

Wilo-Control EC-L



en Installation and operating instructions

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#### Table of contents

1	Gen	eral information	5
	1.1	About these instructions	5
	1.2	Copyright	5
	1.3	Subject to change	5
	1.4	Warranty	5
2	~ ~		-
2	Safe		5
	2.1	Identification of safety instructions	5
	2.2	Personnel qualifications	6
	2.3	Electrical work	6
	2.4	Monitoring devices	7
	2.5	Installing/dismantling	7
	2.6	During operation	7
	2.7	Maintenance tasks	7
	2.8	Operator responsibilities	7
			_
3	Арр	lication/use	/
	3.1	Intended use	7
	3.2	Improper use	7
L	Drog	luct description	7
-	4 1	Structura	7
	4.1		····· / o
	4.2	How It works	o
	4.5	Operating modes	ة م
	4.4	recnnical data	ð
	4.5	Inputs and outputs	8
	4.6	Туре кеу	9
	4.7	Operation on electronic start-up controllers	9
	4.8	Installation in potentially explosive atmospheres	9
	4.9	Scope of delivery	9
	4.10	Accessories	9
5	Trar	asportation and storage	10
5	5 1	Delivery	10
	5.1		10
	J.Z		10
	5.5	Stolage	10
6	Inst	allation	10
	6.1	Personnel qualifications	10
	6.2	Installation types	10
	6.3	Operator responsibilities	10
	6.4	Installation	10
	6.5	Electrical connection	12
7	Оре	ration	22
	7.1	How it works	22
	7.2	Operating modes	23
	7.3	Menu control	25
	7.4	Menu type: Main menu or Easy Actions menu	25
	7.5	Call up the menu	25
	7.6	Quick access to "Easy Actions"	25
	7.7	Factory settings	26
8	Com	missioning	26
	8.1	Operator responsibilities	26
	8.2	Commissioning in explosive atmospheres	26
	8.3	Connection of signal transmitters and pumps within potentially explosive atmospheres	27
	8.4	Activating the device	27
	8.5	Start initial configuration	28
	8.6	Start automatic mode	37

	8.7	During operation	38
9	Shut	t-down	40
	9.1	Personnel qualifications	40
	9.2	Operator responsibilities	40
	9.3	Shut-down	40
	9.4	Removal	40
10	) Main	ntenance and repair	41
	10.1	Maintenance intervals	41
	10.2	Maintenance tasks	41
	10.3	Maintenance interval display	41
11	. Faul	ts, causes and remedies	42
	11.1	Operator responsibilities	42
	11.2	Fault indication	42
	11.3	Fault acknowledgement	43
	11.4	Fault memory	43
	11.5	Error codes	43
	11.6	Further steps for troubleshooting	44
12	Disp	osal	44
	12.1	Rechargeable battery	44
	12.2	Information on the collection of used electrical and electronic products	44
13	Арр	endix	45
	13.1	Potentially explosive atmospheres: Connection of signal transmitters and pumps	45
	13.2	System impedances	46
	13.3	Overview of the symbols	47
	13.4	Terminal diagram overview	47
	13.5	ModBus: Data types	49
	13.6	ModBus: Parameter overview	50

1	General information	
1.1	About these instructions	These installation and operating instructions are an integral part of the product. Read these instructions before commencing work and keep them in an accessible place at all times. Strict adherence to these instructions is a precondition for the intended use and correct operation of the product. All information and markings on the product must be observed.
		The language of the original operating instructions is German. All other languages of these instructions are translations of the original operating instructions.
1.2	Copyright	These installation and operating instructions have been copyrighted by the manufac- turer. Contents of any kind may not be reproduced or distributed, or used for purposes of competition and shared with others.
1.3	Subject to change	The manufacturer reserves the right to make technical modifications to the device or individual components. The illustrations used may differ from the original and are in-tended as an example representation of the device.
1.4	Warranty	The specifications in the current "General Terms and Conditions" apply to the warranty and the warranty period. These can be found at www.wilo.com/legal
		Any deviations must be contractually agreed and shall then be given priority.
		Claim to warranty
		<ul> <li>If the following points are complied with, the manufacturer is obligated to rectify every qualitative or constructive flaw:</li> <li>The defects are reported in writing to the manufacturer within the warranty period.</li> <li>Application according to intended use.</li> <li>All monitoring devices are connected and tested before commissioning.</li> </ul>
		Exclusion from liability
		<ul> <li>Exclusion from liability excludes all liability for personal injury, material damage or financial losses. This exclusion ensues as soon as one of the following applies:</li> <li>Inadequate configuration due to inadequate or incorrect instructions by the operator or the client</li> <li>Non-compliance with installation and operating instructions</li> <li>Improper use</li> <li>Incorrect storage or transport</li> <li>Incorrect installation or dismantling</li> <li>Insufficient maintenance</li> <li>Unauthorised repairs</li> <li>Inadequate construction site</li> <li>Chemical, electrical or electro-chemical influences</li> <li>Wear</li> </ul>
2	Safety	<ul> <li>This chapter contains basic information for the individual phases of the life cycle. Failure to observe this information carries the following risks:</li> <li>Risk of personal injury from electrical, electromagnetic or mechanical influences</li> <li>Environmental damage from discharge of hazardous substances</li> <li>Damage to property</li> <li>Failure of important functions</li> </ul>
		Failure to observe the information contained herein will result in the loss of claims for damages.
		The instructions and safety instructions in the other chapters must also be ob- served!
2.1	Identification of safety instruc- tions	<ul> <li>These installation and operating instructions set out safety instructions for preventing personal injury and damage to property, which are displayed in different ways:</li> <li>Safety instructions relating to personal injury start with a signal word and are preceded by a corresponding symbol.</li> </ul>



# Type and source of the danger!

Consequences of the danger and instructions for avoidance.

 Safety instructions relating to property damage start with a signal word and are displayed without a symbol.

#### CAUTION

DANGER

#### Type and source of the danger!

Consequences or information.

#### Signal words

- Danger!
- Failure to observe safety instructions will result in serious injury or death! Warning!
- Failure to follow instructions can lead to (serious) injury!
- Caution!
- Failure to follow instructions can lead to property damage and possible total loss.
- Notice!
  - Useful information on handling the product

#### Markups

- ✓ Prerequisite
- 1. Work step/list
  - ⇒ Notice/instructions
- Result

#### Symbols

These instructions use the following symbols:

Danger of electric voltage



Danger - explosive atmosphere



Useful information

#### 2.2 **Personnel qualifications**

Personnel must:

- Be instructed about locally applicable regulations governing accident prevention.
- Have read and understood the installation and operating instructions.

Personnel must have the following qualifications:

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.
- Operation/control: Operating personnel must be instructed in the functioning of the complete system.

#### Definition of "qualified electrician"

A qualified electrician is a person with appropriate technical education, knowledge and experience who can identify **and** prevent electrical hazards.

#### 2.3 **Electrical work**

- Electrical work must be carried out by a qualified electrician.
- Before commencing work, disconnect the product from the mains and safeguard it from being switched on again.
- Observe applicable local regulations when connecting to the mains power supply.
- Adhere to the requirements of the local energy supply company.
- Earth the product.
- Observe technical information.

		<ul> <li>Replace a defective connection cable immediately.</li> </ul>
2.4	Monitoring devices	
		Circuit breaker
		The size and switching characteristics of the circuit breakers must conform to the rated current of the connected consumer. Observe local regulations.
2.5	Installing/dismantling	<ul> <li>Locally applicable laws and regulations on work safety and accident prevention must be complied with.</li> <li>Disconnect the product from the mains and secure it against being switched on again.</li> <li>Suitable fixation material must be used for the existing bearing surface.</li> <li>The product is not watertight. Select an appropriate installation site!</li> <li>Do not deform the bousing during installation. Seals could leak and affect the stated</li> </ul>
		IP protection class.
		<ul> <li>The product may <b>not</b> be installed in potentially explosive areas.</li> </ul>
2.6	During operation	<ul> <li>The product is not watertight. Adhere to protection class IP54.</li> <li>The embiant term protection must be between 20°C + 50°C</li> </ul>
		<ul> <li>The maximum humidity may be 90 % (non-condensing).</li> </ul>
		Do not open the switchgear.
		<ul> <li>The operator must immediately report any faults or irregularities to their line manager.</li> <li>In the event of damage to the product or cables, switch off the product immediately.</li> </ul>
2.7	Maintenance tasks	<ul> <li>Do not use any aggressive cleaners or scouring agents or fluids.</li> <li>The product is not watertight. Do not submerse the product in fluids.</li> </ul>
		<ul> <li>Only carry out maintenance tasks mentioned in these installation and operating in-</li> </ul>
		structions.
		• Only original parts from the manufacturer may be used for maintenance and repairs. Use of parts other than the original parts releases the manufacturer from any liability.
2.8	Operator responsibilities	<ul> <li>Provide installation and operating instructions in a language which the personnel can</li> </ul>
		<ul><li>understand.</li><li>Make sure that the personnel has had the corresponding training for the specified work.</li></ul>
		<ul> <li>Safety and information signs mounted on the device must always be legible.</li> <li>Train the personnel on how the system operates.</li> </ul>
		Eliminate risk from electrical current.
		<ul> <li>To ensure safe working practice, define personnel responsibilities.</li> </ul>
		Children and persons younger than 16 years or with reduced physical, sensory or mental capacities or limited experience are prohibited from handling the product! A technician must supervise persons younger than 18 years!
3	Application/use	
3.1	Intended use	The switchgear is designed for level-dependent control of up to three pumps. Float switches, level sensors or dynamic pressure bells can be used as level transmitters.
		Intended use also includes compliance with this manual. Any other use is regarded as non-compliant with the intended use.
3.2	Improper use	<ul> <li>Installation in potentially explosive atmospheres</li> <li>Overflow of the switchgear</li> </ul>

## 4 Product description

Main switch

1

#### 4.1 Structure



#### Fig. 1: Switchgear front

#### 4.2 How it works

**Operating modes** 

4.3

# 2Operating button3LED indicators4LCD display

The front of the switchgear comprises the following main components:

- Main switch for switching the switchgear on/off (not the "EMS" version)
- Operating button for menu selection and parameter input
- LEDs for displaying the current operating state
- LCD display for showing the current operating data and individual menu items

The pumps are individually switched on/off automatically, depending on the fill level. Level measurement is via a two-position control for each pump. An optical signal as well as a forced switch-off or switch-on of all pumps follows upon reaching the dry run or high water level. Faults are stored in the fault memory.

The current operating data and operating states are shown on the LCD display and indicated by LEDs. Operation and input of operating parameters is carried out using a rotary knob.

- The switchgear has two different operating modes:
- drain (drain)

fill (fill)

Selection is via the menu.

#### "Drain" operating mode

The reservoir or pump chamber is drained. The connected pumps are activated when the level rises and switched off when the level falls.

#### *"Fill" operating mode*

The reservoir is filled. The connected pumps are activated when the level falls and switched off when the level rises.

#### 4.4 Technical data

Date of manufacture* (MFY)	See rating plate
Mains connection	1~220/230 V, 3~380/400 V
Mains frequency	50/60 Hz
Max. current consumption per pump	12 A
Max. rated power per pump	4 kW
Pump activation type	Direct
Ambient/operating temperature	-30 °C+50 °C
Storage temperature	-30 °C+60 °C
Max. relative humidity	90 %, non-condensing
Protection class	IP54
Electrical safety	Pollution degree II
Control voltage	24 V DC
Housing material	Polycarbonate, UV-resistant

\*The date of manufacture is stated in accordance with ISO 8601: JJJJWww

JJJJ = year

W = abbreviation for week

ww = calendar week

#### Inputs

- Analogue input:
- 1 x level sensor 4 20 mA
- Digital inputs:
  - 2 x or 3 x float switches for level measurement

NOTICE! A max. of 2 pumps can be actuated with level measurement using a float switch!

- 1 x float switch used for sensing high water level
- 1 x float switch used for sensing dry running level/low water level
- Pump monitoring:
  - 1 x input/pump for thermal winding monitoring using a bimetallic strip. NOTICE! PTC sensors cannot be connected!
  - 1 x input/pump for leakage detection using a moisture probe
- Other inputs:
  - 1 x Extern OFF: for remote switch-off of all pumps
    - In "fill" operating mode, dry-running protection is realised via this input.

#### Outputs

- Potential-free contacts:
  - 1 x changeover contact for collective fault signal
  - 1 x changeover contact for collective run signal
  - 1 x NC contact for every pump for individual fault signals
  - 1 x NO contact for every pump for individual run signals
- Other outputs:
  - 1 x power output for connecting an external alarm signal (lamp or horn) Connection value: 24 V DC, max. 4 VA
  - 1 x analogue output 0 10 V for displaying the actual level value

туре кеу	Example: Wilo-Control EC-L 2x12A-MT34-DOL-WM-X		
	EC	Easy Control switchgear for fixed-speed pumps	
	L	Level-dependent control of pumps	
	2 x	Max. number of pumps that can be connected	
	12 A	Max. rated current in amperes per pump	
	MT34	Mains connection: M = alternating current (1~220/230 V) T34 = three-phase current (3~380/400 V)	
	DOL	Pump activation type: Direct	
	WF	Wall fixation	
	x	Versions: EMS = without main switch (mains isolator must be provided by the cus- tomer!) IPS = with integrated pressure transducer for direct connection of a dy- namic pressure bell	
Operation on electronic start-up controllers	The switchge switching of permitted!	ear must be connected directly to the pump and the mains. Intermediate additional electronic start–up controllers, e.g. a frequency converter, is not	
Installation in potentially explos-	The switchge	ear does not have its own explosion protection class. It may <b>not</b> be installed	

ive atmospheres Scope of delivery in potentially explosive areas.

- Switchgear
  - Installation and operating instructions

#### 4.10 Accessories

4.6

4.7

4.8

4.9

Type key

- Float switch for drainage and sewage
- Level sensor (4 20 mA)
- Level monitor
- Dynamic pressure bell and bubbling-through system
- Signal lamp 24 V DC
- Flash light 230 V
- Horn 230 V
- Rechargeable battery for mains-independent alarm

- Ex cut-off relay
- Zener barrier

5	Transportation and storage	
5.1	Delivery	After receiving the shipment, check it immediately for defects (damage, completeness). The transport company or the manufacturer must be notified of any defects the day the shipment is received, and the damage noted on the freight documentation. Claims can- not be asserted if the notification of defects takes place at a later date.
5.2	Transport	<ul> <li>Clean switchgear.</li> <li>Close housing apertures, ensuring they are sealed watertight.</li> <li>Impact-resistant and watertight packaging. Replace soaked packaging immediately!</li> </ul>
		CAUTION
		<b>Soaked packaging may tear!</b> The product may fall on the ground if unprotected and may be damaged. Lift wet packaging carefully and replace it immediately!
5.3	Storage	<ul> <li>Pack the switchgear in impact-resistant and watertight packaging.</li> <li>Storage temperature between -30 °C+60 °C with a max. relative humidity of 90 %.</li> <li>Frost-proof storage at a temperature of 1025 °C with relative humidity of 4050 % is recommended.</li> <li>Avoid formation of condensation in general!</li> <li>All open threaded cable connections must be sealed to prevent water ingress into the housing.</li> <li>Attached cables should be protected against kinking, damage, and moisture ingress.</li> <li>To prevent damage to the components, protect the switchgear from direct sunlight and heat.</li> <li>Clean the switchgear after storage.</li> <li>If there has been water ingress or condensation has formed, get all of the electronic components tested for correct function. Contact customer service!</li> </ul>
6	Installation	
		<ul> <li>Check the switchgear for damage in transport. Do <b>not</b> install defective switchgears!</li> <li>Observe the local guidelines for the planning and operation of electronic controls.</li> <li>For the correct adjustment of the level control device, the information on submersion in water and the switching sequence of the connected pump must be observed.</li> </ul>
6.1	Personnel qualifications	<ul> <li>Electrical work: A qualified electrician must carry out the electrical work.</li> <li>Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.</li> </ul>
6.2	Installation types	<ul> <li>Wall fixation</li> </ul>
6.3	Operator responsibilities	<ul> <li>The installation location is clean, dry and free of vibration.</li> <li>The installation location is overflow-proof.</li> <li>The switchgear is not exposed to direct sunlight.</li> <li>Installation location outside of potentially explosive atmospheres.</li> </ul>
6.4	Installation	
	EX	DANGER Risk of explosion if the switchgear is installed in potentially explosive

areas!

qualified electrician.

- Level sensor and connection cable provided by the customer.
- While laying the cable, ensure that there is no tension, no kinking and no pinching that could damage the cable.
- Check the cable cross-section and length for the routing type chosen.
- Seal unused threaded cable connections.
- Observe the following ambient conditions:
  - Ambient/operating temperature: -30 °C...+50 °C
  - Relative humidity: 40...50 %
  - Max. relative humidity: 90 %, non-condensing

Various structures can be used for installation (concrete wall, mounting rail, etc.). For this reason, the fixation material for the relevant construction must be provided by the customer and the following information must be observed:

- To prevent cracks in the masonry and chipping of the construction material, ensure sufficient clearance to the edge of the structure.
- The depth of the borehole depends on the length of the screws. Drill the borehole approx. 5 mm deeper than the screw length.
- Drilling dust impairs retention force. Always blow the borehole clean or vacuum it out.
- Do not damage the housing during installation.

6.4.2 Installation of switchgear

Basic advice on fixing the

switchgear in place

6.4.1

Attach the switchgear to the wall with the four screws and wall plugs.

- Max. screw diameter:
  - Control EC-L 1x.../EC-L 2x...: 4 mm
  - Control EC–L 3x...: 6 mm
- Max. screw head diameter:
  - Control EC-L 1x.../EC-L 2x...: 7 mm
  - Control EC-L 3x...: 11 mm
  - $\checkmark$  Switchgear is disconnected from the mains and voltage-free.
  - 1. Align the drill template at the installation location and attach.
  - Drill and clean the mounting holes in accordance with the specifications of the fixation material.
  - 3. Remove the drill template.
  - 4. Loosen the screws on the cover and remove the cover to the side.
  - 5. Attach the lower part to the wall with the fixation material. Check the lower part for deformations! Realign deformed housing covers (e.g. by placing alignment plates below them) to ensure the housing cover closes precisely.NOTICE! If the cover does not close correctly, the protection class is compromised!
  - 6. Close the cover and fasten it with the screws.
  - ► The switchgear is installed. Now connect the mains, pumps and signal transmitter.

For automatic control of the pumps, a level control device must be installed. To this end, the following signal transmitters can be connected:

- Float switch
- Level monitor
- Level sensor
- Dynamic pressure bell ("IPS" version only)

The signal transmitters must be installed according to the system's installation plan. Observe the following points:

- Float switch: Float switches must be able to move freely in the operating space (pump chamber, tank)!
- Dynamic pressure bell: The use of a bubbling-through system is recommended for the optimal venting of the dynamic pressure bell.
- Do not undershoot the minimum water level of the pumps!
- Do not exceed the switching frequency of the pumps!

6.4.4 Dry-running protection

Level control

6.4.3

Level measurement can be performed using the level sensor, the dynamic pressure bell or a separate float switch. If a level sensor or dynamic pressure bell is used, then adjust the switching point via the menu. A **forced switch-off** of all pumps always takes place in the event of an alarm, irrespective of the selected signal transmitter!

The following applies to the "fill" operating mode:

• Realise dry-running protection in all cases via the "Extern OFF" input!

#### Installation

- Install the signal transmitter in the supplying tank (e.g. well).
- 6.4.5 Water shortage (for "fill" operating mode only)
   Level measurement can be performed using the level sensor, the dynamic pressure bell or a separate float switch. If a level sensor or dynamic pressure bell is used, then adjust the switching point via the menu. A forced switch-on of all pumps always takes place in the event of an alarm, irrespective of the selected signal transmitter!
   6.4.6 High water alarm

Level measurement can be performed using the level sensor, the dynamic pressure bell or a separate float switch. If a level sensor or dynamic pressure bell is used, then adjust the switching point via the menu.

#### Behaviour in the event of an alarm

- **Operating mode "drain":** A **forced switch-on** of all pumps always takes place in the event of an alarm, irrespective of the selected signal transmitter!
- **Operating mode "fill":** A **forced switch-off** of all pumps always takes place in the event of an alarm, irrespective of the selected signal transmitter!
- The pumps must be activated for the **forced switch-on**:
- Menu 3.01: Pumps are enabled.
- Extern OFF: Function is inactive.

#### 6.5 Electrical connection



#### DANGER

#### Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.



#### DANGER

#### Risk of explosion due to incorrect connection!

If pumps and signal transmitters are connected in explosive atmospheres, there is a risk of explosion due to incorrect connection. Observe the section on explosive atmospheres in the appendix!



#### NOTICE

- Depending on the system impedance and the maximum connections/hour of the connected consumers, voltage fluctuations and/or drops may occur.
- When using shielded cables, the shielding must be attached to the earth rail on both sides of the switchgear!
- · Connection must always be carried out by a qualified electrician!
- Observe the installation and operating instructions for the connected pumps and signal transmitters.
- The mains connection current and voltage must be as stated on the rating plate.
- Execute fuse protection on the mains side in accordance with the local guidelines.
- If circuit breakers are used, the switching characteristics should be selected according to the connected pump.
- Install a residual-current device (RCD, type A, sinusoidal current).
- Route connection cable in accordance with the local guidelines.
- Do not damage the connection cable during installation.
- Earth the switchgear and all electrical consumers.

#### 6.5.1 Overview of components



1	Terminal strip: Mains connection
2	Adjustment mains voltage
3	Terminal strip: Earth (PE)
4a	Terminal strip: Sensors
4b	Terminal strip: Sensors for active ex-mode
5	Contactor combinations
6	Output relay
7	Control board
8	Potentiometer for motor current monitoring
9	ModBus: RS485 interface
10	Dynamic pressure bell pressure connection ("IPS" version only)
11	ModBus: Jumper for termination/polarisation
12	Slot for 9 V rechargeable battery

Fig. 2: Control EC-L 1.../EC-L 2...



Fig. 3: Contro	ol EC-L 3
----------------	-----------

1	Main switch
2	Adjustment mains voltage
3	Terminal strip: Earth (PE)
4a	Terminal strip: Sensors
4b	Terminal strip: Sensors for active ex-mode
5	Contactor combinations
6	Output relay
7	Control board
8	Potentiometer for motor current monitoring
9	ModBus: RS485 interface
11	ModBus: Jumper for termination/polarisation
12	Slot for 9 V rechargeable battery
13	Housing cover

#### 6.5.2 Switchgear mains connection

#### (2 (1 com C 3 230 $\cap c$ Ōο 380 0 400 0 0 3~380-400 V 50/60 Hz Ð L1 L2L3 1~230 V 50/60 Hz Ð L Ν

*Fig. 4:* Mains connection, Wilo-Control EC-L 1.../EC-L 2...

## CAUTION

#### Material damage due to incorrectly set mains voltage!

The switchgear can be operated at different mains voltages. The mains voltage is set to 400 V at the factory. To use another mains voltage, change the position of the cable jumper before connection. If the wrong mains voltage is set, the switchgear will be destroyed!

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram.

1	Terminal strip: Mains connection
2	Adjustment mains voltage
3	Terminal strip: Earth (PE)

- Mains connection 1~230 V:
  - Cable: 3-core
  - Wire: L, N, PE
- Adjustment mains voltage: Converter bridge 230/COM
- Mains connection 3~380 V:
  - Cable: 4-core
- Wire: L1, L2, L3, PE
- Adjustment mains voltage: Converter bridge 380/COM
- Mains connection 3~400 V:
  - Cable: 4-core
  - Wire: L1, L2, L3, PE
- Adjustment mains voltage: Converter bridge 400/COM (factory setting)



1	Main switch
2	Adjustment mains voltage
3	Terminal strip: Earth (PE)

*Fig. 5:* Mains connection, Wilo-Control EC-L 3...

#### 6.5.3 Mains connection, pump



#### NOTICE

#### Rotating field, power supply and pump connection

The rotating field is routed from the mains connection directly to the pump connection. Check the required rotating field of the pumps to be connected (clockwise or counter-clockwise)! Observe the installation and operating instructions of the pumps.

#### Installation

3	Terminal strip: Earth (PE)
5	Contactor combination

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the contactor as per the connection diagram.

#### Fig. 6: Pump connection

#### 6.5.3.1 Adjust motor current monitoring



Fig. 7: Adjust motor current monitoring

#### 6.5.4 Connection, thermal motor monitoring



8

# NOTICE

Do not apply external voltage!

An external voltage which is applied destroys the component.

Potentiometer for motor current monitoring

ing. Here, the following values can be displayed via the menu:
Currently measured operating current of the pump (menu 4.29-4.31)
The set rated current of motor monitoring (menu 4.25 - 4.27)

Set the permissible rated current at the potentiometer after connecting the pump:
Set the rated current at full load, in accordance with what is stated on the rating plate.
At partial load, set the rated current 5 % above the current measured at the duty point.
Precise adjustment of motor current monitoring can be performed during commission-

One bimetallic strip thermal motor monitoring device can be connected to each connected pump. Do not connect a PTC sensor!

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the cover.** The "x" in the symbol states the respective pump:

- 1 = pump 1
- 2 = pump 2
- 3 = pump 3

 Fig. 8: Overview of connection symbol
 DANGER! Risk of explosion due to incorrect connection! If the connected pumps are used in potentially explosive atmospheres, observe the potentially explosive atmospheres section in the appendix!

6.5.5 Leakage detection connection



#### NOTICE

#### Do not apply external voltage!

An external voltage which is applied destroys the component.



Fig. 9: Overview of connection symbol

#### 6.5.6 Connection of signal transmitter for level control device



### NOTICE

Installation

1 = pump 1
2 = pump 2
3 = pump 3

not connect a float switch!

#### Do not apply external voltage!

spheres section in the appendix!

An external voltage which is applied destroys the component.

**cover.** The "x" in the symbol states the respective pump:

Level measurement can be performed with three float switches, a level sensor or a dynamic pressure bell. Level measurement with electrodes is not possible!

Leakage detection that uses a moisture probe can be connected for each pump. The threshold (< 30 kOhm) for a deactivation is permanently stored in the switchgear. Do

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the** 

DANGER! Risk of explosion due to incorrect connection! If the connected pumps are

used in potentially explosive atmospheres, observe the potentially explosive atmo-

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. For details on the terminal number, see the overview of connections in the cover.

#### Float switch

A max. of two pumps can be actuated if float switches are used for level measurement. The terminals are designated as follows:

off 1+2	Level, "All pumps Off"
on 6	Level, "Pump 1 On"
on 2	Level, "Pump 2 On"

DANGER! Risk of explosion due to incorrect connection! If the connected float switches are used in potentially explosive atmospheres, observe the potentially explosive atmospheres section in the appendix!

#### Level sensor

A max. of three pumps can be actuated if level sensors are used for level measurement. The connection value for the level sensor is 4 - 20 mA. **NOTICE! Observe the correct polarity of the level sensor! Do not connect active level sensors.** 

DANGER! Risk of explosion due to incorrect connection! If the connected level sensor is used in potentially explosive atmospheres, observe the potentially explosive atmospheres section in the appendix!



A max. of three pumps can be actuated if a dynamic pressure bell is used for level measurement. The pressure range for the dynamic pressure bell is 0 – 250 mBar.



*Fig. 10:* Overview of connection symbol



Fig. 11: Overview of connection symbol





- 3. Push the pressure hose onto the pressure connection as far as it will go.
- 4. Screw the union nut back onto the pressure connection and tighten it to fasten the pressure hose.

# 6.5.7 Connection of the NW16 level monitor

29 28 31

33 34



# NOTICE

#### Do not apply external voltage!

An external voltage which is applied destroys the component.

The level detection for **two** pumps can be performed using the NW16 level monitor. The level monitor has the following switching points:

- Pump 1 On/Off
- Pump 2 On/Off
- High water alarm

The level control corresponds to operation with separate float switches. The internal structure of the level monitor ensures hysteresis between the activation/deactivation level of the relevant pump.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram.

DANGER! Risk of explosion due to incorrect connection! The level monitor may not be installed in potentially explosive atmospheres!

*Fig. 13:* Connection diagram NW16 at the control EC-L 2x...

6.5.8 Connection dry-running protection/min. Water level with separate float switch



#### NOTICE

#### Do not apply external voltage!

An external voltage which is applied destroys the component.





*Fig. 14:* Overview of connection symbol

#### Dry-running protection ("drain" operating mode)

The dry-running level can also be monitored by a float switch:

- Open: Dry run
- Closed: No dry run

The terminals are fitted with a converter bridge at the factory. NOTICE! A separate dry-running protection system is recommended as an additional

NOTICE! A separate dry-running protection system is recommended as an additiona system safety measure.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Remove the converter bridge and connect the wires to the terminal strip according to the connection diagram. For details on the terminal number, see the overview of connections in the cover.

DANGER! Risk of explosion due to incorrect connection! If the connected float switch is used in potentially explosive atmospheres, observe the potentially explosive atmospheres section in the appendix!

 Open: min. water level Closed: water level sufficient



Fig. 15: Overview of connection symbol

#### 6.5.9 High water alarm connection with separate float switch



## NOTICE

#### Do not apply external voltage!

overview of connections in the cover.

Min. water level (operating mode "fill")

An external voltage which is applied destroys the component.

The minimum water level can also be monitored by a float switch:

The terminals are fitted with a converter bridge at the factory.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Remove the converter bridge and connect the wires to the terminal strip according to the connection diagram. For details on the terminal number, see the

The high water level can also be monitored by a float switch:

- Open: no high water alarm
- Closed: high water alarm

#### NOTICE! A separate signal transmitter for the high water level is recommended as an additional system safety measure.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. For details on the terminal number, see the overview of connections in the cover.

DANGER! Risk of explosion due to incorrect connection! If the connected float switch is used in potentially explosive atmospheres, observe the potentially explosive atmospheres section in the appendix!

# deactivation



An external voltage which is applied destroys the component.

Remote deactivation of all pumps can be performed using a separate switch: • Closed: Pumps enabled (terminals are fitted with a converter bridge at the factory)

• Open: All pumps off – The "Extern OFF" symbol appears on the display. If the alarm is activated in menu 5.39, in the "fill" operating mode, an audible alarm sounds in addition to the symbol appearing.

#### NOTICE! The remote deactivation has priority. All pumps are deactivated independently of the level measurement. Manual mode and forced switch-on of the pumps is not possible!

Insert the connection cable laid by the customer through the threaded cable connections and secure. Remove the converter bridge and connect the wires to the terminal strip according to the connection diagram. For details on the terminal number, see the overview of connections in the cover.

#### 6.5.11 Connection of a level actual value display

Fig. 17: Overview of connection symbol



#### NOTICE

#### Do not apply external voltage!

An external voltage which is applied destroys the component.







6.5.10 "Extern OFF" connection: Remote



## NOTICE

Do not apply external voltage!

Example:

cover.

provided for this at the output:
0 V = level sensor value "0"
10 V = level sensor upper limit

Display range: 0 – 2.5 m
Setting: 1 V = 0.25 m

- Level sensor measurement range: 0 - 2.5 m



Fig. 18: Overview of connection symbol

#### 6.5.12 Collective run signal (SBM) connection



#### DANGER

#### Risk of fatal injury due to an external electrical current source!

Activate the function in menu 5.07 to output the actual level value.

The actual level value is exported via a separate output. A voltage of 0 - 10 V is

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the** 

The power supply comes from an external source. This voltage is also present at the terminals when the main switch is switched off! There is a risk of fatal injury! The power supply must be disconnected from its source before commencing any work! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

A run signal is exported for all pumps (SBM) via a separate output:

- Contact: potential-free changeover contact
- Switching capacity: 250 V, 1 A

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the cover.** 

Fig. 19: Overview of connection symbol

#### 6.5.13 Collective fault signal connection (SSM)



#### DANGER

cover.

#### Risk of fatal injury due to an external electrical current source!

A fault message is output for all pumps (SSM) via a separate output:

Contact: potential-free changeover contact

Switching capacity: 250 V, 1 A

The power supply comes from an external source. This voltage is also present at the terminals when the main switch is switched off! There is a risk of fatal injury! The power supply must be disconnected from its source before commencing any work! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the** 







Fig. 20: Overview of connection symbol

#### 6.5.14 Individual run signal (EBM) connection



#### DANGER

#### Risk of fatal injury due to an external electrical current source!

The power supply comes from an external source. This voltage is also present at the terminals when the main switch is switched off! There is a risk of fatal injury! The power supply must be disconnected from its source before commencing any work! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

A run signal is output for each pump (EBM) via a separate output:

- Contact: potential-free NO contact
- Switching capacity: 250 V, 1 A

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the cover.** The "x" in the symbol states the respective pump:

- 1 = pump 1
- 2 = pump 2
- 3 = pump 3

Fig. 21: Overview of connection symbol

#### 6.5.15 Individual fault signal (ESM) connection



#### DANGER

1 = pump 1
2 = pump 2
3 = pump 3

NOTICE

#### Risk of fatal injury due to an external electrical current source!

A fault message is output for each pump (ESM) via a separate output:

**cover.** The "x" in the symbol states the respective pump:

The power supply comes from an external source. This voltage is also present at the terminals when the main switch is switched off! There is a risk of fatal injury! The power supply must be disconnected from its source before commencing any work! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the** 



*Fig. 22:* Overview of connection symbol

#### 6.5.16 Connecting an external alarm signal



#### Do not apply external voltage!

Contact: potential-free NC contact
Switching capacity: 250 V, 1 A

An external voltage which is applied destroys the component.



An external alarm signal (horn, flashing light, etc.) can be connected. The output is switched in parallel to the collective fault signal (SSM). Connection load: 24 V DC, max. 4 VA

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram. **For details on the terminal number, see the overview of connections in the cover.** 

NOTICE! Observe the correct polarity of the alarm signal!

*Fig. 23:* Overview of connection symbol

#### 6.5.17 Installing the rechargeable battery



# NOTICE

#### Mains-independent alarm

The alarm sounds as soon as the rechargeable battery is inserted. The alarm can only be switched off by removing the rechargeable battery again or by connecting the power supply.

By inserting a rechargeable battery, alarm signals will be emitted independent of the electricity network upon power failure. An audible, constant tone will be emitted as an alarm. Observe the following points for the use of a rechargeable battery:

- Rechargeable battery type: 9 V rectangular, Ni–MH
- To ensure trouble-free operation, the rechargeable battery must have been fully charged prior to insertion or have been charged for 24 h in the switchgear.
- The capacity of the rechargeable battery will fall if the ambient temperature drops. This reduces the running time of the rechargeable battery.

✓ Power supply is connected.

- ✓ Main switch in the "OFF" position!
- Place the rechargeable battery in the holder. See Overview of components, item 12
  [▶ 12].

WARNING! Do not insert any batteries! There is a risk of explosion! CAUTION! Observe the correct polarity!

- 2. Plug in the connection cable.
  - $\Rightarrow$  Alarm sounds!
- 3. Turn the main switch to the "ON" position.
  - $\Rightarrow$  Alarm off!
- ► Rechargeable battery installed.

#### 6.5.18 Connection ModBus RTU



#### NOTICE Do not apply external voltage!

An external voltage which is applied destroys the component.

The ModBus protocol is available for connection to a building management system. Observe the following points:

- Interface: RS485
- Field bus protocol settings: Menu 2.01 to 2.05.
- Terminate switchgear: Plug in jumper J2.
- If the ModBus requires a polarisation, plug in jumpers "J3" and "J4".

Item numbers, see Overview of components [▶ 12]		
9	ModBus: RS485 interface	
11	ModBus: Jumper for termination/polarisation	

DANGER

Insert the connection cable laid by the customer through the threaded cable connections and secure. Connect the wires to the terminal strip according to the connection diagram.

7 Operation



#### Risk of fatal injury due to electrical current!

Only operate the switchgear when closed. There is a risk of fatal injury from open switchgear! Electrical work on the internal components must be carried out by a qualified electrician.

7.1 How it works

In automatic mode, the pump is switched on and off depending on the water level. Once the first activation point has been reached, pump 1 switches on. Once the second activation point has been reached, pump 2 switches on after the activation delay has elapsed. A visual indicator appears on the LCD display and the green LED lights up during operation. Once the deactivation point has been reached, both pumps are switched off after the deactivation delay has elapsed. To optimise pump running times, pump cycling is carried out every time the pump is switched off.

In the event of a fault, automatic changeover to a fully-functional pump occurs and an alarm signal appears in the LCD display. Additionally, an audible alarm signal can be output via the internal buzzer. Furthermore, the outputs for the collective fault signal (SSM) and individual fault signal (ESM) are activated.

Once the dry run level is reached, all pumps are switched off (forced switch-off). Once the high water level is reached, all pumps are switched on (forced switch-on). An alarm signal is shown on the LCD display. Additionally, an audible alarm signal can be output via the internal buzzer. Furthermore, the output for the collective fault signal (SSM) is activated.

7.1.1 Priority when dry run and high water signals are present simultaneously

If the system malfunctions, it may happen that both signals are present at the same time. In this case, the priority is dependent upon the selected operating mode and thus the reaction of the switchgear:

- Operating mode "drain"
- 1. Dry-running protection
- 2. High water
- "Fill" operating mode
  - 1. Dry-running protection/low water (via "Extern OFF" input)
  - 2. High water
  - 3. Min. water level

7.1.2 Pump cycling

To prevent irregular running times of the individual pumps, general pump cycling takes place. This means that all pumps work alternately.

- 7.1.3 Forced switching of the pumps in case of dry run, min. water level or high water Operat
  - Forced switching depends on the selected operating mode: • High water level

**Operating mode "drain":** A **forced switch-on\*** of all pumps always occurs, irrespective of the signal transmitter used.

**Operating mode "fill":** A **forced switch-off** of all pumps always occurs, irrespective of the signal transmitter used.

Dry-running level
 Operating mode "drain": A forced switch-off of all pumps always occurs, irrespective of the signal transmitter used.

**Operating mode "fill":** Realise dry-running protection via the "Extern OFF" input.

 Min. water level
 Operating mode "fill": A forced switch-on\* of all pumps always occurs, irrespective of the signal transmitter used.

#### NOTICE! Forced switch-on

The following preconditions must be fulfilled so that a forced switch-on can be performed:

- Pumps are enabled (menu 3.01 to 3.04).
- The "Extern OFF" input is not active.

# 7.1.4 Operation with a defective level sensor

If the level sensor does not transfer a measured value (e.g. due to wire break, defective sensor), all pumps are switched off. Furthermore, the fault signal LED lights up and the collective fault signal is activated.

#### **Emergency operation**

NOTICE

NOTICE

• Operating mode "drain": High water level If the high water level is performed by a separate float switch, the system can continue running in emergency operation. The activation and deactivation points are defined by the hysteresis of the float switch.

• Operating mode "fill": Min. water level If the min. water level is monitored by a separate float switch, the system can continue running in emergency operation. The activation and deactivation points are defined by the hysteresis of the float switch.

#### 7.2 Operating modes



#### Changing the operating mode

To change the operating mode, deactivate all pumps: in Menu 3.01, select the value "OFF".



## Operating mode after power failure

Following a power failure, the switchgear will automatically start up in the last operating mode set.

The following operating modes are possible:

- drain
- ∎ fill

#### 7.2.1 "Drain" operating mode

The reservoir or pump chamber is drained. The pumps are activated when the level rises and switched off when the level falls. This control is mainly used for **water drainage**.

#### Level measurement with float switch

1	Pump 1 On
2	Pump 2 On
3	Pump 1 and 2 Off
4	Dry-running level
5	High water level

Up to a maximum of five float switches can be connected. This can be used to control two pumps:

- Pump 1 On
- Pump 2 On
- Pump 1 and 2 Off
- Dry-running level
- High water level

The float switch should be equipped with a NO contact: Once the switching point has been reached, the contact is closed.



*Fig. 24:* Illustration of the switching points with a float switch in the "drain" operating mode using the example of two pumps



#### Level measurement with level sensor or dynamic pressure bell

1	Pump 1 On
2	Pump 1 Off
3	Pump 2 On
4	Pump 2 Off
5	Dry-running level
6	High water level
7	High water level*
8	Dry-running level*
*Also realised via a separate float switch for increased operational reliability.	

A level sensor or dynamic pressure bell can be connected. This can be used to control three pumps:

- Pump 1 On/Off
- Pump 2 On/Off
- Pump 3 On/Off
- Dry-running level

Fig. 25: Illustration of the switching points with High water level a level sensor in the "drain" operating mode using the example of two pumps

#### 7.2.2 "Fill" operating mode



The reservoir is filled up, for instance, to pump water into a rainwater storage tank. The pumps are activated when the level falls and switched off when the level rises. This control is mainly used for water supply.

#### Level measurement with float switch

1	Pump On
2	Pump Off
3	High water level
4	Min. water level
5	Dry-running level in the well
Up to a maximum of five float switches can be connected. This can be used to control	

two pumps:

- Pump 1 On
- Pump 2 On
- Pump 1 and 2 Off
- Min. water level in the tank to be filled
- High water level

• Dry-running level in the well (separate float switch at the "Extern OFF" input)

The float switch should be equipped with a NO contact: Once the switching point has been reached, the contact is closed.

Fig. 26: Illustration of the switching points with a float switch in the "fill" operating mode using the example of one pump

#### Level measurement with level sensor or dynamic pressure bell



#### 7.3 Menu control



#### Fig. 28: Operating button function

- 7.4 Menu type: Main menu or Easy Actions menu
- There are two different menus.
- Main menu: Access to all settings for a complete configuration.
- Easy Actions menu: Quick access to certain functions.
  - Observe the following points when using the Easy Actions menu:
  - The Easy Actions menu only offers access to the selected functions. It is not possible to perform a complete configuration with this.
  - Perform an initial configuration to use the Easy Actions menu.
  - The Easy Actions menu is enabled at the factory. Note, the Easy Actions menu can be disabled in menu 7.06.

#### 7.5 Call up the menu

Call up the main menu

- 1. Press operating button for 3 seconds.
- ▶ Menu item 1.00 appears.

#### Call up the Easy Actions menu

- 1. Turn operating button 180°.
  - ⇒ The "Resetting error messages" or "Manual operation pump 1" function appears
- 2. Turn operating button an additional 180°.
- ▶ The other functions are shown. The main screen appears at the end.

7.6 Quick access to "Easy Actions" The following functions can be called up using the Easy Actions menu:

reset	Reset the current error message NOTICE! Menu point is only shown when an error is present!
® p ; XRnd	Manual operation pump 1 If the operating button is pressed, pump 1 runs. If the operating button is released, the pump switches off. The last set operating mode is active again.
P2 HRnd	<b>Manual operation pump 2</b> If the operating button is pressed, pump 2 runs. If the operating button is released, the pump switches off. The last set operating mode is active again.
P3 HRnd	Manual operation pump 3 If the operating button is pressed, pump 3 runs. If the operating button is released, the pump switches off. The last set operating mode is active again.
° <sub>P ¦</sub>	<b>Pump 1 switch off.</b>
oFF	Corresponds to the "off" value in menu 3.02.
°₽2 ₽₽ ₽₽	<b>Pump 2 switch off.</b> Corresponds to the "off" value in menu 3.03.
P∃	<b>Pump 3 switch off.</b>
oFF	Corresponds to the "off" value in menu 3.04.
© <sub>P ¦</sub>	Automatic mode, pump 1
RUEo	Corresponds to the "Auto" value in menu 3.02.
P2	<b>Automatic mode, pump 2</b>
RUEo	Corresponds to the "Auto" value in menu 3.03.
P3	<b>Automatic mode, pump 3</b>
RUEo	Corresponds to the "Auto" value in menu 3.04.

#### 7.7 Factory settings

To reset the switchgear to the factory settings, contact customer service.

- 8 Commissioning
- 8.1 Operator responsibilities
- Provide installation and operating instructions at the switchgear or at a place specially reserved for it.
- Make the installation and operating instructions available in a language the personnel can understand.
- Make sure that the installation and operating instructions are read and understood by all personnel.
- The installation site of the switchgear is overflow-proof.
- The switchgear must be properly fused and earthed.
- The signal transmitter must be installed and set in accordance with the system documentation.
- Observe the minimum water submersion of the connected pumps.
- Safety devices (incl. emergency off) of the entire system are switched on and checked for trouble-free operation.
- The switchgear is suitable for use under the specified operating conditions.

#### 8.2 Commissioning in explosive atmospheres

The switchgear may **not** be put into operation in potentially explosive atmospheres!



#### DANGER

# Risk of explosion if the switchgear is installed in potentially explosive areas!

The switchgear does not have its own explosion protection class and must always be installed outside of potentially explosive areas! The connection must be made by a qualified electrician.

#### 8.3 Connection of signal transmitters and pumps within potentially explosive atmospheres



## DANGER

#### **Risk of explosion due to incorrect connection!**

If pumps and signal transmitters are connected in explosive atmospheres, there is a risk of explosion due to incorrect connection. Observe the section on explosive atmospheres in the appendix!

#### 8.4 Activating the device



#### NOTICE

#### Error message during operation at the alternating current connection

The switchgear has a rotating field monitor and motor current monitor. Both monitoring functions only work trouble-free at the three-phase current connection and are activated at the factory. If the switchgear is used at an alternating current connection, the following error messages are shown in the display:

- · Rotating field monitoring: Error code "E006"
  - ⇒ Switching off rotating field monitoring: Select Menu 5.68, value "off"!
- Motor current monitoring: Error code "E080.x"
  - ⇒ Switching off the motor current monitoring: Select Menu 5.69, value "off"!
- Monitoring functions deactivated. The switchgear now works trouble-free at the alternating current connection.



### NOTICE

NOTICE

#### Observe the error code in the display

If the red fault LED lights up or flashes, observe the error code on the display! If the error has been confirmed, the previous error is stored in menu 6.01.



# Operating mode after power failure

Following a power failure, the switchgear will automatically start up in the last operating mode set.

- ✓ Switchgear is closed.
- $\checkmark$  Installation has been performed correctly.
- All signal transmitters and consumers are connected and installed in the operating space.
- $\checkmark$  If float switches are used, set the switching points correctly.
- ✓ Motor protection is preset according to the pump data.
- 1. Turn the main switch to the "ON" position.
- 2. Switchgear starts.
  - All LEDs light up for 2 s.
  - The display illuminates and the start screen appears.
  - The standby symbol appears in the display.

The switchgear is ready for operation, start the initial configuration or automatic mode.

#### Display with level sensor or dynamic pressure bell

1	Current pump status: – Number of registered pumps – Pumps activated/deactivated – Pumps On/Off
2	Set operating mode (e.g. drain)
3	Current water level in m
4	Standby: Switchgear is ready for operation.
5	Field bus active

#### Display with float switch

1	Current pump status: – Number of registered pumps – Pumps activated/deactivated – Pumps On/Off
2	Set operating mode (e.g. fill)
3	Switching state of the float switch
4	Standby: Switchgear is ready for operation.
5	Field bus active

Switching state of the float switch depending on the operating mode		
No.	drain	fill
3a	High water level	High water level
3b	Pump 2 On	Pump 1 and 2 Off
3c	Pump 1 On	Pump 1 On
3d	Pump 1 and 2 Off	Pump 2 On
3e	Dry-running level	Min. level (low water)

#### 8.5 Start initial configuration

Fig. 30: Start screen: Float switch

- Observe the following points during the configuration:
- If there is no input or operation for 6 minutes:
  - The display illumination is switched off.
  - The display shows the main screen again.
- Parameter input is locked.
- Some settings can only be changed when all pumps are off.
- The display illumination switches off automatically if not operated for one minute.
- The menu adapts automatically, based on the settings. Example: Menu 1.12 is only visible if the level sensor has been activated.
- The menu structure applies to all EC switchgears (e.g. EC-Lift, EC-Fire). This may lead to gaps in the menu structure.

As standard, the values are only displayed. To change values, the parameters in menu 7.01 must be enabled:

pressure bell

4`



Fig. 29: Start screen: Level sensor/dynamic



Fig. 31: Parameter input enabled



Fig. 32: Menu 5.01



Fig. 33: Menu 5.02



Fig. 34: Menu 5.03



*Fig. 35:* Menu 5.07

- ⇒ Menu item 1.00 appears
- 2. Turn the operating button until menu 7 appears.
- 3. Press the operating button.
  - ⇒ Menu 7.01 appears.
- 4. Press the operating button.
- 5. Change value to "on": Turn the operating button.
- 6. Save value: Press the operating button.
  - $\Rightarrow$  The menu is enabled and can be changed.
- 7. Turn the operating button until the end of menu 7 appears.
- 8. Press the operating button.
  - $\Rightarrow$  Back to the main menu level.
- ► Start initial configuration:
  - Menu 5: Basic settings
  - Menu 1: Switch-on/off values
  - Menu 2: Field bus connection (if applicable)
  - Menu 3: Enable pumps

#### Menu 5: Basic settings

Menu no.	5.01
Description	Operating mode
Value range	fill (fill), drain (drain)
Factory setting	drain

Menu no.	5.02
Description	Number of connected pumps
Value range	13
Factory setting	2

Menu no.	5.03
Description	Standby pump
Value range	on, off
Factory setting	off
Explanation	One pump can be used as the standby pump. This pump is not activated in normal operation. The standby pump is only activated in the event of pump failure due to a fault. The standby pump is subject to standstill monitoring. The standby pump is therefore activated during pump cycling and pump kick.
Menu no.	5.07
Description	Signal transmitter for level measurement
Value range	Float, Level, Bell, Opt01
Factory setting	Level
Explanation	Definition of the signal transmitters for level measurement: - Float = float switch - Level = level sensor - Bell = dynamic pressure bell - Opt01 = NW16 level monitor



*Fig. 36:* Menu 5.09



Fig. 37: Menu 5.39



*Fig. 38:* Menu 5.40



*Fig. 39:* Menu 5.41



*Fig. 40:* Menu 5.42

Menu no.	5.09
Description	Sensor measuring range
Value range	0.25 12.5 m
Factory setting	1.0 m

Menu no.	5.39
Description	Alarm signal with active "Extern OFF" input
Value range	off, on
Factory setting	off
Explanation	The pumps can be switched off using a separate signal transmitter via the "Extern OFF" input. This function over- rides all other switching points and all pumps are switched off. In the "fill" operating mode it can be determined how the alarm signal occurs in the event of an active input: – "off": The "Extern OFF" symbol appears on the LCD dis- play – "on": The "Extern OFF" symbol and the error code "E068" appears on the LCD display.
	In the "drain" operating mode, the factory setting cannot
	be changed:
Menu no.	5.40
Menu no. Description	5.40 Function "pump kick" On/Off
Menu no. Description Value range	5.40 Function "pump kick" On/Off off, on
Menu no. Description Value range Factory setting	5.40 Function "pump kick" On/Off off, on off
Menu no. Description Value range Factory setting Explanation	5.40 Function "pump kick" On/Off off, on off To prevent longer standstill times for the connected pumps, a periodical test run can be performed (pump kick function). If the pump kick function is activated, the fol- lowing menu items can be set: – Menu 5.41: Pump kick permitted in Extern OFF – Menu 5.42: Pump kick interval – Menu 5.43: Pump kick-running time
Menu no. Description Value range Factory setting Explanation Menu no.	5.40 Function "pump kick" On/Off off, on off To prevent longer standstill times for the connected pumps, a periodical test run can be performed (pump kick function). If the pump kick function is activated, the fol- lowing menu items can be set: – Menu 5.41: Pump kick permitted in Extern OFF – Menu 5.42: Pump kick interval – Menu 5.43: Pump kick-running time 5.41
Menu no. Description Value range Factory setting Explanation Menu no. Description	5.40         Function "pump kick" On/Off         off, on         off         To prevent longer standstill times for the connected         pumps, a periodical test run can be performed (pump kick         function). If the pump kick function is activated, the fol-         lowing menu items can be set:         - Menu 5.41: Pump kick permitted in Extern OFF         - Menu 5.42: Pump kick interval         - Menu 5.43: Pump kick-running time         5.41         "Pump kick" permitted in Extern OFF
Menu no. Description Value range Factory setting Explanation Menu no. Description Value range	5.40         Function "pump kick" On/Off         off, on         off         To prevent longer standstill times for the connected         pumps, a periodical test run can be performed (pump kick         function). If the pump kick function is activated, the fol-         lowing menu items can be set:         – Menu 5.41: Pump kick permitted in Extern OFF         – Menu 5.42: Pump kick interval         – Menu 5.43: Pump kick-running time         5.41         "Pump kick" permitted in Extern OFF         off, on

Menu no.	5.42
Description	"Pump kick interval"
Value range	1 336 h
Factory setting	24 h

Menu no.

Description



Menu no.	5.43
Description	"Pump kick running time"
Value range	0 60 s
Factory setting	5 s

en

#### *Fig. 41:* Menu 5.43



*Fig. 42:* Menu 5.44



#### *Fig. 43:* Menu 5.50



#### *Fig. 44:* Menu 5.51



#### Fig. 45: Menu 5.57



Fig. 46: Menu 5.58

Value range	0 180 s
Factory setting	3 s

Activation delay after power failure

5.44

Venu no.	5.50
Description	Dry-running level (drain)/min. water level (fill)
/alue range	0 12.5 m
Factory setting	0.15 m
Explanation	If the level is monitored with a separate float switch, <b>deac-</b> <b>tivate</b> the level sensor: <b>Enter the value "0.00 m".</b>

Menu no.	5.51
Description	High water level
Value range	0 12.5 m
Factory setting	0.46 m

Menu no.	5.57
Description	Max. running time per pump
Value range	0 60 min
Factory setting	0 min
Explanation	Maximum permissible running time of a pump. Once the time has been exceeded, the system switches to the next pump. After three change cycles, the collective fault signal (SSM) is activated. The setting "0 min" switches the running time monitoring off.
Menu no.	5.58
Description	Collective run signal (SBM) function
Value range	on, run
Factory setting	run
Explanation	"on": Switchgear ready for operation "Run": At least one pump is running.



Fig. 47: Menu 5.59



*Fig. 48:* Menu 5.62



*Fig. 49:* Menu 5.64



*Fig. 50:* Menu 5.65



#### *Fig. 51:* Menu 5.66



Fig. 52: Menu 5.67

Commissioning

Menu no.	5.59
Description	Collective fault signal (SSM) function
Value range	fall, raise
Factory setting	raise
Explanation	"fall": The relay is deactivated. Optionally, this function can be used for controlling the mains voltage supply. "raise": The relay is activated.
Manuna	F ( )
Menu no.	5.62
Description	Dry-running protection delay
Value range	0 180 s
Factory setting	0 s

Menu no.	5.64
Description	Ex-mode operation On/Off (only available in the "drain" operating mode!)
Value range	on, off
Factory setting	off
Explanation	If pumps and signal transmitters are connected in explosive atmospheres, additional requirements must be adhered to. DANGER! Risk of explosion due to incorrect configuration of the system! Observe the section on explosive atmo- spheres in the appendix!
Menu no.	5.65
Description	Automatic resetting of error "Dry run"
Value range	on, off
Factory setting	on

Menu no.	5.66
Description	Integrated buzzer On/Off
Value range	on, off
Factory setting	off

NOTICE! Alarm in the event of interrupted power supply: To switch off the internal buzzer if there is a built-in rechargeable battery, remove the battery!

Menu no.	5.67
Description	Output (24 V DC, max. 4 VA) for an external signalling unit On/Off
Value range	off, error
Factory setting	off



Menu no.	5.68
Description	Mains connection rotating field monitoring On/Off
Value range	on, off
Factory setting	on
NOTICE! Switch off during alternating current connection!	

Fig. 53: Menu 5.68



Fig. 54: Menu 5.69



*Fig. 55:* Menu 5.70

NOTICE! Switch off during alternating current connection!	
Factory setting	on
Value range	on, off
Description	Motor current monitoring On/Off
Menu no.	5.69

Menu no.	5.70
Description	Max. switching frequency per hour, per pump
/alue range	0 60
Factory setting	0
Explanation	If the max. number of starts has been exceeded, the collective fault signal (SSM) is activated. <b>Value "0" = function deactivated.</b>

#### Menu 1: Values for switching on and off

\*NOTICE! The menu items 1.12 to 1.17 are only visible if, in menu 5.07, the value "Level" or "Bell" have been set.

#### \*\*NOTICE! The actual value range is dependent on the setting in menu 5.09.

Menu no.	1.09
Description	Base-load pump switch-off delay
Value range	0 60 s
Factory setting	0 s



#### Fig. 56: Menu 1.09



Fig. 57: Menu 1.10



Fig. 58: Menu 1.11

Menu no.	1.10
Description	Activation delay, peak-load pump
Value range	0 30 s
Factory setting	3 s

Menu no.	1.11
Description	Switch-off delay peak-load pump
Value range	0 30 s
Factory setting	1 s



*Fig. 59:* Menu 1.12



*Fig. 60:* Menu 1.13



*Fig. 61:* Menu 1.14



*Fig. 62:* Menu 1.15



*Fig. 63:* Menu 1.16

Menu no.	1.12*
Description	Base-load pump On level
Value range**	0.06 12.5 m
Factory setting	0.40 m
Fundamentian	Operating mode "drain": Value must be 0.03 m <b>higher</b> than the "Base-load pump Off level" (menu 1.13).
	Operating mode "fill": Value must be 0.03 m <b>lower</b> than the "Base-load pump Off level" (menu 1.13).
Menu no.	1.13*
Description	Base-load pump Off level
Value range**	0.06 12.5 m
Factory setting	0.23 m
Evolution	Operating mode "drain": Value must be 0.03 m <b>lower</b> than the "Base-load pump On" level (menu 1.12).
Скрианаціон	Operating mode "fill": Value mandatory 0.03 m <b>higher</b> than the "Base-load pump On level" (menu 1.12).
Menu no.	1.14*
Description	Level peak-load pump 1 on
Value range**	0.06 12.5 m
Factory setting	0.42 m
Explanation	Operating mode "drain": The value must be 0.03 m <b>higher</b> than the "Peak-load pump 1 On" level (menu 1.15). The switch-on level must be <b>greater than/equal to</b> the switch-on level of the base-load pump (menu 1.12).
	Operating mode "fill": The value must be 0.03 m <b>lower</b> than the "Peak-load pump 1 Off" level (menu 1.15). The switch- on level must be <b>lower than/equal to</b> the switch-on level of the base-load pump (menu 1.12).
Menu no.	1.15*
Description	Peak-load pump 1 Off level
Value range**	0.06 12.5 m
Factory setting	0.25 m
Explanation	Operating mode "drain": Value mandatory 0.03 m <b>lower</b> than the "Peak-load pump 1 On" level (menu 1.14). The switch-off level must be <b>greater than/equal to</b> the switch-on level of the base-load pump (menu 1.13).
	Operating mode "fill": Value must be 0.03 m <b>higher</b> than the "Peak-load pump 1 On" level (menu 1.14). The switch- off level must be <b>lower than/equal to</b> the switch-off level of the base-load pump (menu 1.13).
Menu no.	1.16*
Description	Peak-load pump 2 On level
Value range**	0.06 12.5 m
Factory setting	0.42 m
Explanation	Operating mode "drain": The value must be 0.03 m <b>higher</b> than the "Peak-load pump 2 Off" level (menu 1.17). The switch-on level must be <b>greater than/equal to</b> the switch-on level of the peak-load pump (menu 1.14).
	Operating mode "fill": The value must be 0.03 m <b>lower</b> than the "Peak-load pump 2 Off" level (menu 1.17). The switch- on level must be <b>lower than/equal to</b> the switch-on level of the peak-load pump (menu 1.14).

Menu no.

Description

Value range

Factory setting



Fig. 64: Menu 1.17

Menu no.	1.17*
Description	Peak-load pump 2 Off level
Value range**	0.06 12.5 m
Factory setting	0.25 m
Explanation	Operating mode "drain": The value must be 0.03 m <b>lower</b> than the "Peak-load pump 2 On" level (menu 1.16). The switch-off level must be <b>greater than/equal to</b> the switch-off level of the peak-load pump (menu 1.15).
	Operating mode "fill": The value must be 0.03 m <b>higher</b> than the "Peak-load pump 2 On" level (menu 1.16). The switch-off level must be <b>lower than/equal to</b> the switch-off level of the peak-load pump (menu 1.15).

#### Menu 2: ModBus field bus connection

2.01

on, off

off

The switchgear is equipped with an RS485 interface for connection via ModBus RTU. Different parameters can be read and also changed to some extent via the interface. In this case, the switchgear works as a Modbus slave. An overview of individual parameters and a description of the data types used are shown in the appendix. To use the ModBus interface, the settings must be changed in the following menus:

ModBus RTU interface On/Off



Fig. 65: Menu 2.01



Fig. 66: Menu 2.02



#### Fig. 67: Menu 2.03



Menu no.2.04DescriptionParityValue rangenone, even, oddFactory settingeven

Fig. 68: Menu 2.04

Menu no.	2.02
Description	Baud rate
Value range	9600; 19200; 38400; 76800
Factory setting	19200

Menu no.	2.03
Description	Slave address
Value range	1 254
Factory setting	10





Fig. 69: Menu 2.05

Menu no.	2.05
Description	Number of stop bits
Value range	1; 2
Factory setting	1

#### Menu 3: Enable pumps

To operate the system, the operating mode must be set for each pump and the pumps enabled:

- At the factory, every pump is set to the "auto" operating mode.
- Automatic mode starts after the pumps have been enabled in menu 3.01.

#### NOTICE! Required settings for the initial configuration.

During the initial configuration, a direction of rotation check must be performed on the pumps and the motor current monitoring set exactly. The following settings must be made to perform the initial configuration:

- Switch off the pumps: Set to "off", menu 3.02 to 3.04.
- Enable pumps: Menu 3.01 set to "on".

Menu no.	3.02 3.04			
Description	Operating mode pump 1 Pump 3			
Value range	off, Hand, Auto			
Factory setting	Auto			
Explanation	off = pump switched off Hand = manual operation pump, as long as the button is pressed. Auto = level-control dependent automatic operation of the pump <b>NOTICE! For the initial configuration, change the value to</b>			
	"off"!			
Menu no.	3.01			
Description	Enable pumps			
Value range	on, off			
Factory setting	off			
Explanation	off = pumps are locked and cannot be started. NO- TICE! Manual operation or forced switch-on are also not possible! on = pumps are switched on/off, depending on the operat- ing mode set			

#### DANGER

#### Risk of fatal injury due to electrical current!

Only operate the switchgear when closed. There is a risk of fatal injury from open switchgear! Electrical work on the internal components must be carried out by a qualified electrician.

#### Show the current value of the motor current monitoring

- 1. Press the operating button for 3 s.
  - $\Rightarrow$  Menu 1.00 appears.
- 2. Turn the operating button until menu 4 appears.
- 3. Press the operating button.
  - $\Rightarrow$  Menu 4.01 appears.
- 4. Turn the operating button until menu 4.25 to 4.27 appears.



Fig. 70: Menu 3.02



Fig. 71: Menu 3.01

#### 8.5.1 Adjust motor current monitoring



- $\Rightarrow$  Menu 4.25: Show the set motor current for pump 1.
- $\Rightarrow$  Menu 4.26: Show the set motor current for pump 2.
- $\Rightarrow$  Menu 4.27: Show the set motor current for pump 3.
- Checked the current value of the motor current monitoring.
   Compare the set value to the specification on the rating plate. If the set value differs from the specification on the rating plate, adjust the value.

#### Adjust the motor current monitoring value

- $\checkmark$  Motor current monitoring settings checked.
- 1. Turn the operating button until menu 4.25 to 4.27 appears.
  - $\Rightarrow$  Menu 4.25: Show the set motor current for pump 1.
  - $\Rightarrow$  Menu 4.26: Show the set motor current for pump 2.
  - $\Rightarrow$  Menu 4.27: Show the set motor current for pump 3.
- 2. Open the switchgear.

DANGER! Risk of fatal injury due to electrical current! When working on open switchgear, there is a risk of fatal injury! All work must be carried out by a qualified electrician!

- 3. Correct the motor current at the potentiometer with a screwdriver (see Overview of components [▶ 12]). Read changes directly off the display.
- 4. Once all of the motor currents have been corrected, close the switchgear.
- Motor current monitoring set. Perform direction of rotation check.
- 8.5.2 Check the direction of rotation of the connected pumps



## NOTICE

#### Rotating field, power supply and pump connection

The rotating field is routed from the mains connection directly to the pump connection. Check the required rotating field of the pumps to be connected (clockwise or counter-clockwise)! Observe the installation and operating instructions of the pumps.

Perform a test run to check the direction of rotation of the pumps. CAUTION! Property damage! Perform the test run under the prescribed operating conditions.

- $\checkmark$  The switchgear is closed.
- ✓ Configuration of menu 5 and menu 1 complete.
- ✓ All pumps are switched off in menu 3.02 to 3.04: Value "off".
- ✓ The pumps are enabled in menu 3.01: Value "on".
- 1. Start Easy Actions menu: Turn the operating button 180°.
- Select the pump's manual operation mode: Turn the operating button until the menu item is displayed:
  - Pump 1: P1 Hand
  - Pump 2: P2 Hand
  - Pump 3: P3 Hand
- Start test run: Press the operating button. The pump runs until the operating button is released.
- Check the direction of rotation: Check the measured values for delivery head and volume flow.
  - ⇒ Incorrect direction of rotation: Exchange the two phases on the pump connection.
- Direction of rotation checked and corrected as necessary. The initial configuration is complete.

#### 8.6 Start automatic mode

#### Automatic mode after initial configuration

✓ The switchgear is closed.

- ✓ Configuration complete.
- $\checkmark$  Direction of rotation correct.
- $\checkmark$  Motor current monitoring set correctly.
- 1. Start Easy Actions menu: Turn the operating button 180°.
- 2. Select the pump for automatic mode: Turn the operating button until the menu item is displayed:
  - Pump 1: P1 Auto
  - Pump 2: P2 Auto
  - Pump 3: P3 Auto
- 3. Press the operating button.
  - ⇒ Automatic mode is set for the selected pump. Alternatively, setting can be performed in Menu 3.02 to 3.04.
- Automatic mode switched on. The pumps are switched on and off automatically, depending on the fill levels.

#### Automatic mode after decommissioning

- $\checkmark$  The switchgear is closed.
- ✓ Checked configuration.
- ✓ Parameter input enabled: Menu 7.01 shows on.
- 1. Press the operating button for 3 s.
  - $\Rightarrow$  Menu 1.00 appears.
- 2. Turn the operating button until menu 3.00 appears
- 3. Press the operating button.
- $\Rightarrow$  Menu 3.01 appears.
- 4. Press the operating button.
- 5. Change value to "on".
- 6. Press the operating button.
  - $\Rightarrow$  Value saved, pump enabled.
- Automatic mode switched on. The pumps are switched on and off automatically, depending on the fill levels.

8.7 During operation

During operation make sure the following points are observed:

- Keep the switchgear closed and secure it against unauthorised opening.
- Switchgear attached in an overflow-proof manner (protection class IP54).
- Not exposed to direct sunlight.
- Ambient temperature between -30 °C and +50 °C.

The following items of information are shown on the main screen:

- Pump status:
  - Number of registered pumps
  - Pump activated/deactivated
  - Pump On/Off
- Operation with standby pump
- Operating mode: fill or drain
- Current water level or switching state of the float switch
- Active field bus operation

Furthermore, the following information is available via menu 4:

- 1. Press the operating button for 3 s.
  - $\Rightarrow$  Menu 1.00 appears.
- 2. Turn the operating button until menu 4 appears.
- 3. Press the operating button.
- Menu 4.xx appears.

Current water level in m

	Current switching state of the float switch
<sup>∪</sup> ₀५,12 [] <sup>min</sup>	Switchgear running time The time* is stated depending on the unit, in minutes (min), hours (h) or days (d).
© ⋒५ ¦∃ [] <sup>min</sup>	Running time: Pump 1 The time* is stated depending on the unit in minutes (min), hours (h) or days (d). The display varies, depending on the timespan: 1 hour: Display in 0 59 minutes, unit: min 2 hours to 24 hours: Display in hours and minutes, separated by a decimal point, e.g. 10.59, unit: h 2 days to 999 days: Display in days and hours, separated by a decimal point, e.g. 123.7, unit: d From 1000 days: Display in days, unit: d
	Running time: Pump 2 The time* is stated depending on the unit in minutes (min), hours (h) or days (d).
	Running time: Pump 3 The time* is stated depending on the unit in minutes (min), hours (h) or days (d).
<sup>ს</sup> "ң ; ] ქ	Switchgear switching cycle
© ≜Ҷ 18 ╎	Switching cycles: Pump 1
(B	Switching cycles: Pump 2
&\_20 	Switching cycles: Pump 3
<u>ач</u> гг _3456	Serial number Display switches between the 1st and 2nd four digits.
₀423 €[-L	Switchgear type
®424 20 10	Software version
© %425	Set value for the motor current monitoring value: Pump 1 max. rated current in A
° ° 426 □□	Set value for the motor current monitoring value: Pump 2 max. rated current in A
а Ч2 <sup>0</sup> ПП	Set value for the motor current monitoring value: Pump 3 max. rated current in A
© @429 QQL3	Current rated current of pump 1 in A display changes between L1, L2 and L3 press and hold the operating button. The pump starts after 2 s of pumping operation until the operating button is released.
° ° 430 00L 3	Current rated current in A for pump 2 display changes between L1, L2 and L3 press and hold the operating button. The pump starts after 2 s of pumping operation until the operating button is released.

9.2



Current rated current in A for pump 3 display changes between L1, L2 and L3 press and hold the operating button. The pump starts after 2 s of pumping operation until the operating button is released.

#### 9 Shut-down

9.1 Personnel qualifications

Operator responsibilities

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.
- Observe locally applicable accident prevention and safety regulations of trade associations.
- Make sure that the personnel has had the corresponding training for the specified work.
- Train the personnel on how the system operates.
- When working in enclosed spaces, a second person must be present for safety reasons.
- Ensure enclosed spaces have sufficient ventilation.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!

9.3 Shut-down

To decommission the pumps, switch off the pump and switchgear at the main switch. The settings are stored retentively in the switchgear and are not deleted. This ensures that the switchgear is always ready for operation. During the standstill period, adhere to the following points:

- Ambient temperature: -30 ... +50 °C
- Humidity: max. 90 %, non-condensing
  - ✓ Parameter input enabled: Menu 7.01 shows on.
  - 1. Press the operating button for 3 s.
    - ⇒ Menu 1.00 appears.
  - 2. Turn the operating button until menu 3.00 appears
  - 3. Press the operating button.
    - ⇒ Menu 3.01 appears.
  - 4. Press the operating button.
  - 5. Change value to "off".
  - 6. Press the operating button.
    - $\Rightarrow$  Value saved, pump switched off.
  - 7. Turn the main switch to the "OFF" position.
  - 8. Secure the main switch against being switched on by unauthorised persons (e.g. lock main switch)
  - Switchgear switched off.

9.4 Removal



#### DANGER

#### Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

- $\checkmark$  Decommissioning performed.
- Mains connection is switched so that it is voltage-free and safeguarded against being activated by unauthorised persons.
- ✓ The power connection for fault and run signals is switched so that it is voltage-free and safeguarded against being activated by unauthorised persons.
- 1. Open the switchgear.
- 2. Disconnect all connection cables and pull them out through the threaded cable connection.
- 3. Close off the ends of the connection cables watertight.

- 4. Seal threaded cable connections watertight.
- 5. Support the switchgear (e.g. get a second person to help).
- Loosen the switchgear fastening screws and remove the switchgear from the structure.
- ► Switchgear removed. Observe the following for storage!

#### **10** Maintenance and repair



# DANGER

Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.



#### NOTICE

#### Unauthorised work or structural changes are prohibited!

Only maintenance and repair work described in this manual may be carried out. All other works and any alterations to the construction may only be carried out by the manufacturer.

#### 10.1 Maintenance intervals

**Maintenance tasks** 

10.2

#### Regular

Clean switchgear.

#### Annually

- Check electro-mechanical components for wear.
- After 10 years
- General overhaul

#### **Cleaning switchgear**

- ✓ Switch off switchgear.
- 1. Clean switchgear with a damp cotton cloth. Do not use any aggressive or scouring cleaners or fluids!

#### Check electro-mechanical components for wear

Get electro-mechanical components (e.g. contactor combinations) checked for wear by an electrician. If wear is ascertained, have the affected components replaced by an electrician or Wilo Customer Service.

#### General overhaul

During a general overhaul, all of the components, wiring and the housing are checked for wear. Defective or worn components are replaced.

The switchgear has an integrated maintenance interval indicator. Once the set interval has expired, "SER" on the main screen blinks. The next interval starts automatically by resetting the current interval. The function is disabled at the factory.

#### 10.3 Maintenance interval display



*Fig. 72:* Maintenance interval display

#### Activating the interval display

- ✓ Parameter input enabled: Menu 7.01 shows on.
- 1. Press the operating button for 3 s.
  - ⇒ Menu 1.00 appears.
- 2. Turn the operating button until menu 7 appears
- 3. Press operating button.
  - $\Rightarrow$  Menu 7.01 appears.
- 4. Turn the operating button until menu 7.07 appears.
- 5. Press the operating button.
- 6. Set the desired interval:
  - -0 = interval display off.
  - 0.25 = quarterly
  - -0.5 = six-monthly
  - 1 = annually
  - 2 = every two years
- 7. Press the operating button.
  - $\Rightarrow$  Value is saved.
- ► Interval display is activated.

#### Reset the maintenance interval

- $\checkmark$  The "SER" message flashes on the display.
- ✓ Parameter input enabled: Menu 7.01 shows on.
- 1. Press the operating button for 3 s.
- $\Rightarrow$  Menu 1.00 appears.
- 2. Turn the operating button until menu 7 appears
- 3. Press operating button.
  - $\Rightarrow$  Menu 7.01 appears.
- 4. Turn the operating button until menu 7.08 appears.
- 5. Press the operating button.
- 6. Change value to "on".
- 7. Press the operating button.
  - $\Rightarrow$  Display reset.
- Current maintenance interval reset, new maintenance interval started.

#### 11 Faults, causes and remedies



#### DANGER

#### Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

#### 11.1 Operator responsibilities

Fault indication

- Observe locally applicable accident prevention and safety regulations of trade associations.
- Make sure that the personnel has had the corresponding training for the specified work.
- Train the personnel on how the system operates.
- When working in enclosed spaces, a second person must be present for safety reasons.
- Ensure enclosed spaces have sufficient ventilation.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!

Possible faults are shown by the fault LEDs and alphanumeric codes on the display. Get the system checked according to the displayed fault and have defective components replaced. Faults are displayed in various ways:

• Fault in the control/on the switchgear:

11.2



Fig. 73: Activating the maintenance interval

*Fig. 74:* Reset the maintenance interval

- The red fault signal LED **lights up**.
- The error code is shown on the display and stored in the fault memory.
- The contact is activated for the collective fault signal.
- If the internal buzzer is activated, there is an audible alarm signal.
- Pump fault
- Status icon of the respective pump flashes on the display.

Switch off the alarm by pressing the operating button. Acknowledge the fault via the main menu or Easy Actions menu.

#### Main menu

- ✓ All faults rectified.
- 1. Press the operating button for 3 s.
  - ⇒ Menu 1.00 appears.
- 2. Turn the operating button until menu 6 appears.
- 3. Press the operating button.
  - ⇒ Menu 6.01 appears.
- 4. Press the operating button.
- 5. Change value to "reset": Turn the operating button.
- 6. Press the operating button.
- ► The fault indication is reset.

#### Easy Actions menu

- ✓ All faults rectified.
- 1. Starting the Easy Actions menu: Turn operating button 180°.
- 2. Select menu item "Err reset".
- 3. Press the operating button.
- ► The fault indication is reset.

#### Fault acknowledgement failed

If there are further faults, the faults are displayed as follows:

- The fault LED lights up.
- The error code of the last fault is shown in the display. All other faults can be called up from the fault memory.

If all faults have been rectified, acknowledge the faults again.

The switchgear stores the last ten faults in the fault memory. The fault memory works according to the first in/first out principle. The faults are displayed in descending order in the menu items 6.02 to 6.11:

- 6.02: the last/latest fault
- 6.11: the oldest fault

#### 11.5 Error codes

**Fault memory** 

11.4

11.3

 $(\mathbf{1})$ 

(2)

3

(5)

Fig. 75: Acknowledge fault

Fault acknowledgement

Code	Fault	Cause	Remedy
E006	Rotating field error	Mains connection faulty, incorrect rotating field	Establish a clockwise rotating field at the mains connection. In case of an alternating current connection, deactivate rotating field monit- oring!
E014.x	Leakage detection	The moisture probe of the connec- ted pump was tripped.	See the installation and operating instructions of the connected pump
E040	Fault, level sensor	No connection to the sensor	Check the connection cable and sensor, replace the defective component.

Code	Fault	Cause	Remedy
E062	Operating mode "drain": Dry-running protection active**	Dry–running level reached	Check inlet and system parameters. Check that the float switch is working correctly, replace the defective component.
E062	Operating mode "fill": Min. water level active**	Min. water level, below minimum value	Check inlet and system parameters. Check that the float switch is working correctly, replace the defective component.
E066	High water alarm active	High water level reached	Check inlet and system parameters. Check that the float switch is working correctly, replace the defective component.
E068	Extern OFF active	The "Extern OFF" contact is active, the active contact is defined as alarm	Check the connection of the "Extern OFF" con- tact as per the current connection diagram.
E080.x	Fault pump**	No feedback from the correspond- ing contactor, bimetallic strip or ex- cess current tripped.	Check functionality of pump. Check that the motor has sufficient cooling. Check the set rated current. Contact customer service.
E085.x	Pump running time monitoring***	Maximum running time of the pump exceeded	Check the operating parameters (inlet, switch- ing points). Check that other pumps function.
E090	Plausibility error	Float switches are in incorrect se- quence	Check the installation and connections of the float switch.
E140.x	Pump starts exceeded***	The max. number of pump starts has been exceeded	Check the operating parameters (inlet, switch- ing points). Check that other pumps function.
E141.x	Pump running time monitoring***	Maximum running time of the pump exceeded	Check the operating parameters (inlet, switch- ing points). Check that other pumps function.
		Key:	

\*"x" = info on the relevant pump to which the fault shown refers.

\*\* Fault must be **manually** acknowledged in ex-mode!

\*\*\* Fault must be **generally manually** acknowledged.

**11.6** Further steps for troubleshooting

If the points listed here do not rectify the fault, please contact customer service. Costs may be incurred if other services are used. For more details, please contact customer service.

- 12 Disposal
- 12.1 Rechargeable battery

Rechargeable batteries do not belong in domestic waste and must be removed before the product is disposed of. End consumers are legally obliged to return all used rechargeable batteries. To this end, you can return used rechargeable batteries free of charge at municipal collection points or specialist dealers.



## Disposal in domestic waste is forbidden!

Affected rechargeable batteries are marked with this symbol. The identifier for the heavy metal they contain is displayed beneath the graphic:

- Hg (mercury)
- Pb (lead)

NOTICE

• Cd (cadmium)

#### 12.2 Information on the collection of used electrical and electronic products

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



#### NOTICE

#### Disposal in domestic waste is forbidden!

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

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

- Only hand over these products at designated, certified collecting points.
- Observe the locally applicable regulations!

Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal. Further recycling information at www.wilo-recycling.com.

#### 13 Appendix

13.1 Potentially explosive atmospheres: Connection of signal transmitters and pumps



#### DANGER

Risk of explosion if the switchgear is installed in potentially explosive areas The switchgear does not have its own explosion protection class and must always be installed outside of potentially explosive areas! The connection must be made by a qualified electrician. 13.1.1 Fx-zones The connected pumps and signal transmitters may only be used in the ex-zones 1 and 2. Use in ex-zone 0 is prohibited! 13.1.2 Pumps comply with the ignition protection class "flameproof enclosure". Pumps Connect pumps directly to the switchgear. The use of electronic start-up controllers is prohibited! Connect monitoring devices outside of the flameproof enclosure via a cut-off relay (Ex-i, intrinsically safe circuit). 13.1.3 Signal transmitter Connect signal transmitters inside explosive atmospheres via an ex cut-off relay or a Zener barrier (intrinsically safe circuit)! 13.1.4 Connection, thermal motor monitoring Connect the bimetallic strip to the terminal strip for active ex-mode (see Overview of components [> 12], item 4b). For details on the terminal number, see the overview of connections in the cover. The "x" in the symbol states the respective pump.

Fig. 76: Overview of connections, terminal layout

#### 13.1.5 Dry-running protection connection



#### DANGER! Risk of explosion due to incorrect execution! Monitoring of the dry-running level must be performed with a separate float switch!

Connect the float switch to the terminal strip for active ex-mode (see Overview of components [> 12], item 4b). For details on the terminal number, see the overview of connections in the cover.

Fig. 77: Overview of connections, terminal layout

#### 13.1.6 Switchgear configuration: Switching on ex-mode

#### Adapted functions

- Ex-mode adapts the following functions:
- Follow-up times
  - All follow-up times are ignored and the pumps switched off immediately!
- Dry-running level (by level sensor or dynamic pressure bell) The pumps can first be switched on again once the "All pumps Off" fill level has been exceeded!
- Alarm dry-running protection (via float switch) Alarm manual reset (anti-reactivation lock)!
- Alarm thermal motor monitoring Alarm manual reset (anti-reactivation lock)!

#### Activating ex-mode

- 1. Press the operating button for 3 s.
  - ⇒ Menu 1.00 appears.
- 2. Turn the operating button until menu 5 appears.
- 3. Press the operating button.
  - ⇒ Menu 5.01 appears.
- 4. Turn the operating button until menu 5.64 appears.
- 5. Press the operating button.
- 6. Change value to "on": Turn the operating button.
- 7. Press the operating button.
- Ex-mode switched on.

#### 13.2 System impedances

3~400	V 7-	nole	direct	starting
		<b>P010</b> ,		o cui ciii g

3~400 V, 2-pole, direct starting							
Power in kW	System impedance in ohms	Connections/h					
2.2	0.257	12					
2.2	0.212	18					
2.2	0.186	24					
2.2	0.167	30					
3.0	0.204	6					
3.0	0.148	12					
3.0	0.122	18					
3.0	0.107	24					
4.0	0.130	6					
4.0	0.094	12					

3~400 V, 2-pole, direct starting						
Power in kW	System impedance in ohms	Connections/h				
4.0	0.077	18				

13.3 Overview of the symbols

Sym- bol	Description
( <b>1</b> )	Standby: Symbol lights up: The switchgear is switched on and ready for operation. Symbol flashes: Follow-up time of pump 1 active
ſ	Value input not possible: 1. Input disabled 2. The accessed menu is only a value display.
$\bigcirc$	Pumps ready for operation/deactivated: Symbol lights up: Pump is available and ready for operation. Symbol flashes: Pump is deactivated.
	Pumps work/fault: Symbol lights up: Pump is in operation. Symbol flashes: Pump fault
$\bigcirc / \bigcirc$	A pump has been determined as the standby pump.
	Operating mode: "drain"
	Operating mode: "fill"
	High water level reached
	Operating mode "drain": Dry-running level too low
<u></u>	Operating mode "fill": Level for low water too low
$\sim$	Input "Extern OFF" active: All pumps switched off
4	There is at least one current (unacknowledged) error message.
$\Leftrightarrow$	The device communicates using a field bus system.

13.4 Terminal diagram overview

## Wiring diagram EC-L1... and EC-L2...

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Terminal	Function	Terminal	Function
2/3	Output: Individual run signal pump 1	31/32	Input: "Pump 2 on" float switch
4/5	Output: Individual fault signal pump 1	33/34	Input: "High water" float switch
8/9	Output: Individual fault signal pump 2	37/38	Input: Thermal winding monitor pump 1
10/11	Output: Individual run signal pump 2	39/40	Input: Thermal winding monitor pump 2
13/14/15	Output: Collective run signal	41/42	Output: Analogue output for displaying the actual level value
16/17/18	Output: Collective fault signal	45/46	Input: Level sensor 4 – 20 mA
19/20	Output: Power output	49/50	Input: Leakage detection pump 1
21/22	Input: Extern OFF	51/52	Input: Leakage detection pump 2
25/26	Input: "Dry-running protection" float switch	55/56	Input: "Dry-running protection" float switch (ex-mode)
27/28	Input: "All pumps off" float switch	57/58	Input: Thermal winding monitor pump 1 (ex-mode)
29/30	Input: "Pump 1 on" float switch	59/60	Input: Thermal winding monitor pump 2 (ex-mode)

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Terminal di	a <mark>g</mark> ram	EC-L3
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Terminal	Function	Terminal	Function
1/2	Output: Power output	33/34	Input: "All pumps off" float switch
3/4	Output: Individual run signal pump 1	35/36	Input: "Pump 1 on" float switch
5/6	Output: Individual run signal pump 2	37/38	Input: "Pump 2 on" float switch
7/8	Output: Individual run signal pump 3	39/40	Input: "High water" float switch
11/12	Output: Individual fault signal pump 1	41/42	Input: Level sensor 4 – 20 mA
13/14	Output: Individual fault signal pump 2	47/48	Output: Analogue output for displaying the actual level value
15/16	Output: Individual fault signal pump 3	63/64	Input: Leakage detection pump 1
17/18/19	Output: Collective run signal	65/66	Input: Leakage detection pump 2
20/21/22	Output: Collective fault signal	67/68	Input: Leakage detection pump 3
23/24	Input: Thermal winding monitor pump 1	75/76	Input: "Dry-running protection" float switch (ex-mode)
25/26	Input: Thermal winding monitor pump 2	77/78	Input: Thermal winding monitor pump 1 (ex-mode)
27/28	Input: Thermal winding monitor pump 3	79/80	Input: Thermal winding monitor pump 2 (ex-mode)
29/30	Input: Extern OFF	81/82	Input: Thermal winding monitor pump 3 (ex-mode)
31/32	Input: "Dry-running protection" float switch		

#### 13.5 ModBus: Data types

Data type	Description
INT16	Integers in the range from –32768 to 32767. The number range actually used for a data point may be different.
UINT16	Unsigned integers in the range from 0 to 65535. The number range actually used for a data point may be different.
ENUM	Is a list. Only values listed in the parameters can be set.

Data type	Description
BOOL	Boolean value is a parameter with exactly two states (0 — false and 1 — true). Generally, all values greater than zero are classified as true.
BITMAP*	Is an array of 16 Boolean values (bits). Values are indexed from 0 to 15. The number read from or written to the register is the sum of all bits with value 1 multiplied by 2 to the power of its index. Bit 0: $2^0 = 1$ Bit 1: $2^1 = 2$ Bit 2: $2^2 = 4$ Bit 3: $2^3 = 8$ Bit 4: $2^4 = 16$ Bit 5: $2^5 = 32$ Bit 6: $2^6 = 64$ Bit 7: $2^7 = 128$ Bit 8: $2^8 = 256$ Bit 9: $2^9 = 512$ Bit 10: $2^{10} = 1024$ Bit 11: $2^{11} = 2048$ Bit 12: $2^{12} = 4096$ Bit 13: $2^{13} = 8192$ Bit 14: $2^{14} = 16384$ Bit 15: $2^{15} = 32768$ every 0
BITMAP32	Is an array of 32 Boolean values (bits). The calculation details can be found in the description for Bitmap.

\* Example for clarification:

Bit 3, 6, 8, 15 are 1 all others are 0. The sum is then  $2^3+2^6+2^8+2^{15} = 8+64+256+32768 = 33096$ . The other way round is also possible. Based on the bit with the highest index, check whether the read number is greater than/equal to the power of two. If this is the case, bit 1 is set and the power of two is deducted from the number. Then the check with the bit with the next lower index and the recently calculated residual number is repeated until bit 0 is obtained for bit or the residual number is zero. Example for clarification: The read number is 1416. Bit 15 will be 0, since 1416 < 32768. Bit 14 to 11 will also be 0. Bit 10 will be 1, since 1416 > 1024. The remainder will be 1416-1024=392. Bit 9 will be 0, since 392 < 512. Bit 8 will be 1 since 392 > 256. The remainder will be 392-256=136. Bit 7 will be 1 since 136 > 128. The remainder will be 136-128=8. Bit 6 to 4 will be 0. Bit 3 will be 1 since 8=8. The remainder will be 0. Residual bits will thus be 2 to 0.

13.6 ModBus: Parameter overview

Holding register (Protocol)	Name	Data type	Scale & unit	Elements	Access	Added
40001 (0)	Version communica- tion profile	UINT16	0.001		R	31.000
40002 (1)	Wink service	BOOL			RW	31.000
40003 (2)	Switch box type	ENUM		0. SC 1. SCFC 2. SCe 3. CC 4. CCFC 5. CCe 6. SCe NWB 7. CCe NWB 8. EC 9. ECe 10. ECe NWB	R	31.000
40014 (13)	Bus command timer	ENUM		0. – 1. Off 2. Set 3. Active 4. Reset 5. Manual	RW	31.000

#### Appendix

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Holding register (Protocol)	Name	Data type	Scale & unit	Elements	Access	Added
40015 (14)	Drives on/off	BOOL			RW	31.000
40025 (24)	Control mode	ENUM		0. p-c 1. dp-c 2. dp-v 3. dT-c 4. dT-v 5. n(TV) 6. n(TR) 7. n(TP) 8. n(TA) 9. n-c 10. fill 11. empty/drain 12. FTS 13. cleans/day 14. cleans/ month	R	31.000
40026 (25)	Current value	INT16	0.1 bar 0.1 m 0.1 K 0.1 °C 1 cm 1 min 0.1 h 0.1 psi		R	31.000
40041 (40)	Pump 1 mode	ENUM		0. Off 1. Hand 2. Auto	RW	31.000
40042 (41)	Pump 2 mode	ENUM		0. Off 1. Hand 2. Auto	RW	31.000
40043 (42)	Pump 3 mode	ENUM		0. Off 1. Hand 2. Auto	RW	31.000
40062 (61)	Switch box state	ΒΙΤΜΑΡ		0: SBM 1: SSM	R	31.000
40139 - 40140 (138-139)	Error state	BITMAP32		0: Sensor error 1: P man 2: P min 3: FC 4: TLS 5: Pump 1 Alarm 6: Pump 2 Alarm 7: Pump 3 Alarm 8: Pump 4 Alarm 9: Pump 5 Alarm 10: Pump 6 Alarm 11: - 12: - 13: Frost 14: Battery Low 15: High water 16: Priority off 17: Redundancy 18: Plausibility 19: Slave com- munication 20: Net supply 21: Leakage	R	31.000

en

Holding register (Protocol)	Name	Data type	Scale & unit	Elements	Access	Added
40141 (140)	Acknowledge	BOOL			W	31.000
40142 (141)	Alarm history index	UINT16			RW	31.000
40143 (142)	Alarm history error code	UINT16	0.1		R	31.000
40198 (197)	State float swiches	BITMAP		0: DR 1: Ps off 2: P1 on 3: P2 on 4: HW	R	31.102
40204 (203)	Set points water level 1	UNIT16	1 cm		RW	31.102
40205 (204)	Set points water level 2	UNIT16	1 cm		RW	31.102
40206 (205)	Set points water level 3	UNIT16	1 cm		RW	31.102
40212 (211)	Set points water level 1	UNIT16	1 cm		RW	31.102
40213 (212)	Set points water level 2	UNIT16	1 cm		RW	31.102
40214 (213)	Set points water level 3	UNIT16	1 cm		RW	31.102
40220 (219)	Dry run level	UNIT16	1 cm		RW	31.102
40222 (221)	High water level	UNIT16	1 cm		RW	31.102





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