

Circulator / High-efficiency Drinking Water  
Pump

## CalioTherm S

### Installation/Operating Manual



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Installation/Operating Manual CalioTherm S

Original operating manual

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## Glossary

**Discharge line**

The pipeline which is connected to the discharge nozzle

**Pump**

Machine without drive, additional components or accessories

**Pump set**

Complete pump set consisting of pump, drive, additional components and accessories

**Suction lift line/suction head line**

The pipeline which is connected to the suction nozzle

## 1 General

### 1.1 Principles

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

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

The name plate indicates the type series and size as well as the main operating data. They uniquely identify the pump (set) and serve as identification for all further business processes.

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

### 1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, Page 9)

### 1.3 Other applicable documents


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

Document	Contents
Sub-supplier product literature	Operating manual

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










### 1.4 Symbols

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

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

## 1.5 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
	<b>DANGER</b> This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
	<b>WARNING</b> This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
	<b>CAUTION</b> This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	<b>General hazard</b> In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	<b>Electrical hazard</b> In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	<b>Machine damage</b> In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.
	<b>Warning: Strong magnetic field</b> In conjunction with one of the signal words this symbol indicates a hazard involving magnetic fields and identifies information about protection against magnetic fields.
	<b>Warning for persons with pacemaker</b> In conjunction with one of the signal words this symbol indicates a hazard involving magnetic fields and identifies special information for persons with a pacemaker.
	<b>Warning about hot surfaces</b> In conjunction with one of the signal words this symbol indicates a hazard involving hot surfaces.



## 2 Safety

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

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

### 2.1 General

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

### 2.2 Intended use

- The pump (set) must only be operated in the fields of application and within the use limits specified in the other applicable documents.
- Only operate pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the minimum flow rate and maximum flow rate indicated in the data sheet or product literature (e.g. to prevent overheating, cavitation damage, bearing damage).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

#### 2.2.1 Prevention of foreseeable misuse

- Observe all safety information and instructions in this manual.
- Never exceed the permissible application and operating limits specified in the data sheet or product literature regarding pressure, temperature, etc.



### 2.3 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the equipment this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

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

Training on the pump (set) must always be supervised by technical specialist personnel.

This device may be operated by **children** from the age of 8 as well as by persons of limited physical, sensory or mental abilities or lacking experience and knowledge, provided that they are supervised, they have been instructed on how to use this device safely and they understand the hazards it presents. It is impermissible for **children** to play with this device. **Children** must not clean the device or perform any **service work to be carried out by the operator** at the device without supervision.

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

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

### 2.5 Safety awareness

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

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

### 2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If stopping the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

## 2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energised).
- The pump (set) must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual. (⇒ Section 6.3.2, Page 29)
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 25)

## 2.8 Unauthorised modes of operation

Never operate the pump (set) outside the limits stated in the data sheet and in this operating manual.


The warranty relating to the operating reliability and safety of the pump (set) supplied is only valid if the equipment is used in accordance with its intended use.

### 3 Transport/Storage/Disposal



#### 3.1 Checking the condition upon delivery

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

#### 3.2 Transport

	<div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Improper pump transport</b> Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never suspend the pump/pump set from the power cable.</li> <li>▷ Prevent the pump (set) from getting knocked or dropped.</li> </ul>
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#### 3.3 Storage/preservation

	<div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Damage during storage due to humidity, dirt or vermin</b> Corrosion/contamination of pump (set)!</p> <ul style="list-style-type: none"> <li>▷ For outdoor storage cover the pump (set) and accessories with waterproof material and protect against condensation.</li> </ul>
	<div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Wet, contaminated or damaged openings and connections</b> Leakage or damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Clean and cover pump openings and connections as required prior to putting the pump into storage.</li> </ul>

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.

- Store the pump (set) in a dry, protected room where the atmospheric humidity is as constant as possible.

If properly stored indoors, the equipment is protected for a maximum of 12 months. New pumps/pump sets are supplied by our factory duly prepared for storage.

For storing a pump (set) which has already been operated, observe the instructions in (⇒ Section 6.3.2, Page 29) .

**Table 4:** Ambient conditions for storage

Ambient condition	Value
Relative humidity	80 % maximum
Ambient temperature	0 °C to + 40 °C




- Well-ventilated
- Dry
- Dust-free
- Shock-free
- Vibration-free

### 3.4 Return to supplier

1. Prior to returning the product to the supplier, flush and clean it, particularly if it has been used in noxious, explosive, hot or other hazardous fluids.
2. If the product has been used in fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the product must also be neutralised and treated with anhydrous inert gas to ensure drying.
3. Always complete and enclose a certificate of decontamination when returning the product.  
Indicate any safety measures and decontamination measures taken.

	<p><b>NOTE</b></p> <p>If required, a blank certificate of decontamination can be downloaded from the following web site: <a href="http://www.ksb.com/certificate_of_decontamination">www.ksb.com/certificate_of_decontamination</a></p>
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### 3.5 Disposal

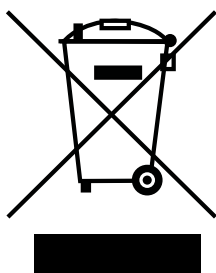
 	<p><b>⚠ DANGER</b></p> <p><b>Strong magnetic field in the pump rotor area</b>            Danger of death for persons with pacemaker!            Interference with magnetic data carriers, electronic devices, components and instruments!            Uncontrolled magnetic attraction forces between magnet-equipped components, tools or similar!</p> <p>▷ Keep a safety distance of at least 0.3 m.</p>
	<p><b>⚠ WARNING</b></p> <p><b>Fluids handled, consumables and supplies which are hot and/or pose a health hazard</b>            Hazard to persons and the environment!</p> <p>▷ Collect and properly dispose of flushing fluid and any fluid residues.            ▷ Wear safety clothing and a protective mask if required.            ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</p>

1. Dismantle the pump (set).  
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
  - Metals
  - Plastics
  - Electronic waste
  - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

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

Contact your local waste disposal partner for returns.

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



## 4 Description of the Pump (Set)

### 4.1 General description

- High-efficiency circulator pump for drinking water applications / foodstuff applications
- Non-self-priming in-line pump with integrated permanent magnet synchronous motor
- Pump for handling clean, non-aggressive fluids which are not chemically and mechanically aggressive to the pump materials

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

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

### 4.3 Designation

Example: CalioTherm S

Table 5: Designation key

Code	Description
CalioTherm S	Type series

### 4.4 Name plate

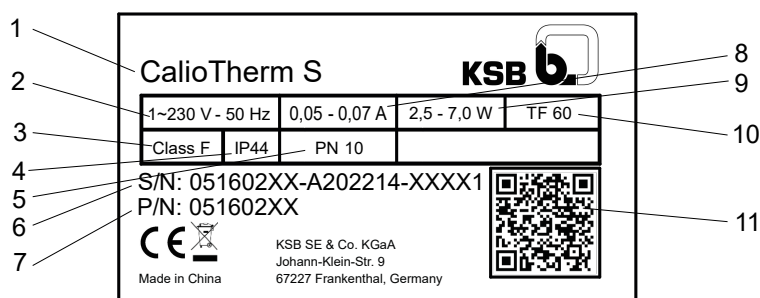


Fig. 1: Name plate (example)

1	Type series, size	7	Material number
2	Supply voltage, frequency	8	Current input
3	Thermal class	9	Power input
4	Enclosure	10	Temperature class
5	Pressure class	11	QR code
6	Production number		

Key to the production number

Example: 051602XX-A202214-XXXX1

Table 6: Key to the production number

Code	Description
051602XX	Material number
2022	Year of production
14	Week of production
XXXX1	Consecutive number

## **4.5 Design details**

### **Design**

- Maintenance-free high-efficiency wet rotor pump (glandless)

### **Drive**

- High-efficiency permanent magnet synchronous motor, brushless, self-cooling
- 1~230 V AC +/- 10%
- Frequency 50 Hz
- Enclosure IP44
- Thermal class F
- Temperature class TF 60
- Interference emissions EN 55014-1, EN 61000-3-2, EN 61000-3-3
- Interference immunity EN 55014-2

### **Bearings**

- Product-lubricated special plain bearing

### **Connections**

- Screw-ended

### **Operating modes**

- Open-loop control via setpoint setting

### **Automatic functions**

- Detection of pump rotor blockages
- Soft start (limitation of starting current)
- Full motor protection with integrated trip electronics

### **Manual functions**

- Setting the speed level

### **Signalling functions and display functions**

- LED indicators for speed level and error codes (3 flashing LEDs)

#### 4.6 Configuration and function

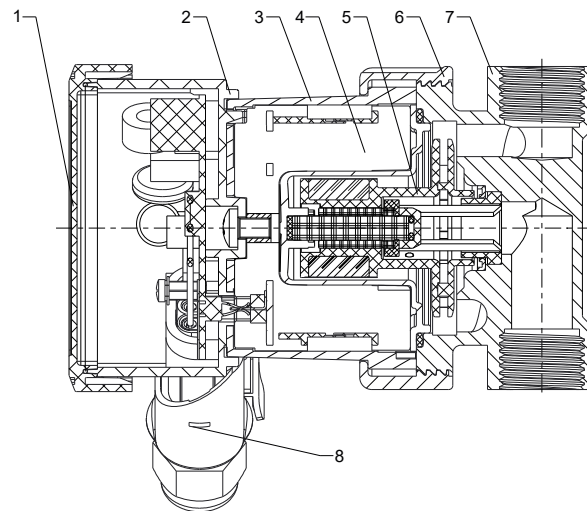


Fig. 2: Illustration of the pump set

1	Control panel (1 control button, LED display)	5	Pump rotor
2	Electronic system housing	6	Union nut
3	Motor housing	7	Pump casing
4	Stator	8	Plug-type connector for power supply

**Design** The pump is designed with a radial fluid inlet (suction nozzle) and a radial fluid outlet (discharge nozzle) arranged on the same axis. The impeller is rigidly connected to the pump rotor (5). Mechanical sealing is not required as the rotating assembly is completely isolated from the stator winding. The rotating assembly is lubricated and cooled by the fluid handled. The lubricating system ensures smooth running and a long service life.

**Function** The fluid enters the pump via the suction nozzle and is accelerated outward in a cylindrical flow by the rotating impeller. In the flow passage of the pump casing (7) the kinetic energy of the fluid is converted into pressure. The fluid is pumped to the discharge nozzle, where it leaves the pump.

### 4.7 Noise characteristics

Average sound pressure level  $\leq 40$  dB (A)

### 4.8 Scope of supply

Depending on the model, the following items are included in the scope of supply:

- Pump set
- Thermal insulation shell
- 2 fitted plugs preventing the ingress of foreign matter
- Plug-type connector to power supply
- Installation/operating manual

### 4.9 Dimensions and weight

For dimensions and weights please refer to the type series booklet of the pump (set).




### 4.10 Accessories

- Timer
- Screw-on set with integrated lift check valve and shut-off valve



## 5 Installation at Site

### 5.1 Safety regulations







	<div data-bbox="507 315 683 360">  <b>DANGER</b> </div> <p><b>Installation in potentially explosive atmospheres</b> Explosion hazard!</p> <ul style="list-style-type: none"> <li>▷ Never install the pump in potentially explosive atmospheres.</li> <li>▷ Observe the information given in the data sheet and on the name plates of the pump system.</li> </ul>
	<div data-bbox="507 593 639 627"> <b>CAUTION</b> </div> <p><b>Improper installation of the pump set</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Observe the permissible ambient conditions and the pump set's type of enclosure.</li> <li>▷ Observe the permissible ambient temperatures. Ambient temperatures &lt; 0 °C are not permitted.</li> <li>▷ In the event of outdoor installation, fit a protective roof to protect the pump set from the weather (e. g. sun, rain, snow).</li> </ul>

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

Before beginning with the installation check the following:

- All structural work required has been checked and prepared in accordance with the dimensions in the outline drawing.
- The data on the name plate of the pump set has been checked. The pump set must be suitable for operation on the available power supply network. (⇒ Section 4.4, Page 13)
- The fluid to be handled matches the description of suitable fluids.

### 5.3 Installing the pump set

	<div data-bbox="507 232 683 282"><b>! DANGER</b></div> <p><b>Leakage at the pump</b> Leakage of hot fluids!</p> <ul style="list-style-type: none"> <li>▸ Fit the sealing elements and make sure they are positioned correctly.</li> </ul>
	<div data-bbox="507 441 639 479"><b>CAUTION</b></div> <p><b>Fluid entering the electronic system housing</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▸ Install the pump set with the pump shaft in a horizontal position. Connect the piping without transmitting any stresses and strains.</li> <li>▸ Never install the pump set with the electronic system housing pointing upwards or downwards.</li> </ul>
	<div data-bbox="507 743 639 781"><b>CAUTION</b></div> <p><b>Air entering the pump</b> Damage to vertically installed pump sets whose direction of flow is downwards!</p> <ul style="list-style-type: none"> <li>▸ Fit a vent valve at the highest point of the suction line.</li> </ul>
	<div data-bbox="507 952 587 990"><b>NOTE</b></div> <p>Installing shut-off valves upstream and downstream of the pump set is recommended. Make sure that no leakage drips onto the pump set.</p>
	<div data-bbox="507 1108 587 1146"><b>NOTE</b></div> <p>The direction of flow of a vertically installed pump should be upwards.</p>
	<div data-bbox="507 1265 587 1303"><b>NOTE</b></div> <p>Do not install the pump at the lowest point of the system to prevent any impurities from collecting in the pump.</p>

#### Permissible installation positions



Fig. 3: Permissible installation positions





### Installing the pump

1. Position the pump set as indicated in an easily accessible place.  
⇒ An arrow on the pump casing indicates the direction of flow.
2. Accurately insert the sealing element.
3. Connect the pump set and piping with a pipe union.
4. Tighten the pipe union hand-tight with a suitable tool.
5. Accurately insert the sealing element in the opposite pipe union.
6. Tighten the pipe union hand-tight with a suitable tool.

### Installing a pump with screw-on set



- ✓ The screw-on set (accessories) is available.
1. Screw the part of the screw-on set with the integrated shut-off valve hand-tight into the suction nozzle of the pump set.
  2. Screw the part of the screw-on set with the integrated lift check valve hand-tight into the discharge nozzle of the pump set.
  3. Position the pump set as indicated in an easily accessible place.  
⇒ An arrow on the pump casing indicates the direction of flow.
  4. Accurately insert the sealing element.
  5. Connect the pump set and piping with a pipe union.
  6. Tighten the pipe union hand-tight with a suitable tool.
  7. Accurately insert the sealing element in the opposite pipe union.
  8. Tighten the pipe union hand-tight with a suitable tool.

### 5.4 Connecting the piping

	<div style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Hot surface</b> Risk of burns</p> <ul style="list-style-type: none"> <li>▷ Never touch a pump set when it is in operation.</li> </ul>
	<div style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Impermissible loads acting on the pump nozzles</b> Risk of burns by hot fluids escaping!</p> <ul style="list-style-type: none"> <li>▷ Do not use the pump as an anchorage point for the piping.</li> <li>▷ Anchor the pipes in close proximity to the pump and connect them without transmitting any stresses or strains.</li> <li>▷ Take appropriate measures to compensate for thermal expansion of the piping.</li> </ul>
	<div style="background-color: #f4d03f; padding: 5px;"><b>CAUTION</b></div> <p><b>Contamination/dirt in the piping</b> Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Flush the piping prior to commissioning or replacing the pump. Remove any foreign matter.</li> </ul>
	<div style="background-color: #2980b9; color: white; padding: 5px;"><b>NOTE</b></div> <p>Installing check and shut-off elements in the system is recommended, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.</p>

- ✓ Suction lift lines have been laid with a rising slope, suction head lines with a downward slope towards the pump.
  - ✓ The nominal sizes of the piping are equal to or greater than the nominal sizes of the pump nozzles.
  - ✓ The piping has been anchored in close proximity to the pump and connected without transmitting any stresses or strains.
1. Thoroughly clean, flush and blow through all vessels, piping and connections (especially of new installations).





### 5.5 Fitting the enclosure/insulation




	<p><b>⚠ WARNING</b></p> <p><b>The pump takes on same temperature as the fluid handled</b> Risk of burns!</p> <p>▷ Insulate the pump casing. Fit protective equipment.</p>
	<p><b>CAUTION</b></p> <p><b>Heat build-up at motor housing and electronic system housing</b> Pump overheating!</p> <p>▷ Do not insulate the motor housing and electronic system housing.</p>

✓ The supplied thermal insulation shell is available.

1. Fit the supplied thermal insulation shell to the pump casing.

### 5.6 Electrical connection

	<p><b>⚠ DANGER</b></p> <p><b>Electrical connection work by unqualified personnel</b> Danger of death from electric shock!</p> <p>▷ Always have the electrical connections installed by a trained and qualified electrician.</p> <p>▷ Observe the EN 61557 regulations as well as any regional regulations.</p>
	<p><b>⚠ DANGER</b></p> <p><b>Work performed on an energised plug-type connector</b> Danger of death from electric shock!</p> <p>▷ Switch off the supply voltage at least 5 minutes prior to commencing work and ensure that it cannot be switched on again unintentionally.</p>
	<p><b>⚠ DANGER</b></p> <p><b>Pump acting as a generator when running in reverse</b> Danger to life from hazardous induction voltage at the motor terminals!</p> <p>▷ Prevent the fluid from flowing back by closing the shut-off elements.</p>
	<p><b>⚠ DANGER</b></p> <p><b>Heat damage to the cable sheath</b> Danger from electric shock!</p> <p>▷ Make sure the cables are never laid in contact with hot casings/housings or pipelines.</p>

	<div data-bbox="504 192 683 237">  <b>DANGER</b> </div> <p><b>Incorrect connection to the mains</b>            Danger to life from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Observe the technical specifications of the local energy supply companies.</li> <li>▷ The core cross-section has to be at least <math>3 \times 0.75 \text{ mm}^2</math>.</li> <li>▷ Use a slow acting C-type circuit breaker with a nominal current of at least <math>1.4 \times</math> the nominal current of the pump set. For the nominal current see name plate.</li> <li>▷ The power cable has to be fitted with an all-pole isolating switch with a minimum contact opening of 3 mm. A shockproof plug must not be used.</li> <li>▷ If the power cable for the device is damaged, have it replaced by the manufacturer, a customer service technician or a similarly qualified person. See EN 60335-1.</li> </ul>
	<div data-bbox="504 678 587 712"><b>NOTE</b></div> <p>Using a permanently installed power cable of type H05VV-F 3G1.5 or similar is recommended.</p>

**Residual current device** Using a universal AC/DC sensitive residual current device to DIN VDE 0160 is recommended. Conventional residual current devices might either fail to trip or trip erroneously.

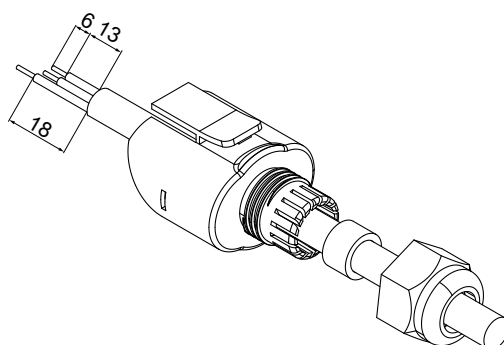
Discharge current per pump < 3.5 mA

### 5.6.1 Connecting the power cable

**Table 7:** Power cable dimensions

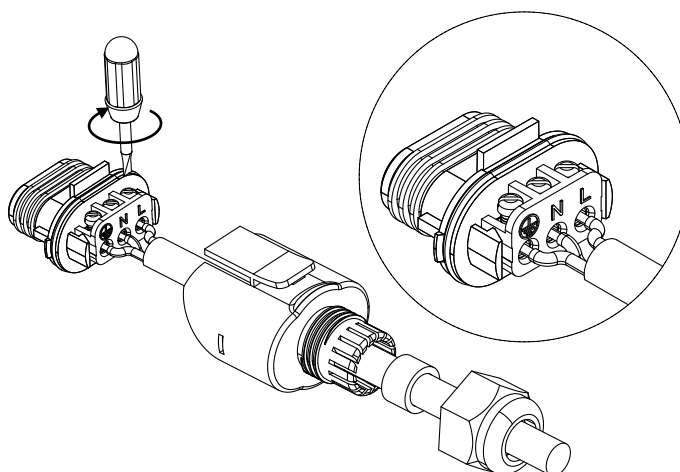
Power cable dimensions	Values
Outside diameter	5,5 - 8,0 mm
Cross-section	0,75 - 1,5 mm <sup>2</sup> (solid or stranded <sup>1)</sup> )

1. Verify the supply voltage at the site against the data on the name plate.
2. Switch off the power supply and make sure it cannot be switched on again unintentionally.
3. Fit the union nut and joint ring on the power cable.
4. Guide the power cable through the plug housing until the cable ends are freely accessible.
5. Strip the power cable as shown in the illustration.  
Strip about 18 mm of the earth conductor sheath. Strip about 13 mm of the neutral conductor sheath and L conductor sheath.  
Strip 6 mm of each core's sheath as a minimum.



**Fig. 4:** Stripping the power cable [mm]

6. Connect the cores at the contact insert.

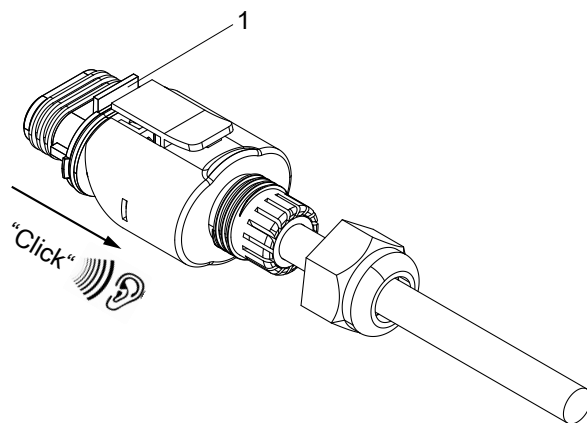


**Fig. 5:** Connecting the cores at the contact insert

L	Conductor / phase (230 V)
N	Neutral conductor
⏚	Earth conductor

7. Slide the contact insert into the plug housing until you can hear it engage.  
Make sure the projection is positioned correctly.

<sup>1</sup> Fit wire end sleeves on stranded / flexible electric cables.



**Fig. 6:** Fastening the contact insert to the plug housing

1	Projection
---	------------

8. Screw the union nut and joint ring onto the thread at the plug housing.  
Tightening torque = 1 Nm
9. Connect the plug-type connector at the pump set.



## 6 Commissioning/Start-up/Shutdown



### 6.1 Commissioning/Start-up

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

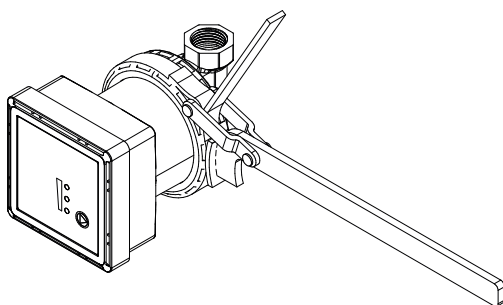
Before commissioning/starting up the pump set, make sure that the following conditions are met:

- The pump set has been properly connected to the power supply and is equipped with all protection devices. (⇒ Section 5.6, Page 21)
- The system piping has been cleaned. (⇒ Section 5.4, Page 20)

#### 6.1.2 Priming and venting the pump

	<div style="background-color: #e67e22; color: white; padding: 5px;"><b>! DANGER</b></div> <p><b>Moisture in the electrical connection area</b> Short circuit in the pump!</p> <p>▷ De-energise the pump.</p>
	<div style="background-color: #f1c40f; color: black; padding: 5px;"><b>CAUTION</b></div> <p><b>Increased wear due to dry running</b> Damage to the pump set!</p> <p>▷ Never operate the pump set without liquid fill.</p> <p>▷ Never close the shut-off element in the suction line and/or supply line during pump operation.</p> <p>▷ Observe the specified minimum pressure for operating the pump set.</p> <p>▷ Always operate the pump set within the permissible operating range.</p>





1. Prime the system with the fluid to be handled. Vent the system. If necessary, vent the system via the pump set.
2. Loosen the union nut with a belt wrench.  
⇒ The system is vented.



**Fig. 7: Loosening and tightening the union nut**


3. Carefully open the inlet line until water escapes from the pump set.
4. Tighten the union nut with a belt wrench. Tightening torque = 30 Nm.
5. Repeat the procedure until all air has escaped.

### 6.1.3 Commissioning/start-up


	<div data-bbox="507 230 683 275"><b>! DANGER</b></div> <p><b>Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and discharge lines closed.</b> Hot fluids escaping!</p> <ul style="list-style-type: none"> <li>▷ Never operate the pump with the shut-off elements in the suction line and/or discharge line closed.</li> <li>▷ Only start up the pump set against a slightly or completely open discharge-side shut-off element.</li> </ul>
	<div data-bbox="507 566 683 611"><b>! DANGER</b></div> <p><b>Excessive temperatures due to insufficient lubrication of shaft seal</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Never operate the pump set without liquid fill.</li> <li>▷ Prime the pump as per operating instructions.</li> <li>▷ Always operate the pump within the permissible operating range.</li> </ul>
	<div data-bbox="507 857 702 902"><b>! WARNING</b></div> <p><b>Hot surfaces (pump and piping take on the temperature of the fluid handled).</b> Risk of burns!</p> <ul style="list-style-type: none"> <li>▷ Do not touch hot surfaces.</li> <li>▷ Use appropriate personal protective equipment.</li> </ul>
	<div data-bbox="507 1104 638 1149"><b>CAUTION</b></div> <p><b>Abnormal noises, vibrations, temperatures or leakage</b> Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Switch off the pump (set) immediately.</li> <li>▷ Eliminate the causes before returning the pump set to service.</li> </ul>

- ✓ The system piping has been cleaned.
- ✓ The system has been vented and primed with the fluid to be handled.
- ✓ The priming lines and venting lines have been closed.
  1. Fully open the shut-off elements in the suction line.
  2. Open the shut-off elements in the discharge line.
  3. Start up the pump set.

## 6.2 Operating limits

	<b>⚠ DANGER</b>
	<p><b>Non-compliance with operating limits for pressure, temperature, fluid handled and speed</b></p> <p>Hot fluids escaping!</p> <ul style="list-style-type: none"> <li>▸ Comply with the operating data indicated in the data sheet.</li> <li>▸ Avoid prolonged operation against a closed shut-off element.</li> <li>▸ Never operate the pump at product temperatures exceeding those specified in the data sheet or on the name plate.</li> </ul>

### 6.2.1 Ambient temperature

	<b>CAUTION</b>
	<p><b>Operation outside the permissible ambient temperature</b></p> <p>Damage to the pump (set)!</p> <ul style="list-style-type: none"> <li>▸ Observe the specified limits for permissible ambient temperatures.</li> </ul>


The maximum permissible ambient temperature is +40 °C.

### 6.2.2 Minimum inlet pressure

The indicated values are applicable up to 300 m above sea level. For installation at altitudes > 300 m, an allowance of 0.01 bar / 100 m must be added.

The minimum inlet pressure is 0.4 bar.


### 6.2.3 Maximum operating pressure

	<b>CAUTION</b>
	<p><b>Permissible operating pressure exceeded</b></p> <p>Damage to connections and seals!</p> <ul style="list-style-type: none"> <li>▸ Never exceed the operating pressure specified in the data sheet.</li> </ul>


The maximum operating pressure is 10 bar.

## 6.2.4 Fluid handled

### 6.2.4.1 Permissible fluids to be handled

	CAUTION
	<p><b>Unsuitable fluids</b> Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use the pump to handle corrosive, combustible or explosive fluids.</li> <li>▷ Never use the pump to handle waste water or abrasive fluids.</li> <li>▷ Do not use the pump for foodstuff applications.</li> </ul>
<ul style="list-style-type: none"> <li>▪ Drinking water and water for the food and beverage industry, as per German TrinkwV 2001 drinking water regulations</li> </ul>	

### 6.2.4.2 Fluid temperature


	CAUTION
	<p><b>Incorrect fluid temperature</b> Damage to the pump (set)!</p> <ul style="list-style-type: none"> <li>▷ Only operate the pump (set) within the temperature limits indicated.</li> </ul>

**Table 8:** Temperature limits of the fluid handled

Permissible fluid temperature	Value
Maximum	+65 °C
Minimum	+5 °C


### 6.3 Shutdown

#### 6.3.1 Shutdown

	<p><b>NOTE</b></p> <p>If the discharge line is equipped with a non-return or check valve, the shut-off element may remain open provided that the system conditions and system regulations are considered and observed.</p>
---	--

- ✓ The shut-off element in the suction line is and remains open.
- 1. Close the shut-off element in the discharge line.
- 2. Switch off the pump set.

#### For prolonged shutdown periods

	<p><b>CAUTION</b></p> <p><b>Risk of freezing during prolonged pump shutdown periods</b></p> <p>Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Drain the pump and the cooling/heating chambers (if any) or otherwise protect them against freezing.</li> </ul>
---	---

- 1. Close the shut-off element in the suction line.

#### 6.3.2 Measures to be taken for shutdown


##### The pump (set) remains installed

- ✓ Sufficient fluid is supplied for the functional check run of the pump.
- 1. For prolonged shutdown periods, start up the pump (set) regularly between once a month and once every three months for approximately five minutes.
  - ⇒ This will prevent the formation of deposits within the pump and the pump intake area.

##### The pump (set) is removed from the pipe and stored

- ✓ The pump has been drained properly (⇒ Section 8.2, Page 32) and the safety instructions for dismantling the pump have been observed.
- 1. Observe any additional instructions and information provided. (⇒ Section 3, Page 11)

#### 6.4 Returning to service

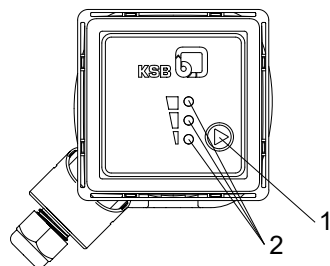
	<p><b>WARNING</b></p> <p><b>Failure to re-install or re-activate protective devices</b></p> <p>Risk of injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> <li>▷ As soon as the work is completed, properly re-install and re-activate any safety-relevant devices and protective devices.</li> </ul>
---	--

For returning the equipment to service, observe the sections on commissioning/start-up (⇒ Section 6.1, Page 25) and the operating limits (⇒ Section 6.2, Page 27) .

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 8, Page 31)

## 7 Operation

### 7.1 Control panel



**Fig. 8:** Control panel

1	Control button	2	LED speed level indicators
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### 7.2 Operating modes

#### 7.2.1 Open-loop control mode

##### Function


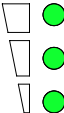
In Open-loop Control operating mode the pump runs at a set speed. The speed can be set to one of three speed levels using the control button.

The current speed level is indicated by the LEDs.

### 7.3 Functions

#### 7.3.1 Fault messages

**Table 9:** Fault messages

Error code	Cause	Response
Upper LED indicator flashes 5 times, pump attempts re-start. 	The pump rotor is blocked.	Remove any contamination from the system. Deblock the pump rotor. (⇒ Section 8.1, Page 31)
All LED indicators are flashing. 	Excessive temperature Electronic system error	Reduce the system temperature. Disconnect the power supply. Re-connect it after 1 minute. Replace the pump set or contact KSBservice.

## 8 Servicing/Maintenance

### 8.1 Servicing/inspection



#### NOTE

Any repairs on the pump must only be performed by one of our authorised service partners.  
Find your contact in the attached Addresses booklet or visit <https://www.ksb.com/en-global/contact>.

The pump set is almost maintenance-free.  
If the pump set has not been in operation for a prolonged period of time or if the system is severely contaminated, the pump rotor can become blocked.

#### Deblocking

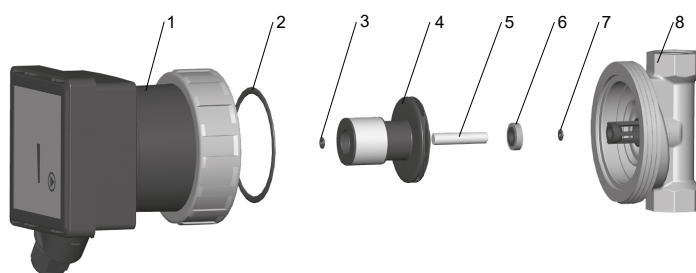


Fig. 9: Dismantling / reassembling the pump set

1	Electronic system housing, motor housing	5	Pump shaft
2	O-ring	6	Thrust collar with rubber support
3	O-ring	7	O-ring
4	Rotor unit	8	Pump casing

1. Undo the union nut of the pump set with a belt wrench and remove the electronic system housing.

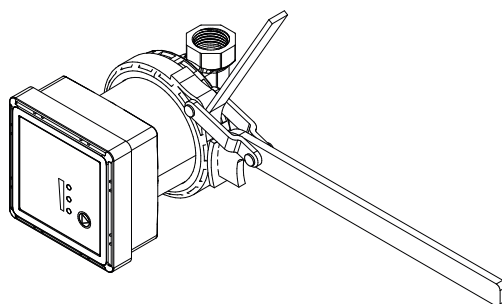




Fig. 10: Loosening and tightening the union nut

2. Unblock the rotor. Clean the pump set if necessary.
3. Reassemble the pump set. Take care to position the thrust collar with rubber support (6) correctly.
4. Fit the electronic system housing and tighten the union nut with a belt wrench. Tightening torque = 30 Nm.

After maintenance work and inspection have been completed, proceed with the section on Returning to service (⇒ Section 6.4, Page 29) .







**8.2 Drainage/cleaning**



	 <b>WARNING</b>
	<p><b>Fluids handled, consumables and supplies which are hot and/or pose a health hazard</b></p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"><li>▸ Collect and properly dispose of flushing fluid and any fluid residues.</li><li>▸ Wear safety clothing and a protective mask if required.</li><li>▸ Observe all legal regulations on the disposal of fluids posing a health hazard.</li></ul>

1. Flush and clean the pump before transporting it to the workshop.
2. Provide a certificate of decontamination for the pump.





### 8.3 Removing the pump set

	<p><b>⚠ DANGER</b></p> <p><b>Pump acting as a generator when running in reverse</b>            Danger to life from hazardous induction voltage at the motor terminals!</p> <ul style="list-style-type: none"> <li>▷ Prevent the fluid from flowing back by closing the shut-off elements.</li> </ul>
	<p><b>⚠ DANGER</b></p> <p><b>Work performed on an energised plug-type connector</b>            Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Switch off the supply voltage at least 5 minutes prior to commencing work and ensure that it cannot be switched on again unintentionally.</li> </ul>
 	<p><b>⚠ DANGER</b></p> <p><b>Strong magnetic field in the pump rotor area</b>            Danger of death for persons with pacemaker!            Interference with magnetic data carriers, electronic devices, components and instruments!            Uncontrolled magnetic attraction forces between magnet-equipped components, tools or similar!</p> <ul style="list-style-type: none"> <li>▷ Keep a safety distance of at least 0.3 m.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Strong magnetic field</b>            Danger of crushing injuries when pulling out the pump rotor!            Strong magnetic field can suddenly pull the pump rotor back into its original position!            Danger of magnetic parts near the pump rotor being attracted!</p> <ul style="list-style-type: none"> <li>▷ The pump rotor must be removed from the electronic system housing by authorised specialist personnel only.</li> <li>▷ Remove any magnetic parts from the vicinity of the rotor.</li> <li>▷ Keep the assembly area clean.</li> <li>▷ Keep a safety distance of at least 0.3 m from electronic components.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Hot surface</b>            Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>

	<p><b>CAUTION</b></p> <p><b>Strong magnetic field in the pump rotor area</b> Interference with magnetic data carriers, electronic devices, components and instruments! Uncontrolled magnetic attraction forces between magnetic components, tools or similar!</p> <ul style="list-style-type: none"> <li>▷ The rotor must generally be removed from the electronic system housing by authorised specialist personnel only.</li> <li>▷ Remove any magnetic parts from the vicinity of the pump rotor.</li> <li>▷ Keep the assembly area clean.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Strong magnetic field</b> Negative impact on or damage to electrical devices!</p> <ul style="list-style-type: none"> <li>▷ The pump rotor must be removed from the electronic system housing by authorised specialist personnel only.</li> </ul>

- ✓ The pump set has been de-energised and secured against unintentional start-up.
  - ✓ The pump has cooled down to ambient temperature.
  - ✓ A container for collecting the fluid has been positioned underneath the pump set.
1. Close the shut-off elements.
  2. Disconnect the discharge nozzle and suction nozzle from the piping.
  3. Depending on the pump size / motor size, remove the supports from the pump set.
  4. Remove the complete pump set from the piping.

## 9 Trouble-shooting

	<div style="background-color: #f4a460; padding: 5px; margin-bottom: 5px;">  <b>WARNING</b> </div> <p><b>Improper work to remedy faults</b></p> <p>Risk of injury!</p> <ul style="list-style-type: none"> <li>▸ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.</li> </ul>
---	--

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

- A** Pump is running, but does not deliver
- B** Pump does not start up or pump running irregularly
- C** Pump running but not delivering water.
- D** Noises during pump operation
- E** Shown on the display

**Table 10:** Trouble-shooting

A	B	C	D	E	Possible cause	Remedy <sup>2)</sup>
<b>X</b>	-	-	-	-	Pump not connected to power supply	<ul style="list-style-type: none"> <li>▪ Check the fuses. Check the connection to the power supply.</li> <li>▪ If applicable, disconnect the pump from the power supply and re-connect it (voltage re-set)</li> </ul>
-	<b>X</b>	-	-	<b>X</b>	<ul style="list-style-type: none"> <li>▪ Impurities in the pump</li> <li>▪ See Error messages. (⇒ Section 7.3.1, Page 30)</li> </ul>	(⇒ Section 8.1, Page 31)
-	<b>X</b>	-	-	<b>X</b>	<ul style="list-style-type: none"> <li>▪ Blockage in the pump</li> <li>▪ See Error messages. (⇒ Section 7.3.1, Page 30)</li> </ul>	(⇒ Section 8.1, Page 31)
-	-	<b>X</b>	-	-	<ul style="list-style-type: none"> <li>▪ Shut-off elements closed</li> <li>▪ If the part of the screw-on set (accessory) with integrated shut-off valve has been fitted, the shut-off valve is closed.</li> </ul>	Open the shut-off elements / the integrated shut-off valve (if applicable).
-	-	-	<b>X</b>	-	Pump power output too high	Select a lower speed level.
-	-	-	<b>X</b>	-	System pressure too low	Increase the system pressure by filling more water into the boiler.
-	-	<b>X</b>	<b>X</b>	-	Air in the system	Vent the pump (vent plug) and system.
-	-	-	<b>X</b>	-	Pump running dry	Prime the pump.

<sup>2)</sup> Release pump set pressure before attempting to remedy faults on parts which are subjected to pressure.

## 10 EU Declaration of Conformity

Manufacturer:

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

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

The manufacturer herewith declares that **the product:**

### CalioTherm S

**From serial number: xxxxxxxx-A202220-00001**

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
  - 2006/42/EC Machinery Directive  
(The safety objectives set out in the 2014/35/EU EC Directive on Low-voltage Equipment are observed.)
  - 2011/65/EU: Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)
  - 2014/30/EU: Electromagnetic Compatibility (EMC)

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - EN 809: 1998+A1:2009/AC:2010
  - EN 55014-1:2006+A1:2009+A2:2011
  - EN 55014-2:1997+A1:2001+A2:2008+AC:1997
  - EN 60335-1:2012+AC:2014+A11:2014+A13:2017+A1:2019+A14:2019+A2:2019+A15:2021
  - EN 60335-2-51:2003+A1:2008+A2:2012
  - EN 61000-3-2:2014, EN 61000-3-3:2013

Person authorised to compile the technical file:

Jennifer Watson  
Product Development Pump Systems & Drives  
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Johann-Klein-Straße 9  
67227 Frankenthal (Germany)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 7 February 2023



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

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