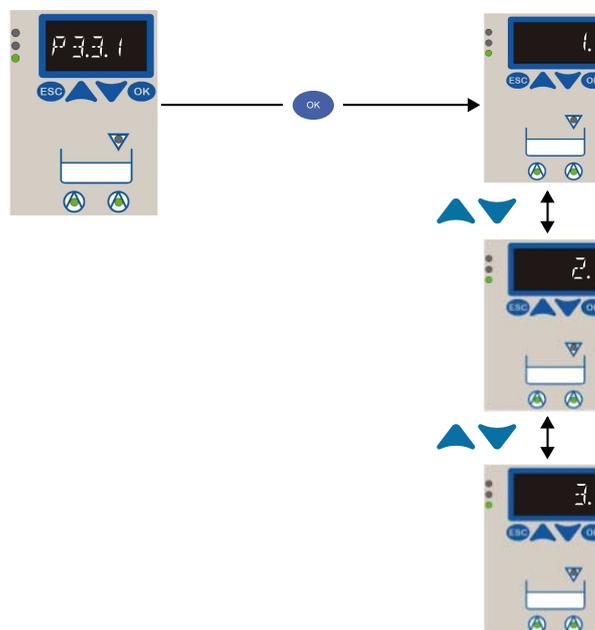
The current level can be read digitally at any time.

Table 15: Overview: digital level indicator

Display	Digital level	Action
	Very low	Pump OFF
	Medium	Before base load pump is started
	High	Base load pump ON
	Very high	Peak load pump ON
	High water	High water alert and both pumps ON

## 6.4.2 Setting parameters

	<div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Incorrect operation</b> Damage to property!</p> <ul style="list-style-type: none"> <li>▷ To protect the device, the parameter settings can only be changed from float switch/digital level switch to 4 .. 20 mA if the peak load switching point has not responded.</li> <li>▷ Drain the tank in manual mode, if necessary.</li> </ul>
	<div style="background-color: #0070C0; color: white; padding: 5px;"><b>NOTE</b></div> <p>The parameters that you can call up depend on the operating mode and measurement method. Only parameters that are relevant to the current operating mode and measurement method are displayed.</p>


**Fig. 9:** Setting parameters

1. Press and hold the **ESC** key and press **OK**.  
⇒ The first parameter number (P 3-3-2) is displayed.
2. Use the arrow keys to select the required parameter number.
3. Confirm the parameter number with **OK**.  
⇒ The parameter value is displayed immediately.
4. Set the parameter value using the arrow keys:  
⇒ In multi-digit entries, the digit to be entered flashes.  
⇒ Press **OK** or **ESC** to move one digit to the right or left and make the required entry.
5. Confirm your entries with **OK**: The parameter value is saved.  
⇒ The parameter number is displayed.
6. Abort the input with **ESC**: The parameter value remains unchanged.  
⇒ The parameter number is displayed.
7. Press **ESC** to return to the measured values.

**Table 16:** Overview of parameters - variant with float switches, digital switches, 4-20 mA

Parameters		Description	Values	Single-pump station	Dual-pump station
3-3-2	Stand-by Pump	Switchover between dual-pump and stand-by mode	0 = dual-pump station with peak-load operation (factory setting) 1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water	-	X
3-3-3	Draining/Filling	Switchover between draining and filling (if float switches or digital level switches are used)	0 = draining (factory setting) 1 = filling	X	X
3-3-4-1	Pumps OFF	Stop level of pumps in millimetres with pneumatic, bubbler, 4-20 mA	250 mm (factory setting)	4-20 mA	4-20 mA
3-3-4-2	Level Base Load ON	Start level of base load pump in millimetres with pneumatic, bubbler, 4-20 mA	400 mm (factory setting)	4-20 mA	4-20 mA
3-3-4-3	Level Peak Load ON	Start level of peak load pump in millimetres with pneumatic, bubbler, 4-20 mA	500 mm (factory setting)	-	4-20 mA
3-3-4-4	High water	Level for high water alert in millimetres with pneumatic, bubbler, 4-20 mA	600 mm (factory setting)	4-20 mA	4-20 mA
3-3-5-3	Stop Delay	Stop delay of base load pump in seconds	0 seconds (factory setting)	X	X
3-3-6	ATEX Mode	Activation of ATEX mode: Tank cannot be drained below the stop level.	0 = OFF 1 = ON	X	X
3-4-2	Measurement Method	Float switches, digital level switches, or 4-20 mA	0 = float switches (with hysteresis; factory setting) 1 = digital level switches (without hysteresis) 2 = 4-20 mA sensor	X	X
3-4-3-1	Level at 4 mA	Measured value at 4 mA in millimetres	200 mm (factory setting)	4-20 mA	4-20 mA
3-4-3-2	Level at 20 mA	Measured value at 20 mA in millimetres	1000 mm (factory setting)	4-20 mA	4-20 mA
3-7-1	Check Run ON/OFF	Functional check run OFF or ON (time-dependent)	0 = functional check OFF (factory setting) 1 = functional check performed after idle period of one week	X	X
3-8-1	Factory Reset	Restores the factory settings	1 = load factory settings	X	X
4-1-1	Firmware version	Firmware version	-	X	X

	<b>NOTE</b>
	The parameters for 4-20 mA are not displayed until parameter 3-4-2 has been set to value 2 = 4-20 mA.

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**Table 17:** Overview of parameters - pneumatic variant and bubbler control

Parameters		Description	Values	Single-pump station	Dual-pump station
3-3-2	Stand-by Pump	Switchover between dual-pump and stand-by mode	0 = dual-pump station with peak-load operation (factory setting) 1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water	-	<b>X</b>
3-3-4-1	Pumps OFF	Stop level of pumps in millimetres with pneumatic, bubbler, 4-20 mA	250 mm (factory setting)	<b>X</b>	<b>X</b>
3-3-4-2	Level Base Load ON	Start level of base load pump in millimetres with pneumatic, bubbler, 4-20 mA	400 mm (factory setting)	<b>X</b>	<b>X</b>
3-3-4-3	Level Peak Load ON	Start level of peak load pump in millimetres with pneumatic, bubbler, 4-20 mA	500 mm (factory setting)	-	<b>X</b>
3-3-4-4	High water	Level for high water alert in millimetres [mm] with pneumatic, bubbler, 4-20 mA	600 mm (factory setting)	<b>X</b>	<b>X</b>
3-3-5-3	Stop Delay	Stop delay of base load pump in seconds	0 seconds (factory setting)	<b>X</b>	<b>X</b>
3-3-6	ATEX Mode	Activation of ATEX mode: Tank cannot be drained below the stop level.	0 = OFF 1 = ON	<b>X</b>	<b>X</b>
3-4-4-1	Level of Bell	Distance of pressure bell (lower edge) from bottom of tank (offset). Factory setting: 200 mm	200 mm (factory setting)	<b>X</b>	<b>X</b>
3-7-1	Check Run ON/OFF	Functional check run OFF or ON (time-dependent)	0 = functional check OFF (factory setting) 1 = functional check performed after idle period of one week	<b>X</b>	<b>X</b>
3-8-1	Factory Reset	Restores the factory settings	1 = load factory settings	<b>X</b>	<b>X</b>
4-1-1	Firmware version	Firmware version	-	<b>X</b>	<b>X</b>

	<b>NOTE</b>
	<p>Set the stop delay (parameter 3-3-5) in such a way that the liquid level drops below the open pressure bell. This is to allow the air cushion in the measuring tube to build up again and pumps operated in ATEX mode to be fully covered by the liquid at all times.</p>

### 6.4.3 Alerts and warnings

#### Alerts

- Display
  - If an alert is triggered, the alert value is displayed, e.g. -A9-.
  - Alerts will superimpose the measured value menu respectively shown in the display.
  - However, alerts will not superimpose if parameters are displayed in the settings menu. This allows for completing parameter settings without interruption by alerts triggered.
- Traffic light LEDs
  - Red = alert
  - Yellow = warning
- Horn/buzzer

	<b>NOTE</b>
	In the event that several alerts were triggered, alerts with a higher priority prevail over alerts with a lower priority. For instance, alert A1 has a higher priority than alert A2.
	<b>NOTE</b>
	Alerts present in the background can be called up via parameter 2-1-1.

#### 6.4.3.1 Displaying and acknowledging alerts and warnings

The LEDs signal warnings (yellow) and alerts (red).

- Faults with manual acknowledgement: Acknowledgement via the control panel or via the remote acknowledgement input.
- Faults with auto-acknowledgement: Automatic deactivation and acknowledgement as soon as the cause of the fault has been rectified. Manual acknowledgement is possible.

**Table 18:** Displaying and acknowledging fault messages

	Step 1: Displaying fault message. 1. If the screen for editing parameters is displayed, exit it by pressing ESC. ⇒ The fault with the highest priority is displayed.
	Step 2: Remedying and acknowledging a fault. 1. To acknowledge the fault message, press OK. ⇒ Fault no longer active: The horn / buzzer is deactivated. ⇒ Fault is still present: The fault is entered in the alerts list (⇒ Section 6.4.3.2, Page 33) . The next fault (if any) is displayed. 2. Rectify the cause of the fault.

**Table 19:** Overview of fault messages

Fault message	Priority	Description	Type of message		Acknowledgement
			Warning	Alert	
A1	1	Motor protection pump 1 <i>Pump set 1 stops.</i>	-	X	Manual
A2	2	Motor protection pump 2 <i>Pump set 2 stops.</i>	-	X	Manual

Fault message	Priority	Description	Type of message		Acknowledge- ment
			Warning	Alert	
A3	3	Motor 1 temperature too high <i>Pump set 1 stops.</i>	-	<b>X</b>	Auto
A4	4	Motor 2 temperature too high <i>Pump set 2 stops.</i>	-	<b>X</b>	Auto
A5	5	Power supply failure <i>Pump sets 1 and 2 stop.</i>	-	<b>X</b>	Auto
A6	6	Phase error / phase failure <i>Pump sets 1 and 2 stop.</i>	-	<b>X</b>	Auto
A7	7	Leakage motor 1 <i>Pump set 1 stops.</i>	-	<b>X</b>	Manual
A8	8	Leakage motor 2 <i>Pump set 2 stops.</i>	-	<b>X</b>	Manual
A9	9	High water alert <i>Pump sets 1 and 2 stop.</i>	-	<b>X</b>	Auto
A10	10	External alarm <i>Pump sets 1 and 2 stop (can be set via the KSB ServiceTool).</i>	-	<b>X</b>	Auto
A11	11	Sensor fault <i>No action</i>	-	<b>X</b>	Auto
A12	12	Incorrect rotary field of mains supply (phase sequence) <i>No action</i>	<b>X</b>	-	Auto
A13	13	Undervoltage (-15 % of nominal voltage 230 V or 400 V) <i>No action</i>	<b>X</b>	-	Auto
A14	14	Overvoltage (+15 % of nominal voltage 230 V or 400 V) <i>No action</i>	<b>X</b>	-	Auto
A15	15	Flat battery <i>No action</i>	<b>X</b>	-	Auto
A16	16	Service interval system <i>No action (deactivated by default; can be set via the KSB ServiceTool).</i>	<b>X</b>	-	Auto

#### 6.4.3.2 Displaying the alerts list

The alerts list serves to call up alerts / warnings that have been acknowledged but are still present.

**Table 20:** Displaying the alerts list

	<p>Step 1: Activating the alerts list</p> <ul style="list-style-type: none"> <li>✓ Alerts / warnings have been acknowledged but are still present. (⇒ Section 6.4.3.1, Page 32)</li> <li>1. If no measured value parameter is active, press the ESC key. Repeat if necessary.</li> </ul>
	<p>Step 2: Navigating</p> <ul style="list-style-type: none"> <li>1. Use the arrow keys to select parameter P 2.1.1. <ul style="list-style-type: none"> <li>⇒ After 1.5 seconds the most recent fault message on the alerts list is automatically displayed.</li> <li>⇒ If further fault messages are present, the next fault message will be displayed after another 1.5 seconds.</li> </ul> </li> </ul>
	<p>Step 3: Leaving the alerts list</p> <ul style="list-style-type: none"> <li>1. To leave the alerts list press the ESC key. <ul style="list-style-type: none"> <li>⇒ The measured value display is shown.</li> </ul> </li> </ul>

6.4.4 ATEX mode

	<b>NOTE</b>
	The ATEX mode can also be enabled on non-ATEX models. However, this will not ensure ATEX-compliant operation of non-ATEX models.
	<b>NOTE</b>
	In ATEX mode, too, the stop delay will result in the fluid being pumped off to a level below the set stop level. Make sure that the pumps are always covered by the fluid pumped.
	<b>NOTE</b>
	In ATEX mode, the redundant high water float switch will trigger an alert if the high water level is exceeded and the level measuring device is defective. For safety reasons, the pump can only be operated if the presence of an adequate liquid cover is ensured by the existing basic level measurement.

Tanks cannot be pumped completely dry in ATEX mode (dry-running protection). You can set the control unit to non-ATEX mode to be able to clean the tank or carry out similar tasks.

Table 21: Parameter settings

Parameter	Value
3-3-6	0 = ATEX mode deactivated
3-3-6	1 = ATEX mode activated

6.4.4.1 Deactivating / activating ATEX mode

	<b>⚠ DANGER</b>
	<p><b>Risk of explosion due to dry running in non-ATEX mode</b>            Danger to life!</p> <ul style="list-style-type: none"> <li>▷ Only deactivate ATEX mode when you are sure that the tank does not contain a potentially explosive atmosphere.</li> <li>▷ Reactivate ATEX mode once you have completed all the necessary work.</li> </ul>
	<b>NOTE</b>
	If you want to clean the tank or carry out similar tasks, ATEX mode must be deactivated.

**Deactivating ATEX mode**

- ✓ Make sure that the tank does not contain a potentially explosive atmosphere.
  1. Set the manual-0-automatic selector switches for both pumps to "0".
  2. Set parameter P 3-3-6 to "0".
  3. Pump the tank dry in manual mode.

**Activating ATEX mode**

1. Set parameter P 3-3-6 to "1".
2. Set the manual-0-automatic selector switches for both pumps to "automatic".

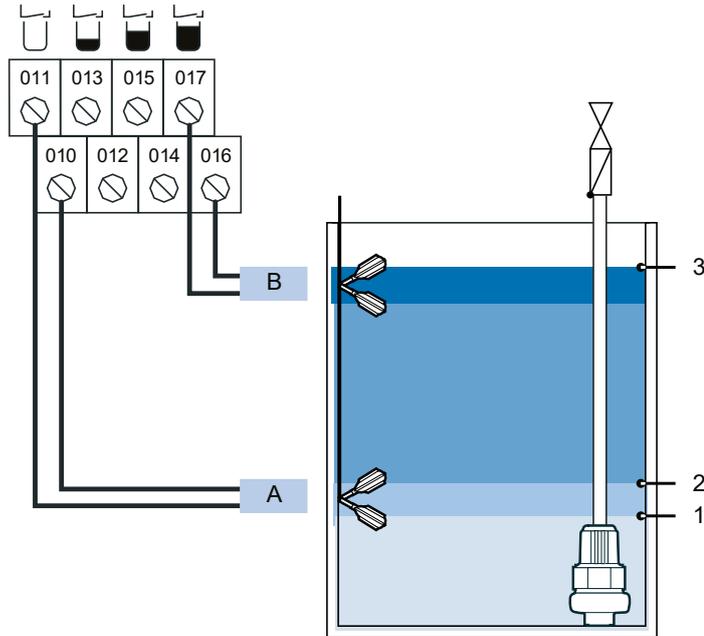
## 7 Application Examples

### 7.1 Draining via float switches

#### 7.1.1 Single-pump station: Draining via one float switch

**Application**

- Draining a tank or sump with one pump.
- Level measurement via one float switch.
- An additional float switch for high water alert can be used as an option.



**Fig. 10:** Single-pump station: Draining via one float switch

A	Base load float switch	2	Pump ON
B	High-water float switch (optional)	3	High water alert
1	Pump OFF		

**Table 22:** Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	0 = float switch

7.1.2 Dual-pump station: Draining via two float switches

Application

- Draining a tank or sump with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement via two float switches.
- An additional float switch for high water alert can be used as an option.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.

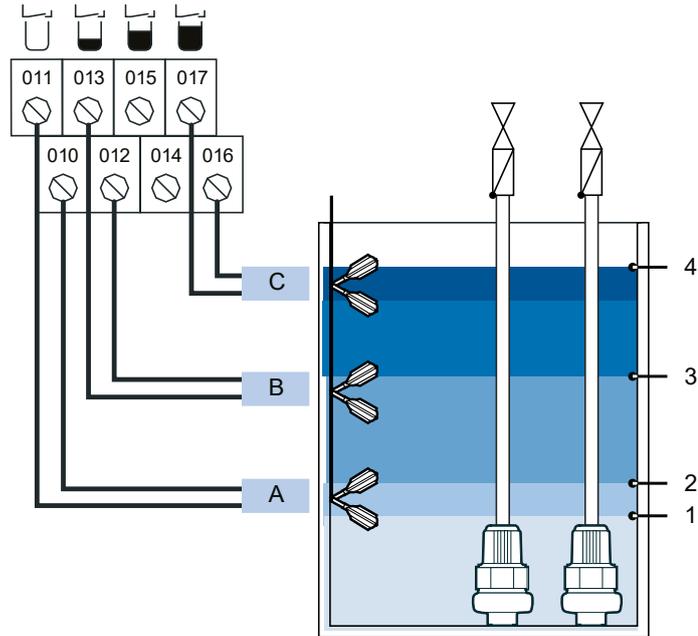


Fig. 11: Dual-pump station: Draining via two float switches

A	Base load float switch	2	Base load pump ON
B	Peak load float switch	3	Both pumps ON
C	High water float switch (optional)	4	High water alert
1	Both pumps OFF		

Table 23: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	0 = float switch

7.1.3 Dual-pump station as stand-by pump: Draining via one float switch

Application

- Draining a tank or sump with two pumps.
  - Pumps are alternated.
  - Dual-pump operation only possible during high-water conditions.
- Level measurement via one float switch.
- An additional float switch for high water alert can be used as an option.

If a fault occurs on the first pump, the second pump acts as a stand-by pump (redundant system). The pumps are alternated following each pumping cycle.

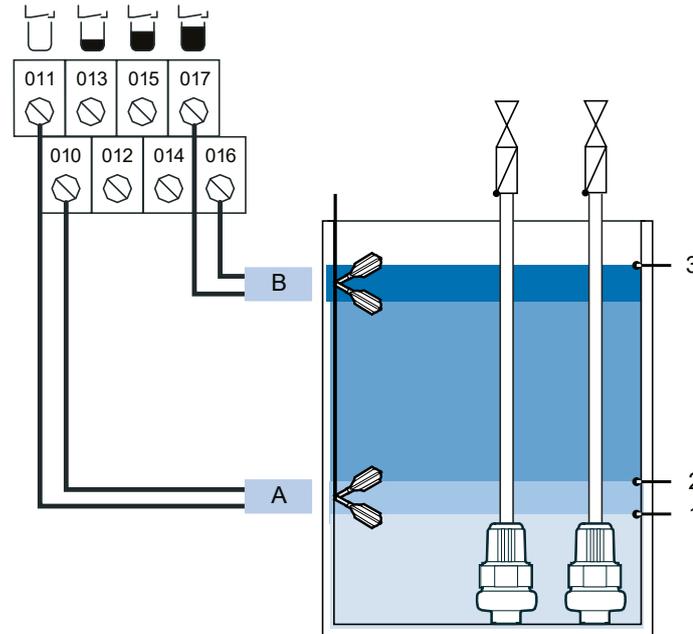


Fig. 12: Dual-pump station as stand-by pump: Draining via one float switch

A	Base load float switch	2	Base load pump ON
B	High water float switch (optional)	3	High water alert
1	Both pumps OFF		

Table 24: Parameter settings

Parameter	Parameter name	Value
3-3-2	Stand-by Pump	1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	0 = float switch

## 7.2 Draining via digital level switches

### 7.2.1 Single-pump station: Draining via two digital level switches

#### Application

- Draining a tank or sump with one pump.
- Level measurement with two digital level switches.
- An additional digital level switch for high water alert can be used as an option.

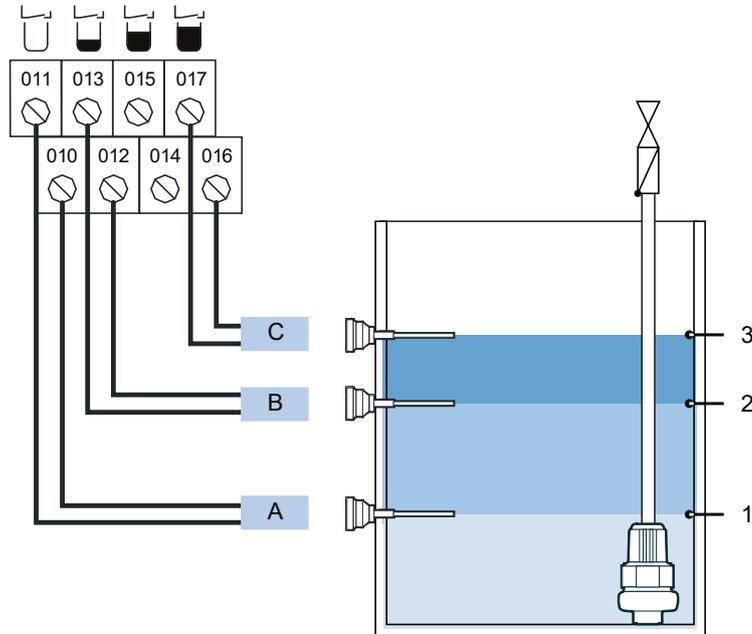


Fig. 13: Single-pump station: Draining via two digital level switches

A	Digital level switch OFF	1	Pump OFF
B	Digital base load level switch	2	Pump ON
C	Digital high water level switch (optional)	3	High water alert

Table 25: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	1 = digital level switches

7.2.2 Dual-pump station: Draining via three digital level switches

Application

- Draining a tank or sump with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement with three digital level switches.
- An additional digital level switch for high water alert can be used as an option.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.

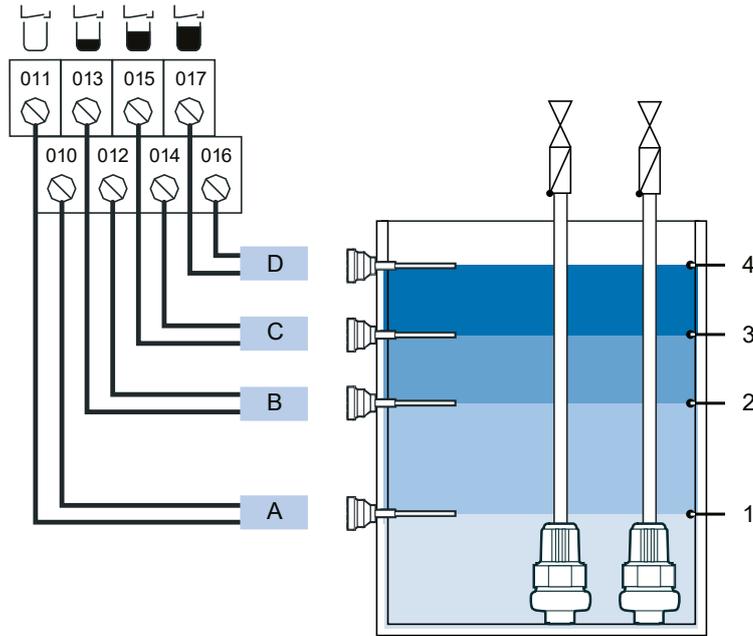


Fig. 14: Dual-pump station: Draining via three digital level switches

A	Digital level switch OFF	1	Both pumps OFF
B	Digital base load level switch	2	Base load pump ON
C	Digital peak load level switch	3	Peak load pump ON
D	Digital high water level switch (optional)	4	High water alert

Table 26: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	1 = digital level switches

7.2.3 Dual-pump station as stand-by pump: Draining via two digital level switches

Application

- Draining a tank or sump with two pumps.
  - Pumps are alternated.
  - Dual-pump operation only possible during high-water conditions.
- Level measurement with two digital level switches.
- An additional float switch for high water alert can be used as an option.

If a fault occurs on the first pump, the second pump acts as a stand-by pump (redundant system). The pumps are alternated following each pumping cycle.

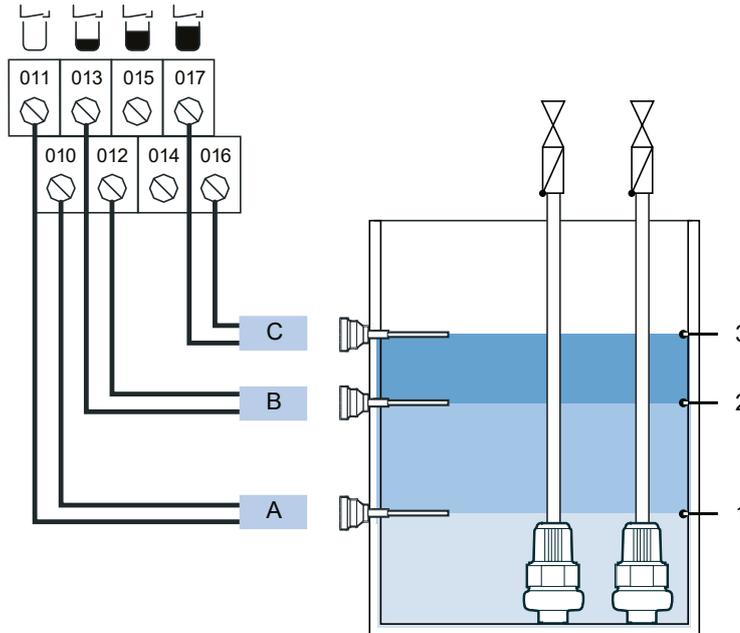


Fig. 15: Dual-pump station as stand-by pump: Draining via two digital level switches

A	Digital level switch OFF	1	Both pumps OFF
B	Digital base load level switch	2	Base load pump ON
C	Digital high water level switch (optional)	3	High water alert

Table 27: Parameter settings

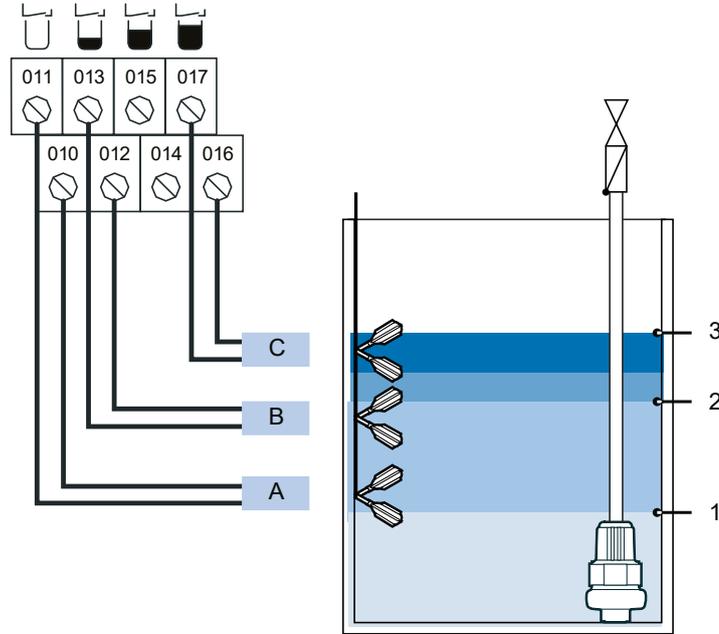
Parameter	Parameter name	Value
3-3-2	Stand-by Pump	1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	0 = digital level switches

### 7.3 Draining via float switches without hysteresis

#### 7.3.1 Single-pump station: Draining via two float switches without hysteresis

**Application**

- Draining a tank or sump with one pump.
- Level measurement with two float switches without hysteresis.
- An additional float switch without hysteresis can be optionally used for high water alert.



**Fig. 16:** Single-pump station: Draining via two float switches without hysteresis

A	Float switch OFF	1	Pump OFF
B	Base load float switch	2	Base load pump ON
C	High water float switch (optional)	3	High water alert

**Table 28:** Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	1 = digital level switches

7.3.2 Dual-pump station: Draining via three float switches without hysteresis

Application

- Draining a tank or sump with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement with three float switches without hysteresis.
- An additional float switch without hysteresis can be optionally used for high water alert.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.

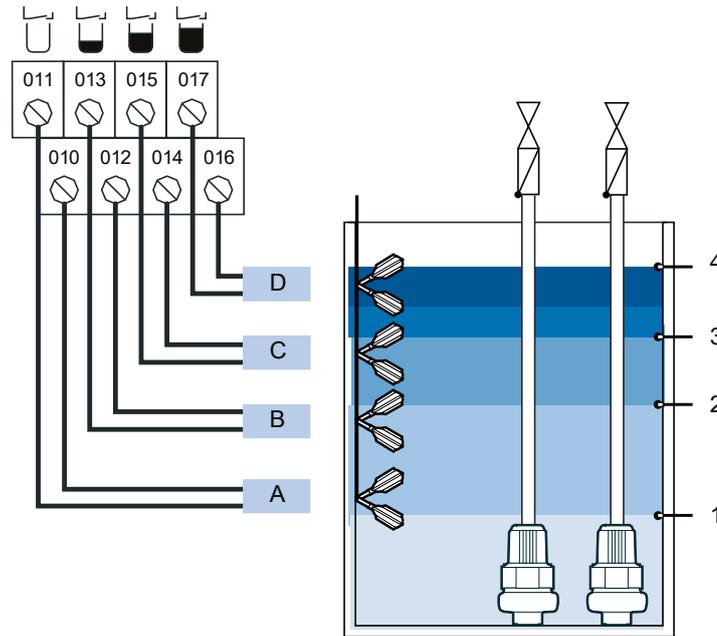


Fig. 17: Dual-pump station: Draining via three float switches without hysteresis

A	Float switch OFF	1	Both pumps OFF
B	Base load float switch	2	Base load pump ON
C	Peak load float switch	3	Peak load pump ON
D	High water float switch (optional)	4	High water alert

Table 29: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	1 = digital level switches

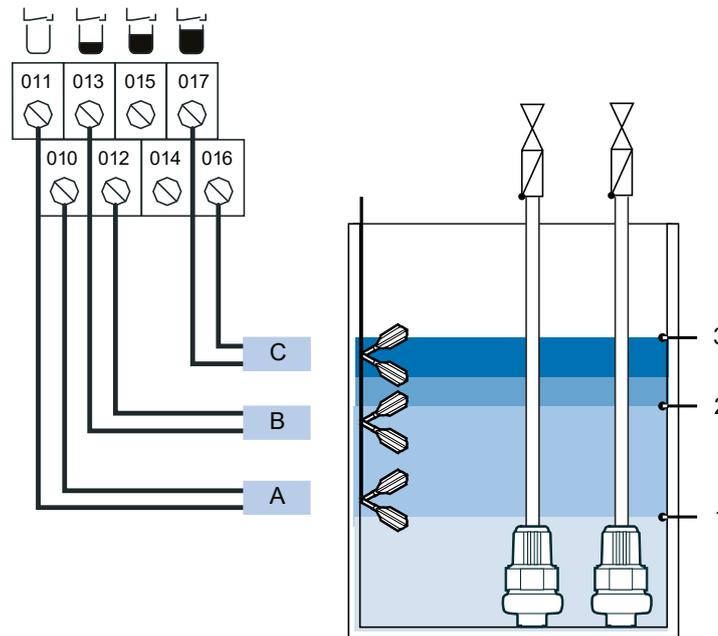
### 7.3.3 Dual-pump station as stand-by pump: Draining via two float switches without hysteresis

#### Application

- Draining a tank or sump with two pumps.
  - Pumps are alternated.
  - Dual-pump operation only possible during high-water conditions.
- Level measurement with two float switches without hysteresis.
- An additional float switch without hysteresis can be optionally used for high water alert.

If a fault occurs on the first pump, the second pump acts as a stand-by pump (redundant system). The pumps are alternated following each pumping cycle.

The second pump is operated as a stand-by pump in case the first pump fails (redundant system). The pumps are alternated after each pumping cycle.



**Fig. 18:** Dual-pump station as stand-by pump: Draining via two float switches without hysteresis

A	Float switch OFF	1	Both pumps OFF
B	Base load float switch	2	Base load pump ON
C	High water float switch (optional)	3	High water alert

**Table 30:** Parameter settings

Parameter	Parameter name	Value
3-3-2	Stand-by Pump	1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water
3-3-3	Draining/Filling	0 = draining
3-4-2	Measurement Method	0 = digital level switches

7.4 Draining with pneumatic pressure measurement or bubbler control

	<b>NOTE</b>
	When installing a redundant high water float switch (optional), ensure that the electric cable has sufficient play (sufficient hysteresis). This avoids frequent starting/ stopping of the pumps in the event of an analog measurement failure (4-20 mA, pneumatic, bubbler control)). In addition, the pumps' actual stop level can be influenced via the set stop delay.
	<b>NOTE</b>
	In potentially explosive atmospheres, redundant high water float switches must only be used with intrinsic safety (IS) barriers. See Accessories/Optional Components for required intrinsic safety barriers.

7.4.1 Single-pump station: Draining with pneumatic pressure measurement or bubbler control

Application

- Draining a tank or sump with one pump.
- Level measurement via pneumatic measurement or bubbler control.
- An additional redundant float switch for high water alert can be optionally used.

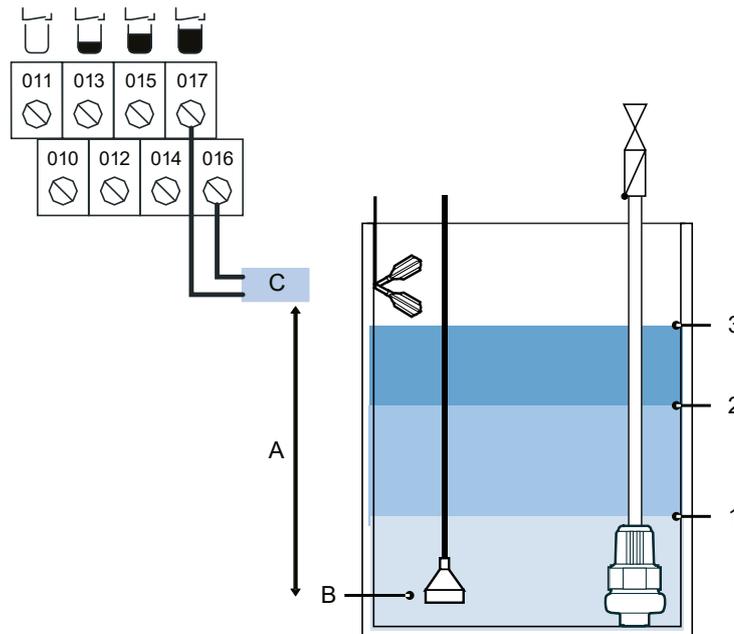


Fig. 19: Single-pump station: Draining with pneumatic pressure measurement or bubbler control

A	User-defined switching levels [mm]	1	Pump OFF
B	Reference point for level measurement	2	Pump ON
C	Redundant high water float switch (optional)	3	High water alert

Table 31: Parameter settings

Parameter	Parameter name	Value
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]

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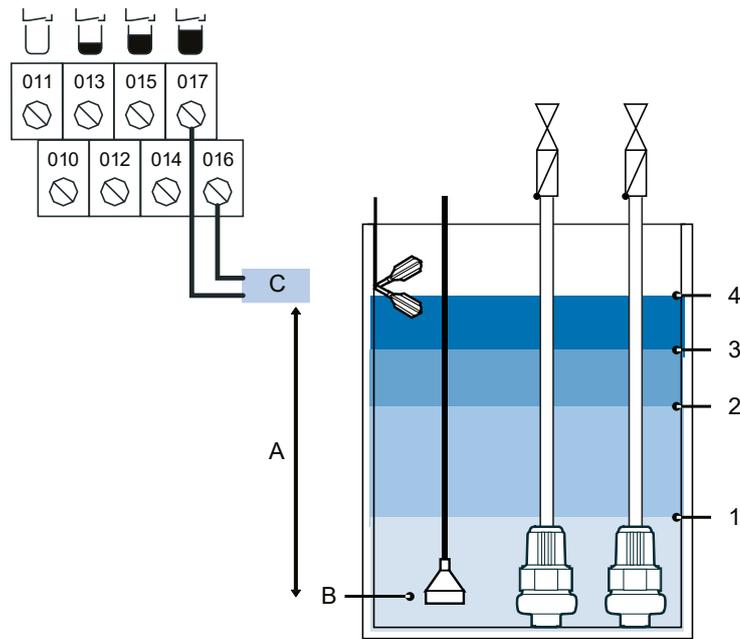
Parameter	Parameter name	Value
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-4-1	Level of Bell (lower edge)	e.g. 200 [mm]

**7.4.2 Dual-pump station: Draining with pneumatic pressure measurement or bubbler control**

**Application**

- Draining a tank or sump with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement via pneumatic measurement or bubbler control.
- An additional redundant float switch for high water alert can be optionally used.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.



**Fig. 20:** Dual-pump station: Draining with pneumatic pressure measurement or bubbler control

A	User-defined switching levels [mm]	2	Base load pump ON
B	Reference point for level measurement	3	Peak load pump ON
C	Redundant high water float switch (optional)	4	High water alert
1	Both pumps OFF		

**Table 32:** Parameter settings

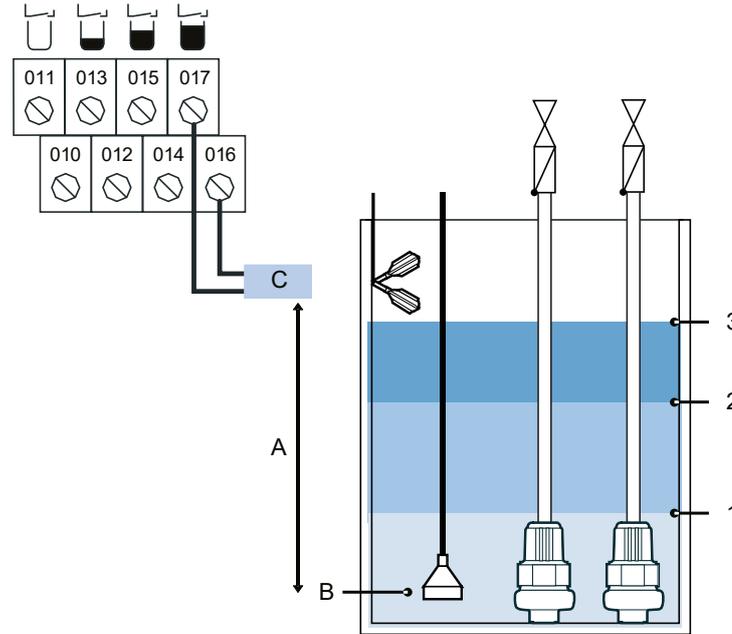
Parameter	Parameter name	Value
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-3	Level Peak Load ON	e.g. 500 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-4-1	Level of Bell (lower edge)	e.g. 200 [mm]

**7.4.3 Dual-pump station as stand-by pump: Draining with pneumatic pressure measurement or bubbler control**

**Application**

- Draining a tank or sump with two pumps.
  - Pumps are alternated.
  - Dual-pump operation only possible during high-water conditions.
- Level measurement via pneumatic measurement or bubbler control.
- An additional redundant float switch for high water alert can be optionally used.

If a fault occurs on the first pump, the second pump acts as a stand-by pump (redundant system). The pumps are alternated following each pumping cycle.



**Fig. 21:** Dual-pump station as stand-by pump: Draining with pneumatic pressure measurement or bubbler control

A	User-defined switching levels [mm]	1	Both pumps OFF
B	Reference point for level measurement	2	Base load pump ON
C	Redundant high water float switch (optional)	3	High water alert

**Table 33:** Parameter settings

Parameter	Parameter name	Value
3-3-2	Stand-by Pump	1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water
3-3-3	Draining/Filling	0 = draining
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-3	Level Peak Load ON	e.g. 500 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-4-1	Level of Bell (lower edge)	e.g. 200 [mm]

7.5 Draining via analog sensor 4-20 mA

	<p><b>NOTE</b></p> <p>The control unit is set for the measurement method with float switch at the factory. The setting can be changed to the measurement method with 4-20 mA analog sensor via parameter 3-4-2. This setting must be changed before connecting the 4-20 mA analog sensor.</p> <p>For ATEX, route all electrical connections of the sensor system via intrinsic safety barriers. The intrinsic safety barrier can only be installed in control unit type BS.</p>
	<p><b>NOTE</b></p> <p>The parameters that you can call up depend on the operating mode and measurement method. Only parameters that are relevant to the current operating mode and measurement method are displayed.</p>
	<p><b>NOTE</b></p> <p>When installing a redundant high water float switch (optional), ensure that the electric cable has sufficient play (sufficient hysteresis). This avoids frequent starting/stopping of the pumps in the event of an analog measurement failure (4-20 mA, pneumatic, bubbler control)). In addition, the pumps' actual stop level can be influenced via the set stop delay.</p>
	<p><b>NOTE</b></p> <p>In potentially explosive atmospheres, redundant high water float switches must only be used with intrinsic safety (IS) barriers. See Accessories/Optional Components for required intrinsic safety barriers.</p>

7.5.1 Single-pump station: Draining via analog sensor 4-20 mA

Application

- Draining a tank or sump with one pump.
- Level measurement with analog sensor 4-20 mA.
- An additional redundant float switch for high water alert can be optionally used.

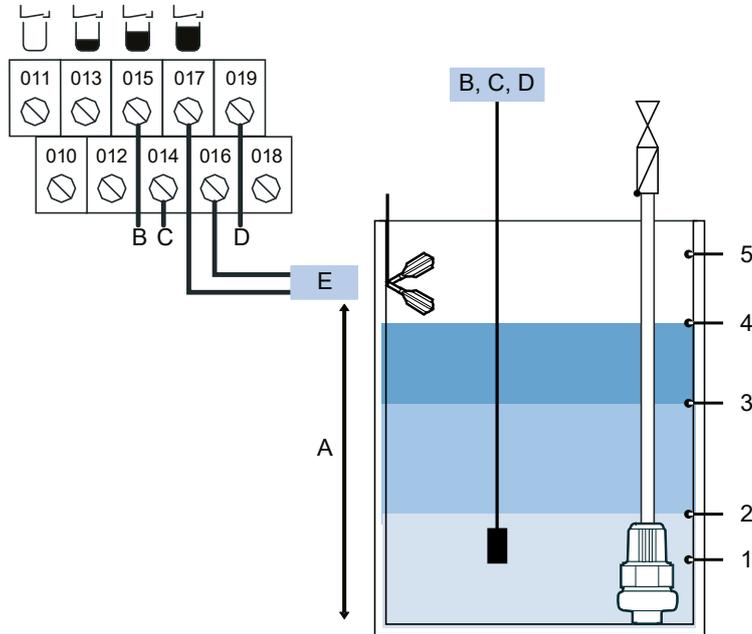


Fig. 22: Single-pump station: Draining via analog sensor 4-20 mA

A	User-defined switching levels [mm]	1	Level at 4 mA
B	Analog IN	2	Pump OFF
C	+24 V	3	Pump ON
D	Ground (GND)	4	High water alert
E	Redundant high water float switch (optional)	5	Level at 20 mA

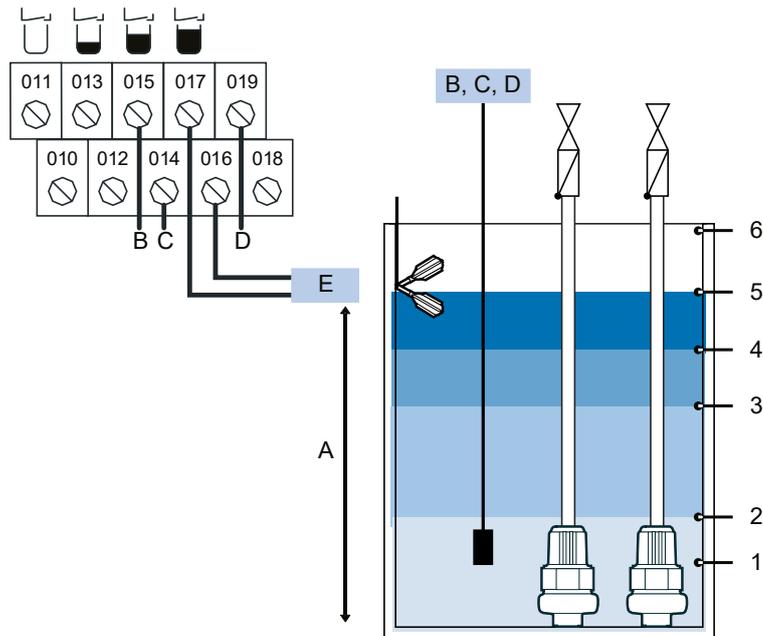
Table 34: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-2	Measurement Method	2 = 4-20 mA
3-4-3-1	Level at 4 mA	e.g. 200 [mm]
3-4-3-2	Level at 20 mA	e.g. 1000 [mm]

**7.5.2 Dual-pump station: Draining via analog sensor 4-20 mA**

- Draining a tank or sump with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement with analog sensor 4-20 mA.
- An additional redundant float switch for high water alert can be optionally used.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.



**Fig. 23:** Dual-pump station: Draining via analog sensor 4-20 mA

A	User-defined switching levels [mm]	2	Both pumps OFF
B	Analog IN	3	Base load pump ON
C	+24 V	4	Peak load pump ON
D	Ground (GND)	5	High water alert
E	Redundant high water float switch (optional)	6	Level at 20 mA
1	Level at 4 mA		

**Table 35:** Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	0 = draining
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-3	Level Peak Load ON	e.g. 500 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-2	Measurement Method	2 = 4-20 mA
3-4-3-1	Level at 4 mA	e.g. 200 [mm]
3-4-3-2	Level at 20 mA	e.g. 1000 [mm]

7.5.3 Dual-pump station as stand-by pump: Draining via analog sensor 4-20 mA

Application

- Draining a tank or sump with two pumps.
  - Pumps are alternated.
  - Dual-pump operation only possible during high-water conditions.
- Level measurement with analog sensor 4-20 mA.
- An additional redundant float switch for high water alert can be optionally used.

If a fault occurs on the first pump, the second pump acts as a stand-by pump (redundant system). The pumps are alternated following each pumping cycle.

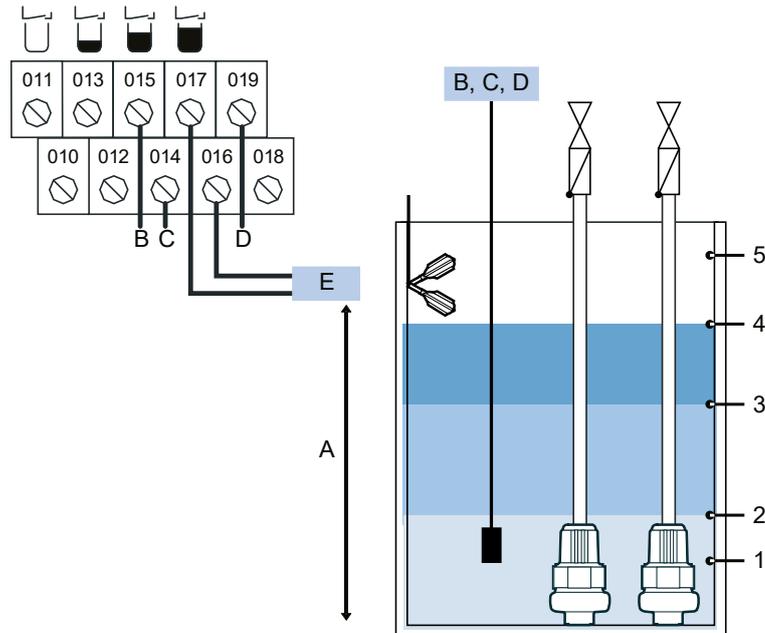


Fig. 24: Dual-pump station as stand-by pump: Draining via analog sensor 4-20 mA

A	User-defined switching levels [mm]	1	Level at 4 mA
B	Analog IN	2	Both pumps OFF
C	+24 V	3	Both pumps ON
D	Ground (GND)	4	High water alert
E	Redundant high water float switch (optional)	5	Level at 20 mA

Table 36: Parameter settings

Parameter	Parameter name	Value
3-3-2	Stand-by Pump	1 = stand-by pump, one pump ON at high water 2 = stand-by pump, two pumps ON at high water
3-3-3	Draining/Filling	0 = draining
3-3-4-1	Level Pumps OFF	e.g. 250 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-2	Measurement Method	2 = 4-20 mA
3-4-3-1	Level at 4 mA	e.g. 200 [mm]
3-4-3-2	Level at 20 mA	e.g. 1000 [mm]

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7.6 Filling using float switch(es)

	<p style="background-color: #FFD700; margin: 0;"><b>CAUTION</b></p> <p><b>Changing the external alarm input</b>          Damage to property!</p> <ul style="list-style-type: none"> <li>▸ Make sure that the pumps will be tripped in the event of dry running.</li> </ul>
	<p style="background-color: #0070C0; color: white; margin: 0;"><b>NOTE</b></p> <p>The external alarm input of the control unit can be used to protect the pump(s) against dry running. The control unit is set at the factory to stop the pumps if there is a risk of dry running. This setting is independent of the fill level of the reservoir or tank.</p>

7.6.1 Single-pump station: Filling via one float switch

	<b>NOTE</b>
	<p>Use float switches A and B as NO contacts (circuit closed in upper float position) or change the control direction of the inputs using the KSB ServiceTool (accessory). If the external alarm input (terminals 40 - 41) is used to monitor for dry running, use an additional float switch as an NC contact (circuit open in upper float position).</p>

**Application**

- Filling a reservoir or tank with one pump.
- Level measurement via one float switch.
- An additional float switch for dry running protection can be optionally used.
- An additional float switch for high water alert (redundant OFF) can be optionally used.

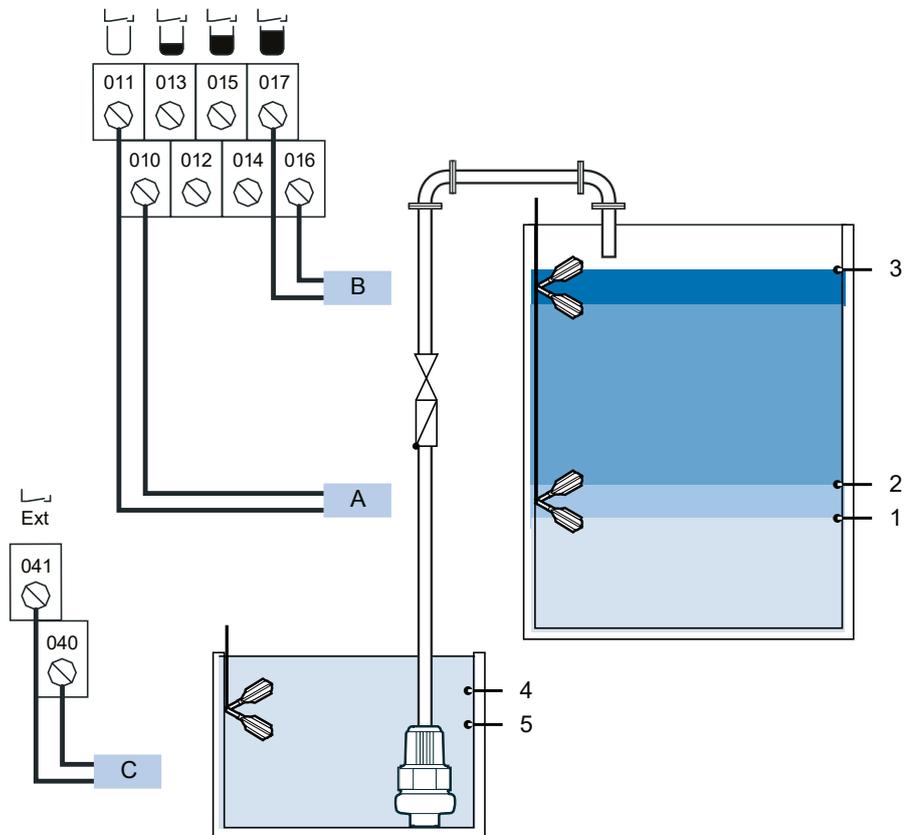


Fig. 25: Single-pump station: Filling via one float switch

A	Base load float switch as NO contact	2	Pump OFF
B	High water float switch as NO contact (optional)	3	High water alert
C	Dry running float switch as NC contact (optional)	4	No dry running: pump ON
1	Pump ON	5	Dry running: pump OFF

Table 37: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	1 = filling
3-4-2	Measurement Method	0 = float switch

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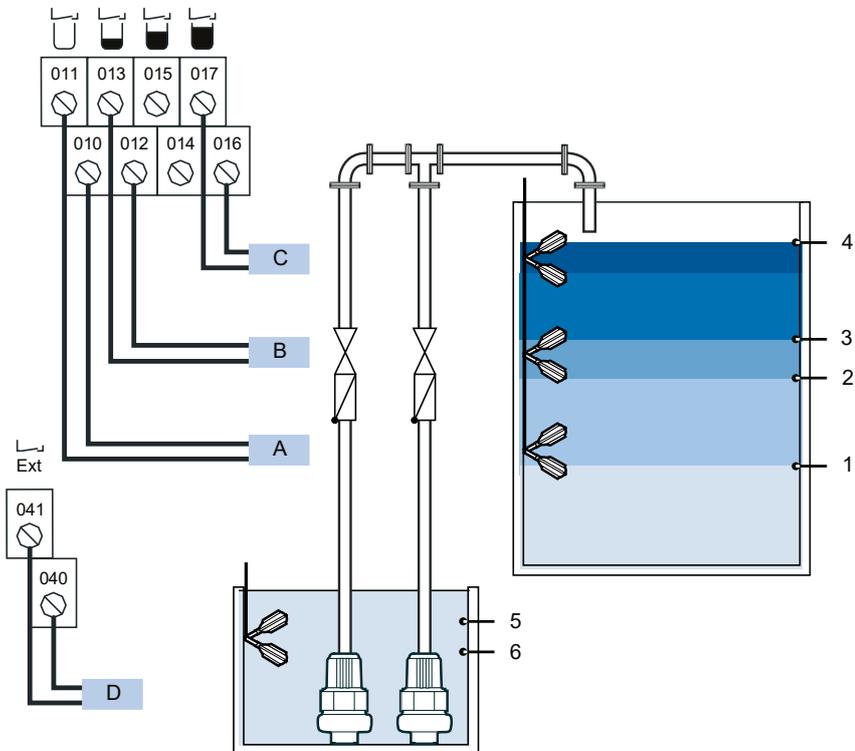
7.6.2 Dual-pump station: Filling via two float switches

	<b>NOTE</b>
	<p>Use float switches A and B as NO contacts (circuit closed in upper float position) or change the control direction of the inputs using the KSB ServiceTool (accessory). If the external alarm input (terminals 40 - 41) is used to monitor for dry running, use an additional float switch as an NC contact (circuit open in upper float position).</p>

**Application**

- Filling a reservoir or tank with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement via two float switches.
- An additional float switch for high water alert can be used as an option.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.



**Fig. 26:** Dual-pump station: Filling via two float switches

A	Peak load float switch as NO contact	2	Base load pump ON
B	Base load float switch as NO contact (optional)	3	Both pumps OFF
C	High water float switch as NO contact (optional)	4	High water alert
D	Dry running protection float switch as NC contact (optional)	5	No dry running: pump(s) ON
1	Both pumps ON	6	Dry running: pump(s) OFF

**Table 38:** Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	1 = filling
3-4-2	Measurement Method	0 = float switch

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### 7.7 Filling via analog sensor 4-20 mA

	<b>CAUTION</b>
	<p><b>Changing the external alarm input</b>            Damage to property!</p> <p>▸ Make sure that the pumps will be tripped in the event of dry running.</p>

	<b>NOTE</b>
	<p>The external alarm input of the control unit can be used to protect the pump(s) against dry running. The control unit is set at the factory to stop the pumps if there is a risk of dry running. This setting is independent of the fill level of the reservoir or tank.</p>

#### 7.7.1 Single-pump station: Filling via analog sensor 4-20 mA

	<b>NOTE</b>
	<p>If the value of parameter 3-3-3 (Draining/Filling) is changed, the values of parameters 3-3-4-1 (Pump/Pumps OFF) and 3-3-4-3 (Peak-load Pump ON (only shown with control units for dual-pump stations)) are automatically reversed. This ensures appropriate parameter settings.</p>

#### Application

- Filling a reservoir or tank with one pump.
- Level measurement with analog sensor 4-20 mA.
- An additional float switch for dry running protection can be optionally used.
- An additional float switch for high water alert (redundant OFF) can be optionally used.

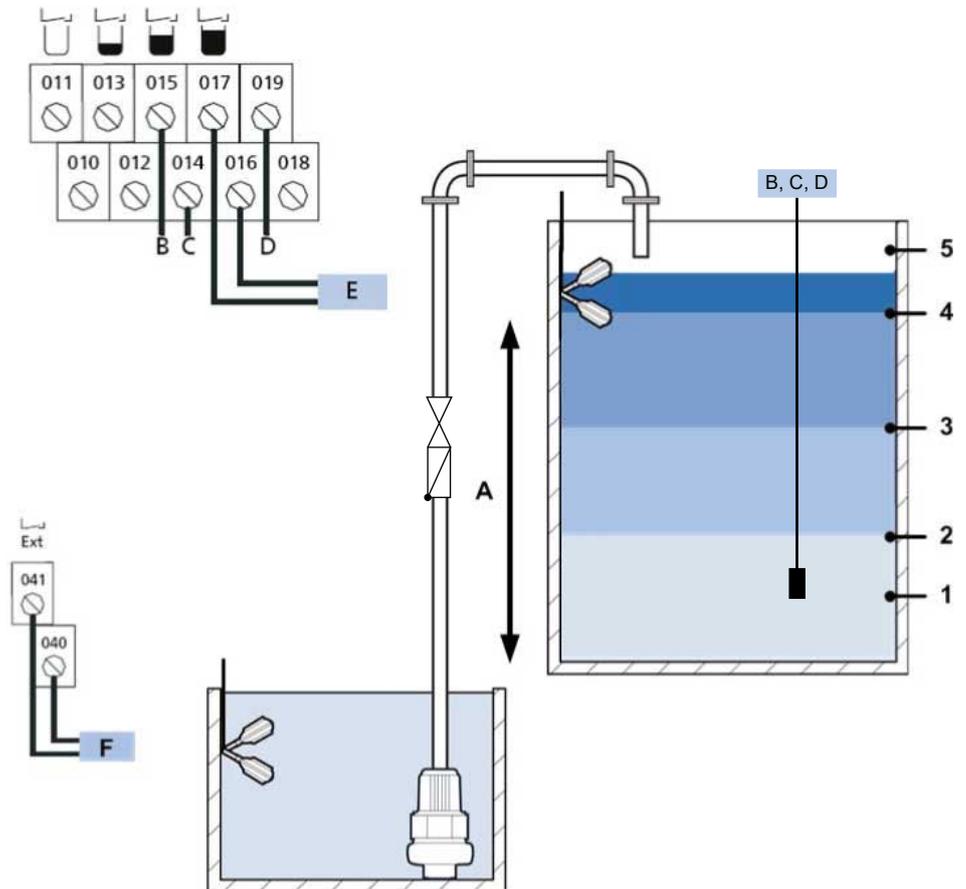


Fig. 27: Single-pump station: Filling via analog sensor 4-20 mA

A	User-defined switching levels [mm]	1	Level at 4 mA
B	Analog IN	2	Pump ON
C	+24 V	3	Pump OFF
D	Ground (GND)	4	High water alert
E	High water float switch as NO contact (optional)	5	Level at 20 mA
F	Dry running protection float switch as NC contact (optional)		

Table 39: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	1 = filling
3-3-4-1	Level Pumps OFF	e.g. 500 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-2	Measurement Method	2 = 4-20 mA
3-4-3-1	Level at 4 mA	e.g. 200 [mm]
3-4-3-2	Level at 20 mA	e.g. 1000 [mm]

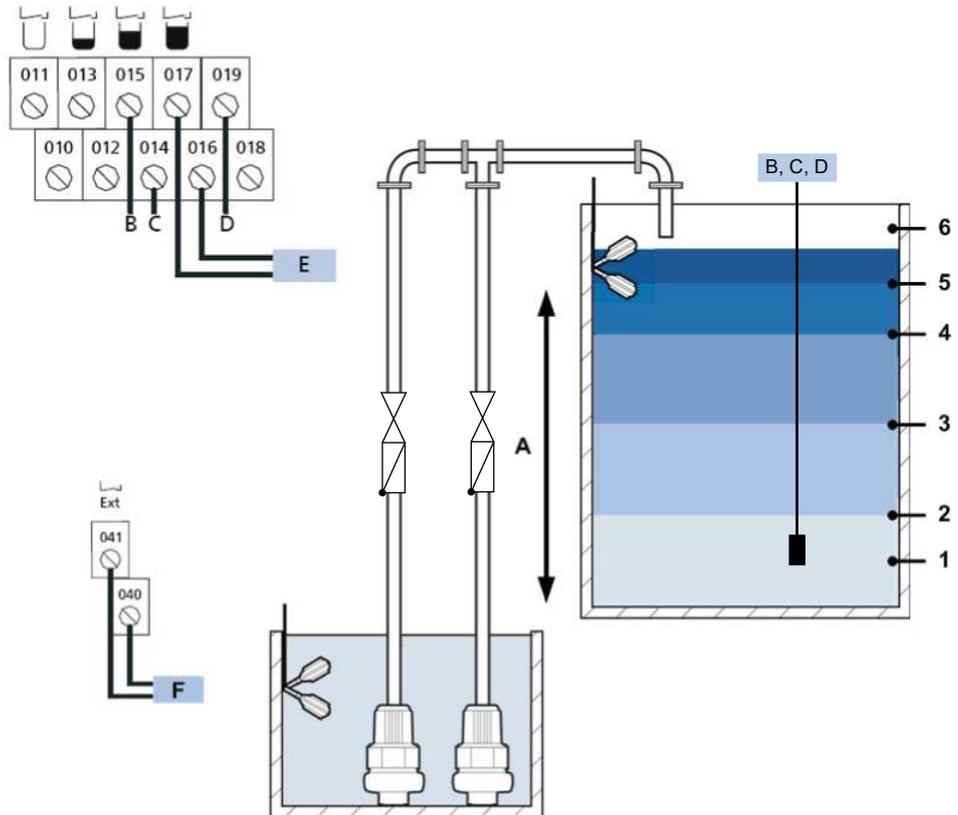
7.7.2 Dual-pump station: Filling via analog sensor 4-20 mA

	NOTE
	<p>If the value of parameter 3-3-3 (Draining/Filling) is changed, the values of parameters 3-3-4-1 (Pump/Pumps OFF) and 3-3-4-3 (Peak-load Pump ON (only shown with control units for dual-pump stations)) are automatically reversed. This ensures appropriate parameter settings.</p>

**Application**

- Filling a reservoir or tank with two pumps.
  - Pumps alternate in base load operation.
  - Dual-pump operation at peak load.
- Level measurement with analog sensor 4-20 mA.
- An additional float switch for dry running protection can be optionally used.
- An additional float switch for high water alert (redundant OFF) can be optionally used.

The pump that is started up first is the base load pump. To ensure equal distribution of pump operating hours, the pumps are automatically alternated after each pumping cycle.



**Fig. 28:** Dual-pump station: Filling via analog sensor 4-20 mA

A	User-defined switching levels [mm]	1	Level at 4 mA
B	Analog IN	2	Peak load pump ON
C	+24 V	3	Base load pump ON
D	Ground (GND)	4	Both pumps OFF
E	High water float switch as NO contact (optional)	5	High water alert
F	Dry running protection float switch as NC contact (optional)	6	Level at 20 mA

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Table 40: Parameter settings

Parameter	Parameter name	Value
3-3-3	Draining/Filling	1 = filling
3-3-4-1	Level Pumps OFF	e.g. 500 [mm]
3-3-4-2	Level Base Load ON	e.g. 400 [mm]
3-3-4-3	Level Peak Load ON	e.g. 250 [mm]
3-3-4-4	Level High Water	e.g. 600 [mm]
3-4-2	Measurement Method	2 = 4-20 mA
3-4-3-1	Level at 4 mA	e.g. 200 [mm]
3-4-3-2	Level at 20 mA	e.g. 1000 [mm]

### 7.8 Additional connections

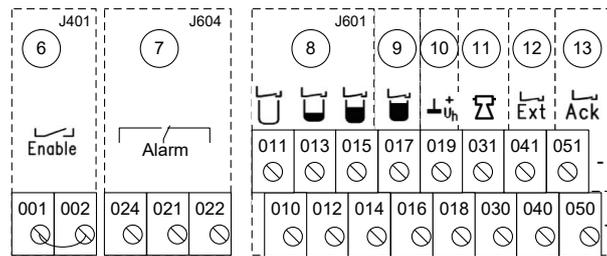


Fig. 29: Additional connections

#### 7.8.1 Auxiliary voltage for lifting unit

##### Application

- Connection of the analog float switch of mini-Compacta/Compacta lifting units

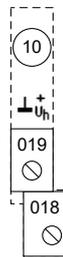


Fig. 30: Auxiliary voltage for lifting unit

Terminal assignment:

- Terminal 18: +5 V DC
- Terminal 19: Ground (GND)

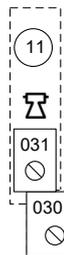
7.8.2 Signalling output

	<p><b>NOTE</b></p> <p>When the rechargeable battery option is used for the first time or after the battery has been completely discharged, the control unit with active rechargeable battery option must be operated for approximately 11 hours without interruption on the power supply network to ensure that the battery is fully charged and 100 % of the rechargeable battery runtime is attained.</p>
	<p><b>NOTE</b></p> <p>The runtime of the control unit without signalling accessories is approximately 10 hours once the rechargeable battery is fully charged.</p>

**Application**

- For connecting external alarm equipment (e.g. horn, alarm strobe light, or alarm combination)
- Maximum capacity: 200 mA
- The rechargeable battery option safeguards the power supply to the control unit and alarm device in the event of a mains power failure. Runtimes in rechargeable battery mode:
  - Horn 12 V DC, 110 mA: approx. 4.5 hours
  - Alarm strobe light, 12 V DC, 195 mA: approx. 3.5 hours
  - Alarm combination 12 V DC, 150 mA: approx. 4 hours

The signalling output of the control unit is activated as for high water alert and sensor fault. This setting can be changed using the KSB ServiceTool.



**Fig. 31:** Signalling output

Terminal assignment:

- Terminal 30: +12 V DC
- Terminal 31: Ground (GND)

### 7.8.3 External alarm input

#### Application

- Dry running monitoring
  - To stop the pump(s), use the float switch as an NC contact (circuit closed in upper float position) when filling.  
If a high water alert is present at the same time, this alert has a higher priority. The pumps are thus stopped in redundant fashion during filling.
- Monitoring the sump/tank/cistern
- External alarm without effect
- External alarm with pump stop
- More...

The pumps are factory-set to stop when the contact is closed. The response of the external alarm input can be changed using the KSB Service Tool.



**Fig. 32:** External alarm input

Terminal assignment:

- Terminal 40: Approx. 12 V DC - Approx. 24 V DC
- Terminal 41: Digital input

### 7.8.4 Remote acknowledgement

#### Application

- Connection for remote acknowledgement of alarms requiring acknowledgement.



**Fig. 33:** Remote acknowledgement

Terminal assignment:

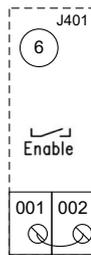
- Terminal 50: Approx. 12 V DC - Approx. 24 V DC
- Terminal 51: Digital input

## 7.8.5 Enable input

	<b>NOTE</b>
	<p>If the wiring distance exceeds 15 m (length of electric cable), impermissibly high cable losses occur and correct operation of the control unit is not ensured. The enable input must be connected via an additional coupling relay fitted in the control unit.</p>

**Application**

- Connecting a remote OFF for all pumps connected to the control unit.
  - The connection is fitted with a wire jumper at the factory. If the connection is not bridged, pump control will be disabled.


**Fig. 34:** Enable input

Terminal assignment:

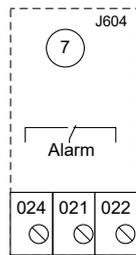
- Terminal 001: 24 V DC
- Terminal 002: 24 V DC

7.8.6 General fault message relay

	<b>NOTE</b>
	<p>The general fault message relay is picked up when no message is present and releases if a message is present. This minimises energy consumption and prevents loss of battery runtime in the event of a power failure.</p>

**Application**

- Connecting a volt-free signalling output.
  - $V_{max} = 250 \text{ V AC}$
  - $I_{max} = 1 \text{ A}$
  - NO contact/NC contact



**Fig. 35:** General fault message relay

Terminal assignment:

- Terminal 021: Common
- Terminal 022: NC contact
- Terminal 024: NO contact

**Table 41:** Switching operations of the general fault message relay

Message	Description	Status
A1	Motor protection pump 1 (upper circuit of thermal motor monitoring or motor protection switch has tripped)	Released
A2	Motor protection pump 2 (upper circuit of thermal motor monitoring or motor protection switch has tripped)	Released
A3	Motor 1 temperature high (lower circuit of thermal motor monitoring or motor protection switch has tripped)	-
A4	Motor 2 temperature high (lower circuit of thermal motor monitoring or motor protection switch has tripped)	-
A5	Power supply failure	Released
A6	Phase error (phase failure) of power supply	Released
A7	Leakage motor 1	Released
A8	Leakage motor 2	Released
A9	High water alert	Released
A10	External alarm	Released
A11	Sensor fault	Released
A12	Incorrect rotary field of mains supply (phase sequence)	-
A13	Undervoltage (-15 % of rated voltage)	-
A14	Overvoltage (+15 % of rated voltage)	-
A15	Rechargeable battery flat	-
A16	Service interval (activation via parameter 3-7-1)	-

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## 8 Commissioning/Start-up/Shutdown

### 8.1 Commissioning/Start-up

#### 8.1.1 Prerequisites for commissioning/start-up

Before commissioning/starting up the control unit, make sure the following conditions are met:

1. The control unit has been wired in accordance with the wiring diagram.
2. The motor protection device or fuses are inserted.
3. The mains power cable is connected.
4. The sensors are connected.
5. The checklist has been observed. (⇒ Section 9.1, Page 66)

#### 8.1.2 Start-up

	<b>CAUTION</b>
	<p><b>Incorrect commissioning/start-up</b> Damage to property!</p> <ul style="list-style-type: none"> <li>▷ Ensure that all local applicable regulations and directives – particularly the machinery and low-voltage directives – are fulfilled.</li> <li>▷ Install a line protection device in the supply cable. For the line protection required please refer to the attached logic diagram.</li> <li>▷ Before commissioning, check all connected cables against the wiring diagram.</li> </ul>

- ✓ The control unit is properly installed and electrically connected.
  1. Check whether the device variant conforms with requirements. See name plate (⇒ Section 4.4, Page 13) .
  2. Set the manual-0-automatic switches for both pumps to "0".
  3. Switch on the power supply.
  4. Check the parameters to ensure they are compatible with the required application and functionality. Adjust if necessary.
  5. Set the manual-0-automatic switches for both pumps to "Automatic".
- ⇒ The control unit starts/stops both pumps as required.

## 8.2 Shutdown

### 8.2.1 Shutdown

#### Short-term shutdown

1. Set the manual-0-automatic switches for both pumps to "0".
  - ⇒ Both pumps are switched off.
  - ⇒ The control unit remains operational (read measured values, set parameters).

#### Performing work on the pumps

##### 400 V variants

1. Open the control unit.  
 Type BC: Remove the 6 hexagon socket head cap screws from the front of the cover.  
 Type BS: Open the control cabinet door using the cabinet key.
2. Switch off the motor protection switches for both pumps and secure them so that they cannot be switched on again unintentionally.
3. Close the control unit.  
 Type BC: Properly fasten the cover using the 6 hexagon socket head cap screws.  
 Type BS: Securely lock the control cabinet using the cabinet key.

##### 230 V variants

1. Open the control unit.  
 Type BC: Remove the 6 hexagon socket head cap screws from the front of the cover.  
 Type BS: Open the control cabinet door using the cabinet key.
2. Disconnect the pump power plugs.  
 If the pumps are connected directly to the terminals in the control unit, they must be disconnected from the power supply.
3. Close the control unit.  
 Type BC: Properly fasten the cover using the 6 hexagon socket head cap screws.  
 Type BS: Securely lock the control cabinet using the cabinet key.

#### Long-term shutdown

1. Set the manual-0-automatic switches for both pumps to "0".
2. Switch off the power supply.

## 9 Servicing/Maintenance

### 9.1 Checklist for commissioning/inspection and maintenance

**Table 42:** Symbols key

Symbol	Description
①	Commissioning/Inspection
②	Maintenance

**Table 43:** Checklist

Read the operating manual.	①	②
Compare the power supply data against the name plate data.	①	②
Check the earth conductor to ensure that it functions properly (to EN 60 439).	①	②
Check the connection of the temperature switches (thermal circuit breaker). No reversal vis-à-vis pump (note alert and warning)	①	②
Check winding resistances.	-	②
Check insulation resistances.	-	②
Re-tighten the terminals of: <ul style="list-style-type: none"> <li>▪ Motor(s)</li> <li>▪ Control unit</li> <li>▪ Level sensor</li> </ul>	①	②
Check the switching mechanism. <ul style="list-style-type: none"> <li>▪ Remove the level sensor.</li> <li>▪ Check for jamming/incrustations.</li> <li>▪ Clean level sensor if necessary.</li> </ul>	①	②
Check the switchover time from star to delta. Required = approx. 3 seconds (not applicable to DOL starting)	①	②
Check the fuses. <ul style="list-style-type: none"> <li>▪ Size</li> <li>▪ Characteristics</li> <li>▪ 3-pole, mechanically interlocked (3~ only)</li> </ul>	①	②
Replace fuses after two years of operation. (cartridges)	①	②
Check the settings on the motor protection switch.	①	-
Check the direction of rotation of the pump.	①	②
Check the pump/motor to ensure that it runs smoothly.	①	②
Check the automatic switching functionality. <ul style="list-style-type: none"> <li>▪ Manual-0-automatic selector switch</li> <li>▪ Additional start-up of stand-by pump at peak load (dual-pump station only)</li> <li>▪ Switchover to stand-by pump if the duty pump fails (dual-pump station only)</li> <li>▪ Set selector switch back to automatic mode.</li> </ul>	-	②
Check the tank coding/parameter settings (see parameter 3-1-2; mini-Compacta/Compacta version only).	①	②
Test-run for several start/stop cycles.	①	②
Check the alarm device to ensure that it functions properly.	①	②
If applicable: reset service alert.	-	②
Determine the spare parts requirements, if any.	-	②
Provide support and/or training for operating personnel.	①	②
Provide new operating manual if necessary.	①	②

### 9.2 Inserting/replacing the rechargeable battery

	 <b>DANGER</b>
	<p><b>Unintentional contact with live parts</b>            Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ De-energise the mains connection.</li> <li>▷ Take steps to ensure that the mains connection cannot be re-energised unintentionally.</li> </ul>

	<b>NOTE</b>
	<p>The rechargeable batteries must be replaced every five years to ensure that the control unit will operate reliably in battery mode. Use original spare parts only.</p>

- ✓ Supply voltage has been switched of.
- 1. Open the control unit.  
 Type BC: Remove the 6 hexagon socket head cap screws from the front of the cover.  
 Type BS: Open the control cabinet door using the cabinet key.
- 2. Disconnect the battery.
- 3. Undo the battery clamp and store it.
- 4. Replace the batteries.
- 5. Re-fit the battery clamp.
- 6. Re-establish the connections for the battery.
- 7. Close the control unit.  
 Type BC: Properly fasten the cover using the 6 hexagon socket head cap screws.  
 Type BS: Securely lock the control cabinet using the cabinet key.
- 8. Reconnect the power supply.

	<b>NOTE</b>
	<p>When retrofitting the control unit with the rechargeable battery installation option, it is not sufficient to insert the rechargeable battery/batteries only. A rechargeable battery retrofit kit is required, which not only comprises the rechargeable battery/batteries but also an electronic recharging unit as well as some fastening material.</p>

## 10 Trouble-shooting

	<b>⚠ WARNING</b>
	<p><b>Carrying out work on a running pump</b> Risk of injury: Limbs can be pulled into or crushed by machinery!</p> <ul style="list-style-type: none"> <li>▷ Disconnect the drive from the power supply.</li> <li>▷ Take steps to ensure that the drive cannot be switched on again unintentionally.</li> </ul>
	<b>⚠ WARNING</b>
	<p><b>The pump set may still be pressurised</b> Danger from escaping fluid!</p> <ul style="list-style-type: none"> <li>▷ Release the pump pressure before carrying out maintenance work on the pump set.</li> <li>▷ Disconnect the pump set from the power supply.</li> </ul>
	<b>⚠ WARNING</b>
	<p><b>Improper work to remedy faults</b> Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.</li> </ul>

If problems occur that are not described in the following table, consultation with the KSB service is required.

- A Pump is running, but does not deliver
- B Insufficient discharge head
- C Excessive current/power input
- D Vibrations and noise during pump operation
- E Lifting unit frequently switches to fault mode

**Table 44:** Trouble-shooting

A	B	C	D	E	Possible cause	Remedy
	X	X	-	-	Operating voltage is too low.	Check the mains voltage. Check the cable connections.
X	-	-	-	-	Motor/pump not running due to lack of voltage.	Check electrical connection and fuses. Fuse (230 V) or motor protection switch (400 V) tripped.
-	X	X	X	X	Wrong direction of rotation (for 3~ units)	Reverse two phases of power cable or motor supply cable.
X	X	-	-	X	Two-phase operation (for 3~ units)	Check conductor voltages. If necessary, replace defective fuse. Check the cable connections.
X	-	-	-	X	Manual-0-automatic selector switch set to "0"	Set manual-0-automatic switch to "automatic".
X	-	-	-	X	Motor winding or electric cable are defective.	Replace by new original KSB parts or contact KSB.
-	X	-	-	-	Water level in tank/sump too low during operation.	Check level sensor. Check parameters. If necessary, repeat parameterisation.

A	B	C	D	E	Possible cause	Remedy
X	-	-	-	-	Temperature sensor in the winding has tripped the pump because of an excessive temperature rise in the winding.	The motor will restart automatically once the unit has cooled down. If storing thermal circuit breaker alert tripped, acknowledge with OK. Check pump.
X	-	-	X	X	Defective level sensor	Check level sensor. Clean or replace as necessary.
X	X	X	X	X	Control unit does not function properly.	Verify parameterisation of control unit. Check control unit and replace if necessary.
X	X	X	X	X	Control unit does not function as expected / incorrect parameterisation.	Verify parameterisation of control unit.

## 11 Related Documents

### 11.1 Wiring Diagrams

**NOTE**

For type BS, refer to the circuit diagrams provided.

In certain cases, the pump connections may not be exactly as shown on the wiring diagrams provided here. For this reason, always refer to the pump's product literature and circuit diagrams provided.

11.1.1 AmaDrainer with control unit type BC

11.1.1.1 1~230 V: AmaDrainer 3, Ama-Drainer N, Ama-Drainer NE 4 / 5

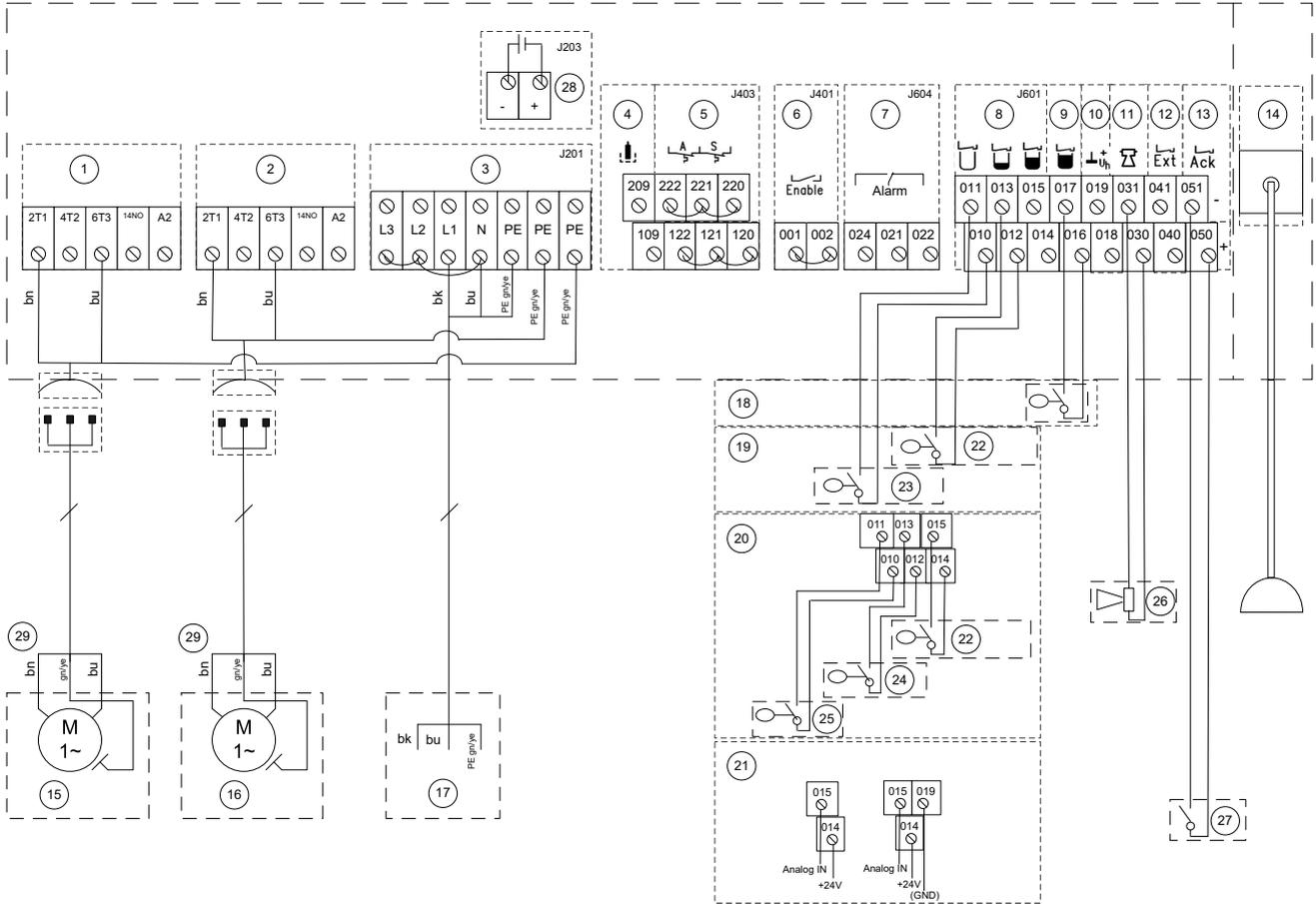


Fig. 36: Circuit diagram: AmaDrainer 3, Ama-Drainer N, Ama-Drainer NE 4/5

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 1~230 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pumps OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	29	230 V bk (black) bu (blue) bn (brown) PE: gn/ye (green/yellow)
15	Pump 1		

11.1.1.2 3~400 V: Ama-Drainer ND 4 / 5

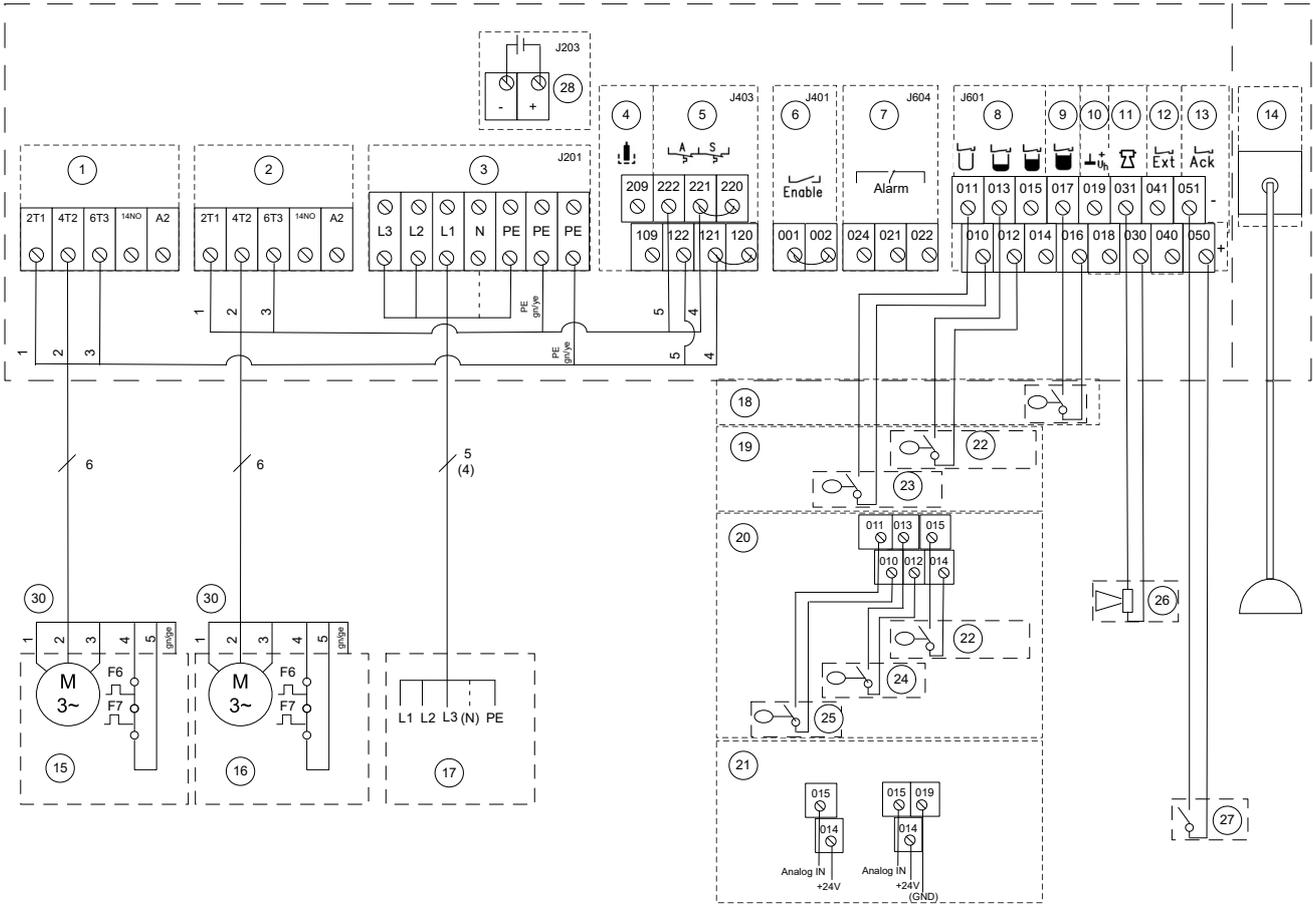


Fig. 37: Circuit diagram: Ama-Drainer ND 4 / 5

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 3~400 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pumps OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	30	400 V U1: bk (black) V1: bu (blue) W1: bn (brown) PE: gn/ye (green/yellow)
15	Pump 1		

11.1.1.3 3~400 V: Ama-Drainer B / BH 80

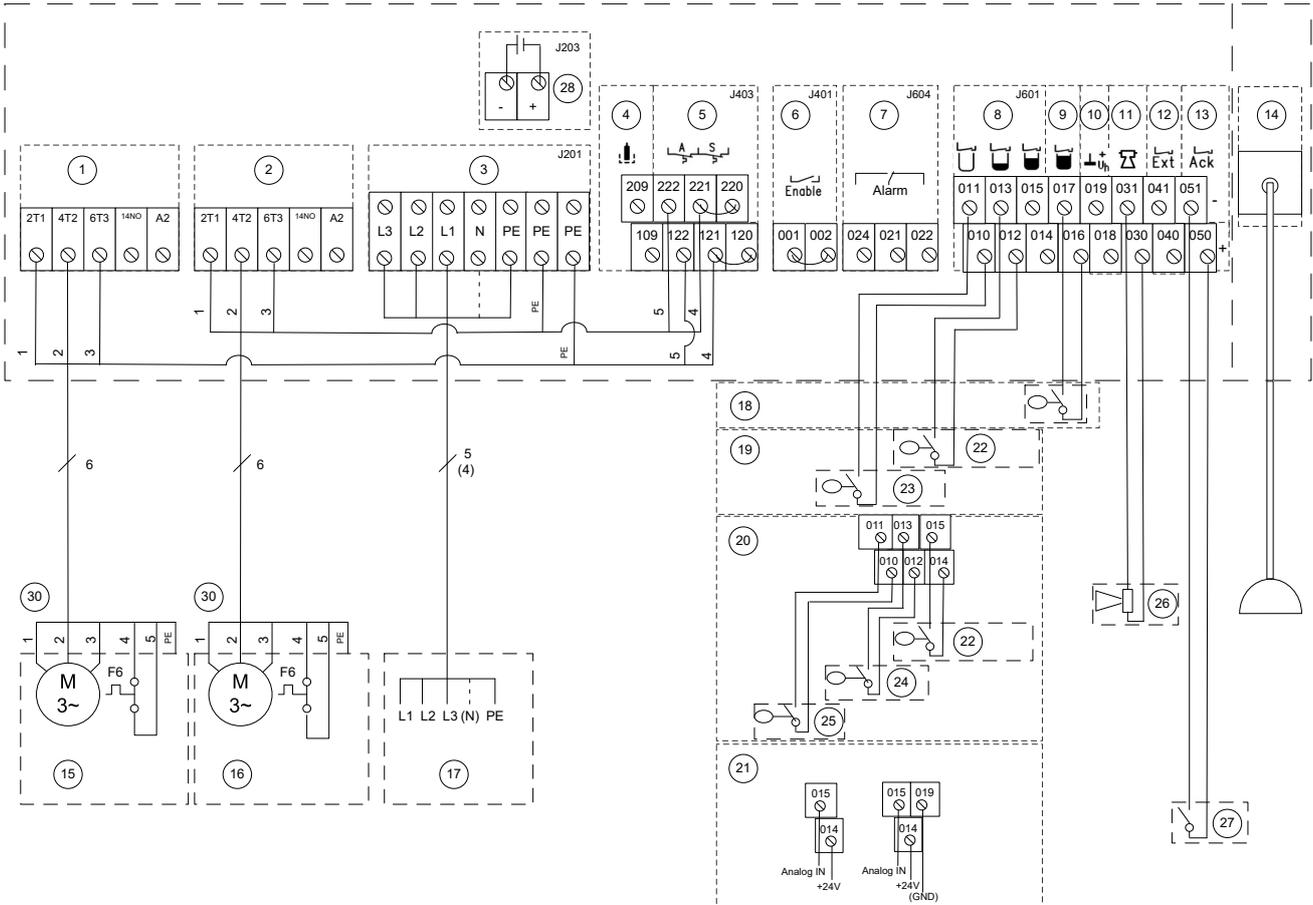


Fig. 38: Circuit diagram: Ama-Drainer B / BH 80

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 3~400 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pumps OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	30	400 V U1: bk (black) V1: bu (blue) W1: bn (brown) PE: gn/ye (green/yellow)
15	Pump 1		

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11.1.2 Ama-Porter with control unit type BC

11.1.2.1 1~230 V: Ama-Porter NE

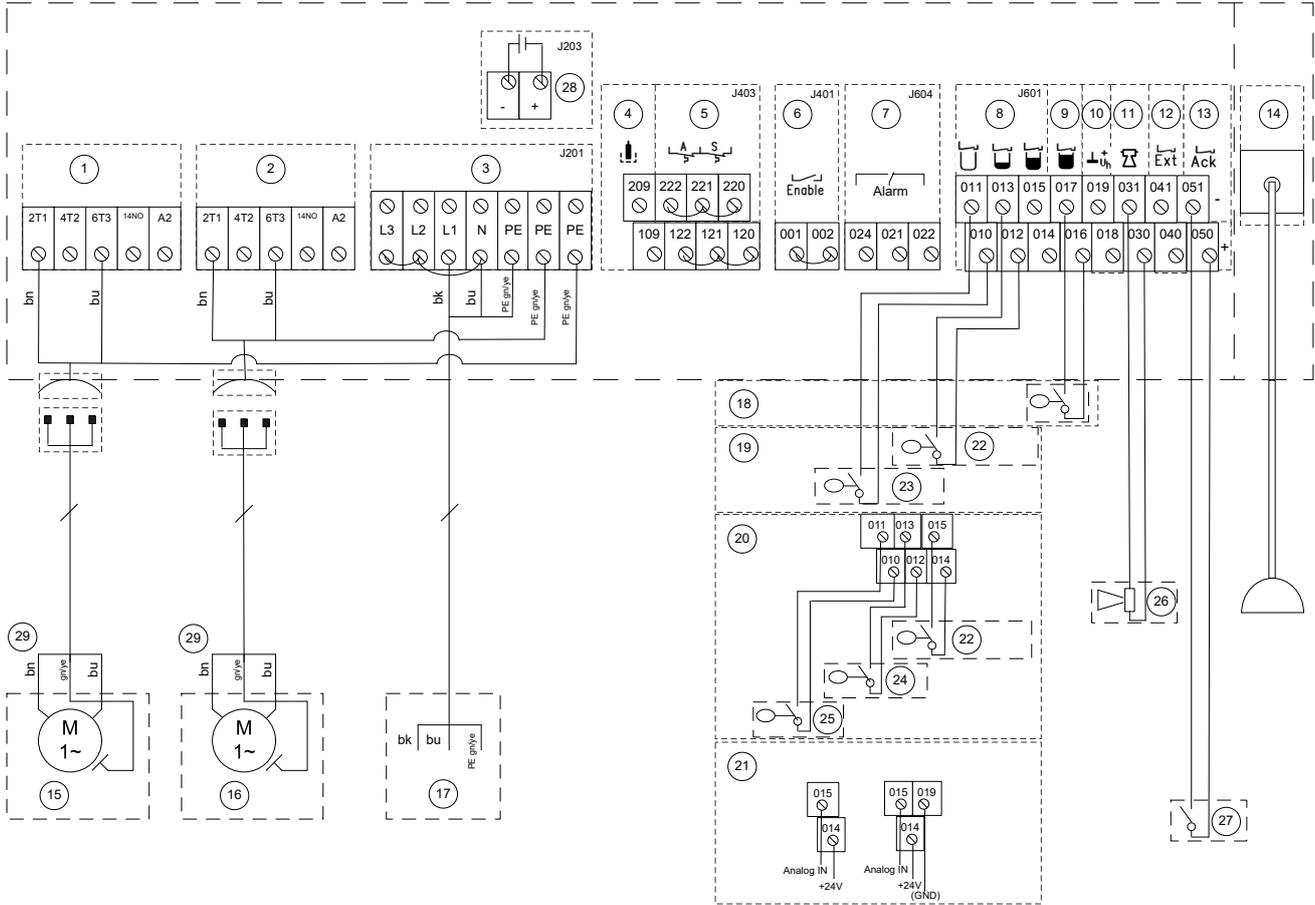


Fig. 39: Circuit diagram: Ama-Porter NE

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 1~230 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pump OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	29	230 V bk (black) bu (blue) bn (brown) PE: gn/ye (green/yellow)
15	Pump 1		

11.1.2.2 3~400 V: Ama-Porter ND

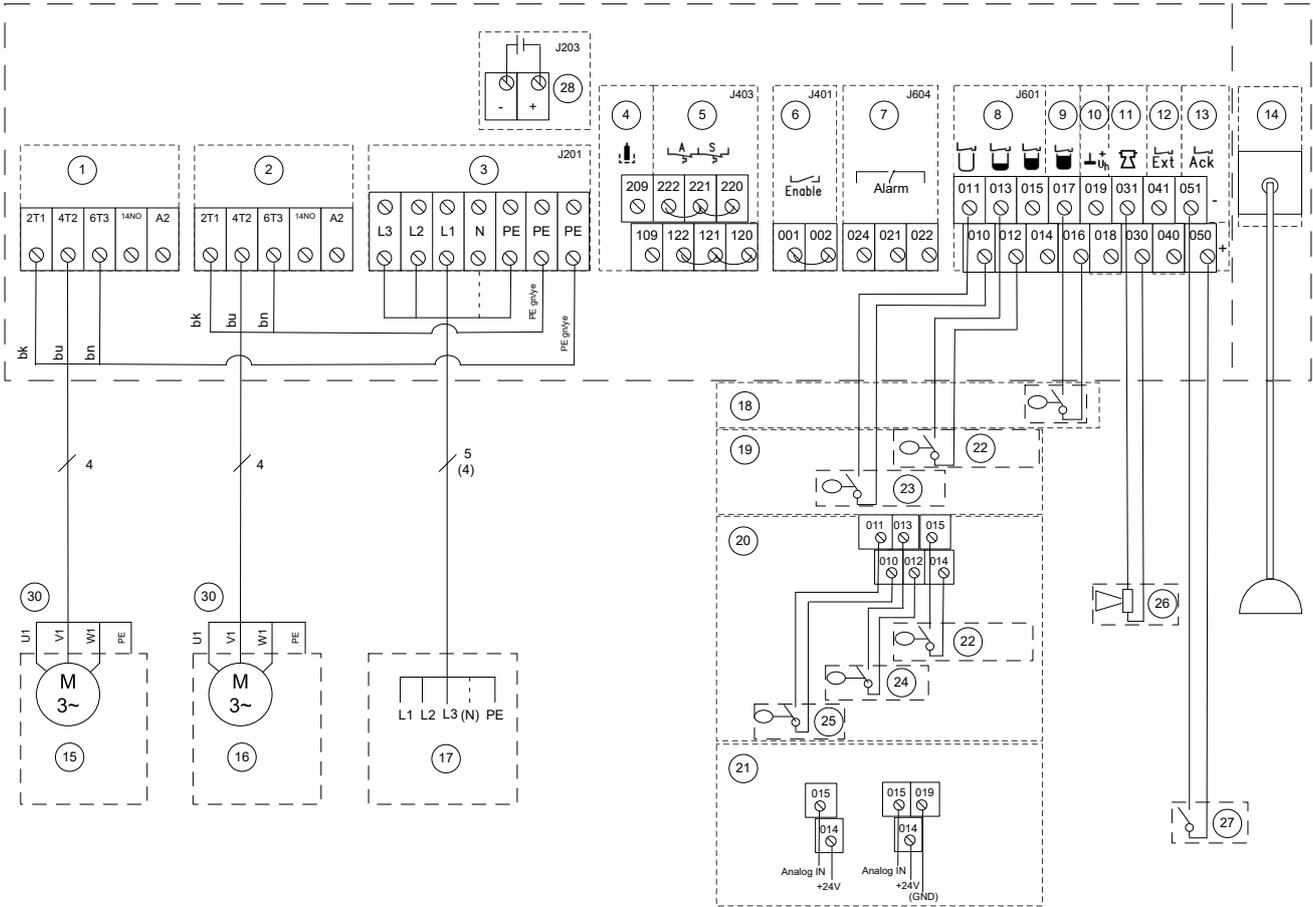


Fig. 40: Circuit diagram: Ama-Porter ND

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 3~400 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pump OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	30	400 V U1: bk (black) V1: bu (blue) W1: bn (brown) PE: gn/ye (green/yellow)
15	Pump 1		

11.1.3 Amarex with control unit type BC

11.1.3.1 3~400 V: Amarex Fmax/Dmax up to 4 kW

NOTE

For ATEX, route all electrical connections of the sensor system (float switch, 4 - 20 mA analog sensor) via intrinsic safety barriers (not relevant for pneumatic pressure measurement and bubbler control).

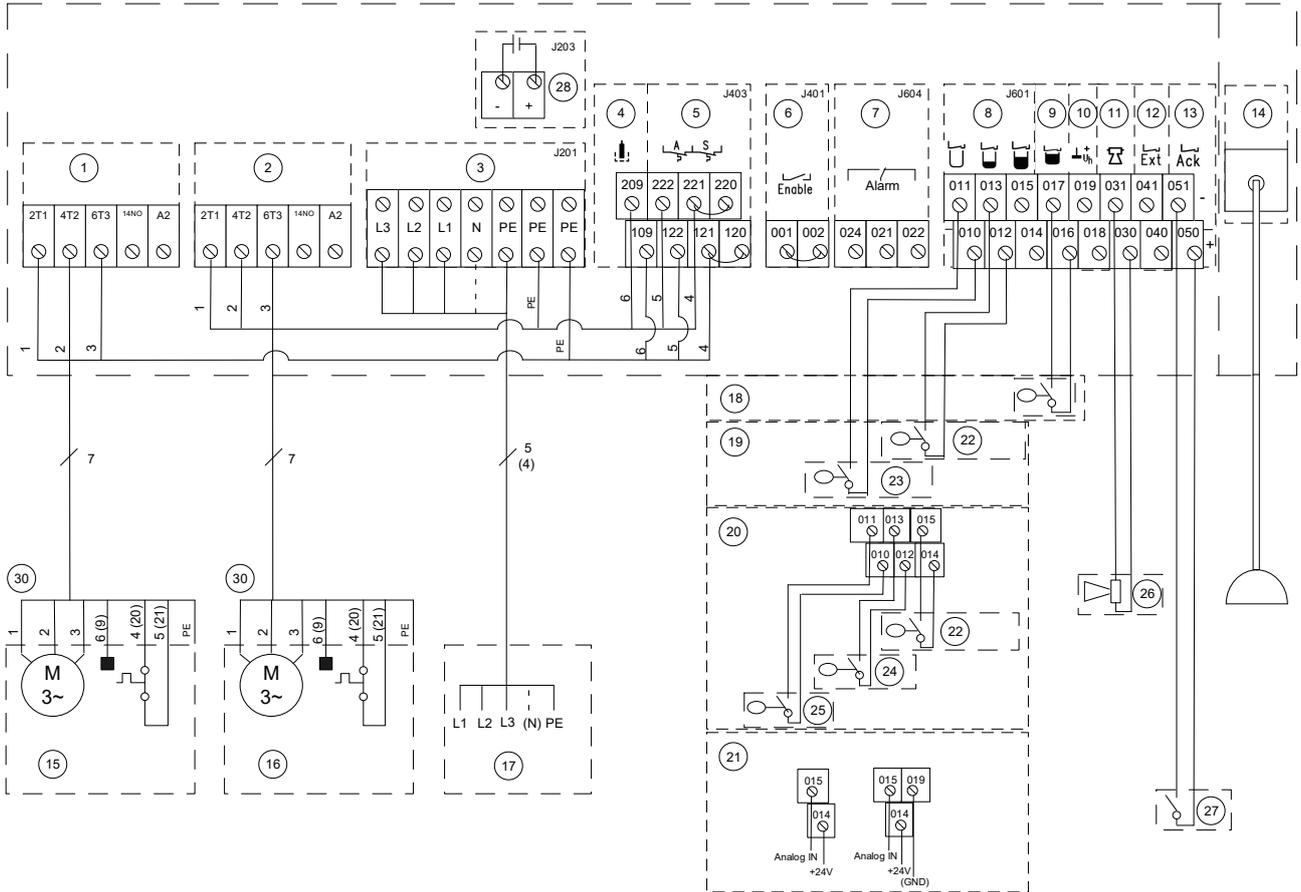


Fig. 41: Circuit diagram: Amarex Fmax / Dmax up to 4 kW

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 3~400 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pump OFF
11	Connection for alarm equipment	26	Signal transmitter 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	30	Pump connection
15	Pump 1		

11.1.4 Amarex N with control unit type BC

11.1.4.1 3~400 V: Amarex N / S

	<b>NOTE</b>
<p>For ATEX, route all electrical connections of the sensor system (float switch, 4 - 20 mA analog sensor) via intrinsic safety barriers (not relevant for pneumatic pressure measurement and bubbler control).</p>	

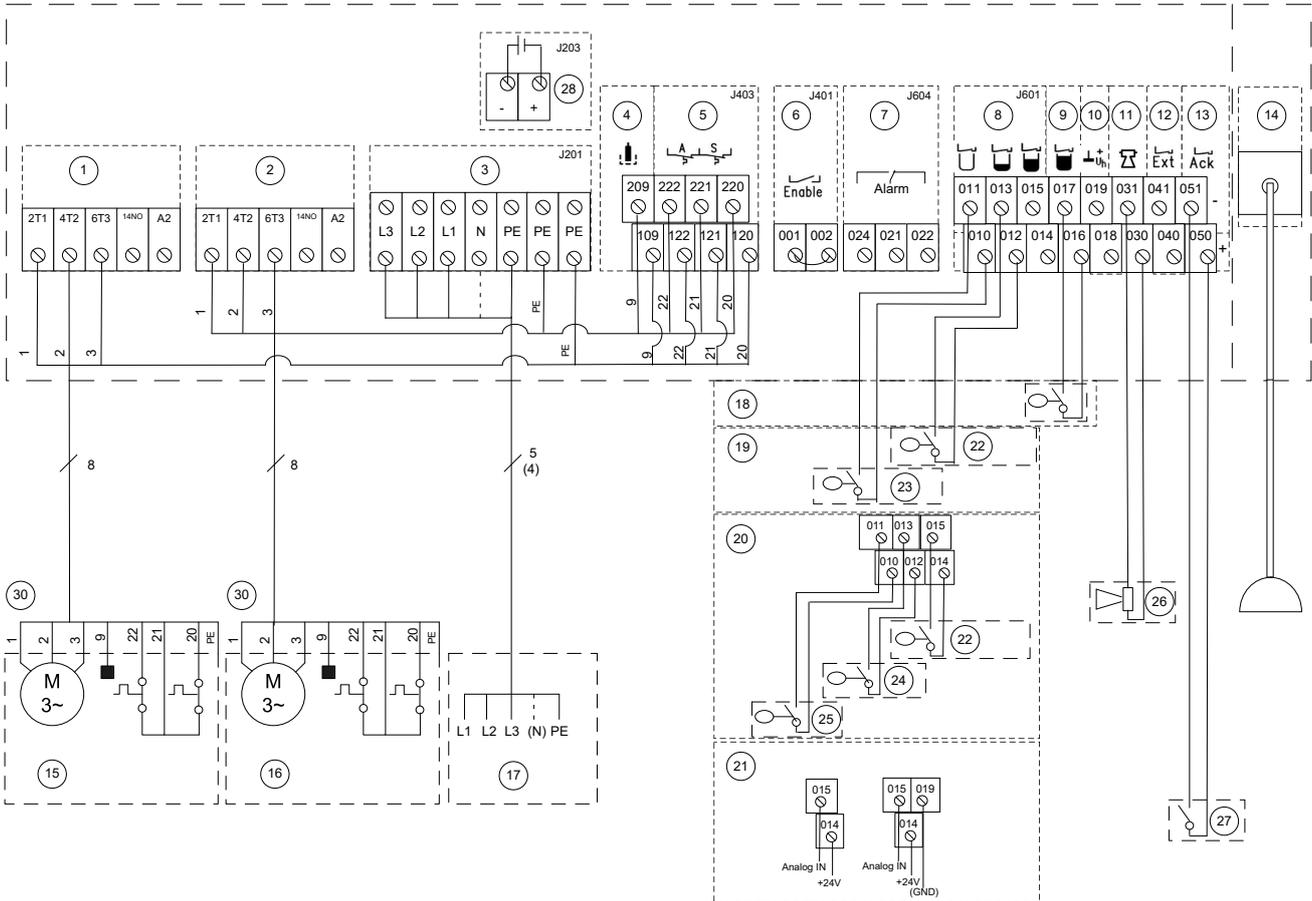


Fig. 42: Circuit diagram: Amarex N / S

1	Contactor pump 1	16	Pump 2
2	Contactor pump 2	17	Power supply
3	Mains connection 3~400 V	18	High-water float switch
4	Leakage monitor	19	Float switch
5	Thermal circuit breaker	20	Digital level switch
6	Release	21	Analog sensor 4 - 20 mA
7	Volt-free alarm contact	22	Peak load ON
8	Float switch / digital level switch	23	Pump ON/OFF
9	High-water float switch	24	Base load ON
10	Sensors for mini-Compacta/Compacta	25	Pump OFF
11	Connection for alarm equipment	26	Signalling device 12 V
12	External alarm input	27	Contact
13	Remote acknowledgement	28	Rechargeable battery connection
14	Pneumatic	30	Pump connection
15	Pump 1		

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1	Contacteur pump 1	15	Pump 1
2	Contacteur pump 2	16	Pump 2
3	Mains connection 3~400 V	17	Power supply
4	Leakage monitor	18	High-water float switch
5	Thermal circuit breaker	19	Float switch
6	Release	20	Digital level switch
7	Volt-free alarm contact	21	Analog sensor 4 - 20 mA
8	Float switch / digital level switch	22	Peak load ON
9	High-water float switch	23	Pump ON/OFF
10	Sensors for mini-Compacta/Compacta	24	Base load ON
11	Connection for alarm equipment	25	Pumps OFF
12	External alarm input	26	Signal transmitter 12 V
13	Remote acknowledgement	27	Contact
14	Pneumatic	28	Rechargeable battery connection

\* Drive connected in Y/D configuration: The wires of the power cable must be reversed.

## 12 UK Declaration of Conformity

Manufacturer:

KSB SE & Co. KGaA  
Johann-Klein-Straße 9  
67227 Frankenthal (Germany)

This UK Declaration of Conformity is issued under the sole responsibility of the manufacturer.

The manufacturer herewith declares that the product:

### LevelControl Basic 2 Models BC (Basic Compact) and BS (Basic Switchgear)

Serial number range: 2022w01 to 2024w52

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
  - Electromagnetic Compatibility Regulations 2016
  - Electrical Equipment (Safety) Regulations 2016
  - The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The manufacturer also declares that

- the following *designated standards* have been applied:
  - EN 60204-1
  - EN 50178
  - EN 61000-6-2, EN 61000-6-3

The UK Declaration of Conformity was issued in/on:

Frankenthal, 3 January 2022



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Jochen Schaab  
Head of Product Development Pump Systems & Drives  
KSB SE & Co. KGaA  
Johann-Klein-Straße 9  
67227 Frankenthal (Germany)

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