

Monitoring System

# KSB Leakage Sensor

## Installation/Operating Manual



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Installation/Operating Manual KSB Leakage Sensor

Original operating manual

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## 1 General

### 1.1 Principles

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

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

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

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

### 1.2 Target group

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

### 1.3 Other applicable documents


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

Document	Contents
Sub-supplier product literature	Operating manuals and other product literature describing accessories and integrated machinery components

For accessories and/or integrated machinery components observe the product literature of the relevant manufacturer.



### 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>	<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>	<b>WARNING</b> This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.

Symbol	Description
	<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.



## 2 Safety

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

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

### 2.1 General

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

### 2.2 Intended use

- The values specified in the technical product literature for the mains voltage and ambient temperature must not be exceeded. The device must only be operated in accordance with the instructions provided in the operating manual and other applicable documents.

### 2.3 Personnel qualification and personnel training

All personnel involved must be fully qualified to install, operate, maintain and inspect the equipment this manual refers to. The responsibilities, competence and supervision of all personnel involved in 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 device must always be supervised by specialist technical personnel.

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

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

## 2.5 Safety awareness

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

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

## 2.6 Software changes

The software has been specially created for this product and thoroughly tested.

Making changes or additions to the software or parts of the software is prohibited.

## 2.7 Explosion protection

**Always observe the information on explosion protection given in this section when operating the product in potentially explosive atmospheres.**

The standard design of the KSB Leakage Sensor is not approved for use in potentially explosive atmospheres.

The KSB Leakage Sensor may be used in potentially explosive atmospheres (II 2G T5-T1) provided that an inductive sensor<sup>1)</sup> approved for use in potentially explosive atmospheres and a switching amplifier<sup>1)</sup> are used.

In this case, it must be ensured that the switching amplifier and the display unit are located outside of the potentially explosive atmosphere. (⇒ Section 9.2.2, Page 30)

This operating manual's additional sections containing information on use in potentially explosive atmospheres must be observed. In addition, observe the operating manuals provided by the manufacturers of components supplied with this product that are marked as explosion-proof.

The KSB Leakage Sensor does not have its own marking (mechanical part: housing parts and balance scale without inductive sensor) as it is considered an integral part of the pump.

KSB Leakage Sensors fitted on pumps of a make other than KSB must not be used in potentially explosive atmospheres.



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<sup>1</sup> Only to be purchased from KSB





### 3 Transport/Storage/Disposal

#### 3.1 Checking the condition upon delivery

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


#### 3.2 Transport

	<div style="background-color: #e67e22; color: white; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Improper transport of the pump with fitted KSB Leakage Sensor</b> Risk of injury from falling parts!</p> <ul style="list-style-type: none"> <li>▷ Never use the piping, leakage sensor or its fastening elements as attachment points.</li> </ul>
	<div style="background-color: #f1c40f; padding: 5px;"><b>CAUTION</b></div> <p><b>Improper transport</b> Damage to the device!</p> <ul style="list-style-type: none"> <li>▷ Always transport the device properly and in its original packaging.</li> <li>▷ For transport, observe the transport instructions on the original packaging.</li> <li>▷ Do not throw the device.</li> </ul>

1. Upon receipt, unpack the device and check for in-transit damage.
2. Report any in-transit damage to the manufacturer immediately.
3. Dispose of packaging material in accordance with local regulations.

#### 3.3 Storage

If the ambient conditions for storage are met, the function of the device will be ensured even after a prolonged period of storage.

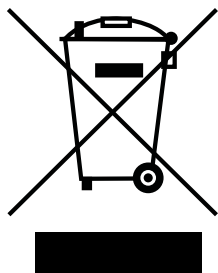
	<div style="background-color: #f1c40f; padding: 5px;"><b>CAUTION</b></div> <p><b>Damage during storage due to humidity, dirt or vermin</b> Corrosion/contamination of the device!</p> <ul style="list-style-type: none"> <li>▷ For outdoor storage cover the (packed or unpacked) device and accessories with water-proof material.</li> </ul>
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**Table 4:** Ambient conditions for storage

Ambient condition	Value
Relative humidity	85 % max. (non-condensing)
Ambient temperature	-30 °C to +60 °C

1. Store the device in dry conditions and in its original packaging.
2. Store the device in a dry room in which the atmospheric humidity is maintained at a constant level (as far as this is possible).
3. Prevent excessive fluctuations in atmospheric humidity.

### 3.4 Disposal



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

Contact your local waste disposal partner for returns.

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



#### NOTE

Due to certain components it contains, the device is classified as special waste and meets RoHs 2011/65/EC requirements.

Once decommissioned, the device must be properly disposed of in accordance with local regulations.

## 4 Description

### 4.1 General description

The device is an intelligent leakage sensor for pumps with mechanical seal.

The following information is provided by the device:

- The statuses "ready for operation", warning and alarm are shown as light signals (LEDs) on the display unit.
- An acoustic signal is emitted when the device changes to alarm status.
- "Ready for operation", warning and alarm statuses are output as an open collector signal (24 V).
- The leakage rate is output as an analog signal (4 - 20 mA).




### 4.2 Name plate




Fig. 1: Name plate (example)

1	Serial number	2	KSB ident. number
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### 4.3 Operating limits

	<div data-bbox="507 1236 683 1281"> <b>DANGER</b></div> <div data-bbox="496 1299 967 1330"><b>Use in potentially explosive atmospheres</b></div> <div data-bbox="496 1337 702 1366">Explosion hazard!</div> <div data-bbox="517 1377 1394 1505"> <ul style="list-style-type: none"> <li>▸ The device in standard design must not be used in potentially explosive atmospheres.</li> <li>▸ For use in potentially explosive atmospheres refer to the information in the corresponding section. (⇒ Section 2.7, Page 8)</li> </ul> </div>
	<div data-bbox="507 1541 639 1579"><b>CAUTION</b></div> <div data-bbox="496 1608 711 1637"><b>Improper handling</b></div> <div data-bbox="496 1641 738 1673">Damage to property!</div> <div data-bbox="517 1684 1434 1740"> <ul style="list-style-type: none"> <li>▸ Only use the device with solids-free fluids handled which are not liable to stick, encrust, solidify, crystallise or polymerise.</li> </ul> </div>

	CAUTION
	<p><b>Leakage temperature in the sensor housing exceeded</b> Damage to the measurement transmitter!</p> <p>▷ If the permissible leakage temperature in the sensor housing is exceeded, the inductive measurement transmitter 69-8 can become damaged and must be replaced as a precautionary measure. (⇒ Section 7.3.3, Page 25)</p>

- IP65 enclosure<sup>2)</sup>
- Permissible in-service ambient temperature: -10 °C to + 60 °C
- Permissible fluid temperature of the pump: -30 °C to +350 °C
- Permissible leakage temperature in the sensor housing -20 °C to +100 °C (the fluid handled must not solidify inside the sensor.)
- Resistant to oil mist and alkaline industrial cleaning agents
- Free from paint-wetting impairment substances (silicone-free)

#### 4.4 Fluids handled




	 <b>DANGER</b>
	<p><b>Leakage caused by chemically or mechanically affected material</b> Hot and/or toxic fluid may escape! Hazard to persons and the environment!</p> <p>▷ Only use the equipment for fluids which are neither chemically nor mechanically aggressive to the equipment materials.</p> <p>▷ Only use the equipment for the fluids indicated in the operating manual or the data sheet, or consult KSB.</p>
	<b>NOTE</b>
<p>The fluids handled must be clean when entering the leakage sensor. If there is any risk of the drop capillary in the upper sensor housing becoming clogged (e.g. by crystallisation), its free passage has to be checked regularly.</p>	

Table 5: Overview of fluids handled

Fluid handled	Concentration	Temperature <sup>3)</sup>	
		Minimum	Maximum
Alum	3	0	80
Alkaline solution, bottle rinsing	10	0	80
Alcohol	–	0	60
Ammonium bicarbonate	10	0	40
Ammonium sulphate	20	0	60
Beer mash, beer wort	-	0	80
Calcium acetate	10	0	80
Calcium nitrate	10	0	30
Ferric sulphate (II)	5	0	80
Emulsion	-	0	80
Degreasing solution	10	0	80

<sup>2)</sup> Applies to the analysing unit incl. inductive sensor, closed service interface (DIP) and external connections (EXT, IN1, IN2)




<sup>3)</sup> Permissible temperatures at the inlet into the sensor housing. The fluid temperatures inside the pump have to comply with the pump's temperature limits.

Fluid handled	Concentration	Temperature <sup>3)</sup>	
		Minimum	Maximum
	[%]	[°C]	[°C]
Condenser water (sugar production)	-	0	60
Antifreeze on ethylene glycol basis or propylene glycol basis with inhibitors, closed or open system	30	-10	80
Beverages, alcoholic	-	0	80
Beverages containing carbon dioxide	-	0	40
Glycerine	90	10	80
Glycols, pure	-	0	80
Potassium hydroxide	10	-10	80
Potassium nitrate	5	0	60
Potassium sulphate	3	0	20
Cooling lubricants	-	20	60
Copper sulphate	5	10	30
Magnesium sulphate	10	10	20
Sodium carbonate	6	0	60
Sodium hydrogen carbonate	6	0	20
Sodium hydroxide	20	20	80
Sodium nitrate	10	20	90
Sodium sulphate	5	20	60
Oil, mineral-based thermal oil	-	-10	90
Oil, synthetic-based thermal oil	-	-10	90
Oil, hydraulic oil	-	0	80
Oil, mineral oil	-	0	80
Oil, cutting oil	-	0	80
Oil, silicone oil	-	0	80
Oil, vegetable oil	-	0	90
Oil, lubricating oil	-	20	80
Paraffin	-	20	40
Kerosene	-	20	60
Acid, butanoic acid	-	10	30
Acid, citric acid	25	10	30
Acid, acetic acid	10	0	30
Acid, tannic acid	50	0	30
Acid, maleic acid	10	0	30
Acid, lactic acid	50	0	30
Acid, oxalic acid	10	0	40
Acid, tartaric acid	50	0	40
Trisodium phosphate	4	20	85
Water, desalinated	-	0	90
Water, fire-fighting water	-	0	40
Water, heating water	-	0	90
Water, hot water	-	0	90
Water, boiler feed water	-	0	90
Water, condensate	-	0	90
Water, seawater, brackish water	-	0	25
Water, surface water	-	0	40
Water, process water	-	0	90
Water, rainwater	-	0	40


Fluid handled	Concentration	Temperature <sup>3)</sup>	
		Minimum	Maximum
	[%]	[°C]	[°C]
Water, raw water	-	0	40
Water, swimming pool water, bathing water	-	0	50
Water, drinking water, tap water	-	0	50

## 5 Installation at site

### 5.1 Safety regulations

	<div data-bbox="507 315 703 358"><b>⚠ WARNING</b></div> <p><b>Sensor housing and piping take on the same temperature as the fluid handled</b> Risk of burns!</p> <ul style="list-style-type: none"> <li>▸ Fit protective equipment/devices if necessary.</li> </ul>
	<div data-bbox="507 519 703 562"><b>⚠ WARNING</b></div> <p><b>Mechanical loads acting on the connections between pump (set) and sensor</b> Fluid could spurt out! Burns, scalding!</p> <ul style="list-style-type: none"> <li>▸ Never subject the connections and piping between the pump (set) and sensor housing to mechanical loads.</li> <li>▸ Verify proper installation of the sensor.</li> </ul>
	<div data-bbox="507 835 587 873"><b>NOTE</b></div> <p>Comply with all safety regulations of the corresponding pump (set).</p>

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

	<div data-bbox="507 1066 587 1102"><b>NOTE</b></div> <p>The KSB Leakage Sensor can be supplied pre-mounted on the pump (set) or supplied but not fitted. Observe the operating conditions of the pump (set). Always contact the manufacturer if the device is to be used under ambient conditions other than specified.</p>
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### 5.3 Installing the sensor

Observe the following:

- No forces must act on the sensor housing via the leakage lines.
- Do not insulate the piping to the leakage sensor. Ensure sufficient leakage cooling.
- The inside diameter of the leakage drain line must be equal to or greater than that of the leakage inlet line. Otherwise large quantities of leakage can cause backflow in the sensor housing and a malfunction of the sensor.
- The inside diameter of the leakage lines must not be smaller than 6 mm.
- Never cover the vents in the upper housing half.

### 5.3.1 Installing a KSB Leakage Sensor that has been supplied but not fitted


- ✓ The operating manual for the pump (set) is available.
  - ✓ Assembly tools are available.
  - ✓ All safety instructions have been observed and carried out.
  - ✓ The pump (set) has been taken out of service and secured against unintentional re-start.
  - ✓ The pump (set) has cooled down to room temperature.
1. Position sensor housing 105 on a level surface next to the pump, e.g. on the baseplate of the pump.
    - ⇒ Select a sensor housing position that keeps the line leading from the pump to the sensor as short as possible.
    - ⇒ Select a sensor housing position that keeps the distance to any hot pump components and system components as large as possible.
    - ⇒ If the leakage inlet 8E is positioned on the same side as the leakage drain 8B, the upper half of the sensor housing can be taken off, rotated by 180° and mounted in this position. (⇒ Section 7.3.2, Page 25)
  2. Mark the position of the drilled holes at the two lower recesses of sensor housing 105 on the pump baseplate.
  3. Carefully place aside sensor housing 105. Drill holes (M5) into the pump baseplate.
  4. Position the sensor housing again. Fasten it to the pump baseplate with hexagon socket head cap screws 914.2.
  5. Verify the levelling of sensor housing 105 with measuring instrument 690 (bullseye level). If necessary, undo hexagon socket head cap screws 914.2 and level the sensor housing with suitable shims. Re-tighten hexagon socket head cap screws 914.2.
  6. Use the supplied compression fittings and L-pipe to connect the leakage drain hole of the pump (set) with leakage inlet 8E of the sensor housing.
    - ⇒ If necessary, shorten the leakage line (pipe) accordingly.
  7. Use the supplied compression fittings and L-pipe to connect the leakage drain hole 8B of the sensor housing to the site-supplied leakage collector.
    - ⇒ Fit the leakage line with a continuously falling slope towards the site-supplied leakage collector.

### 5.3.2 Installing a pre-mounted KSB Leakage Sensor

- ✓ The operating manual for the pump (set) is available.
  - ✓ Assembly tools are available.
  - ✓ All safety instructions have been observed and carried out.
  - ✓ The pump (set) has been taken out of service and secured against unintentional re-start.
  - ✓ The pump (set) has cooled down to room temperature.
1. After the pump set has been installed, verify the levelling of sensor housing 105 with measuring instrument 690 (bullseye level). If necessary, loosen hexagon socket head cap screws 914.2 and level the sensor housing with suitable shims. Re-tighten hexagon socket head cap screws 914.2.
  2. Use the supplied compression fittings and L-pipe to connect the leakage drain hole 8B of the sensor housing to the site-supplied leakage collector.
    - ⇒ Fit the leakage line with a continuously falling slope towards the site-supplied leakage collector.



## 5.4 Electrical connection

	<div style="background-color: #FFD700; padding: 5px; text-align: center;"><b>CAUTION</b></div> <p><b>Improper electrical connections</b> Damage to the device!</p> <ul style="list-style-type: none"> <li>▸ Check the electrical connection.</li> <li>▸ Observe the wiring diagrams.</li> </ul>
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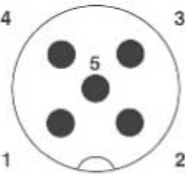
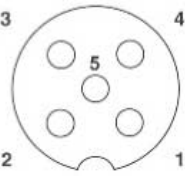
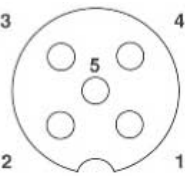
### 5.4.1 Standard design

The KSB Leakage Sensor is supplied with two pre-configured cables of 10 m length each.



- The power cable (connection EXT) is supplied with an open cable end.
- The sensor cable is supplied with two M12 connectors.

Optionally, a third cable is supplied for transmitting the leakage rate to an external analysis device. (10 m length, 4-core, open cable end and M12 connector, KSB material number 05059190)

**Table 6:** Pin assignment of the display unit

Illustration	Power supply and signals to external device
<p><b>M12 connector EXT</b></p> 	<p>1: Power supply 24 V DC (+V<sub>B-IN</sub>)  2: Signal 1 red (open collector signal)  3: GND (-V<sub>B-IN</sub>)  4: Signal 2 yellow (open collector signal)  5: Signal 3 green (open collector signal)</p>
<p><b>M12 socket IN1</b></p> 	<p>1: Power supply 24 V DC (+V<sub>B-OUT</sub>)  2: Signal sensor  3: GND (-V<sub>B-OUT</sub>)  4: (not connected)  5: (not connected)</p>
<p><b>M12 socket IN2</b></p> 	<p>1: OUT 4 - 20 mA (+) leakage rate  2: (not connected)  3: OUT 4 - 20 mA (-) leakage rate  4: (not connected)  5: (not connected)</p>
<p><b>Colour coding of the power cable cores</b></p>	<p>1: BN = brown  2: WH = white  3: BU = blue  4: BK = black  5: GY = grey</p>

### 5.4.2 Variant for use in potentially explosive atmospheres

	<div style="background-color: #f4a460; padding: 5px; margin-bottom: 5px;">  <b>DANGER</b> </div> <p><b>Use in potentially explosive atmospheres</b></p> <p>Explosion hazard!</p> <ul style="list-style-type: none"> <li>▷ The device in standard design must not be used in potentially explosive atmospheres.</li> <li>▷ For use in potentially explosive atmospheres refer to the information in the corresponding section. (⇒ Section 2.7, Page 8)</li> </ul>
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The KSB Leakage Sensor is supplied with three pre-configured cables.

- The power cable (connection **EXT**) is supplied with an open cable end, cable length 10 m.
- The blue sensor cable from the switching amplifier (blue terminals) to the inductive sensor in potentially explosive atmospheres is supplied with open cable ends, cable length 25 m.
- The black sensor cable from the display unit (connection **INT1**) to the switching amplifier (green terminals) is supplied with an open cable end, cable length 10 m.

Optionally, a third cable is supplied for transmitting the leakage rate to an external analysis device. (10 m length, 4-core, open cable end and M12 connector, KSB material number 05059190)

#### Pin assignment

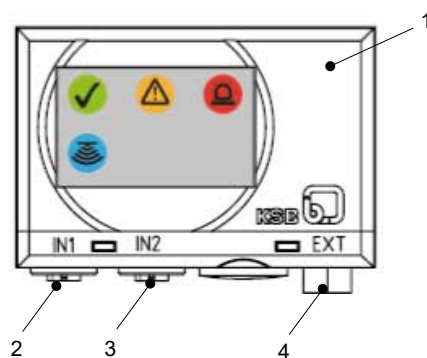
Pin assignment of the display unit see (⇒ Table 6)

**Table 7:** Terminal configuration of the switching amplifier

Switching amplifier		Connection cable	
Terminal colour	Terminal	Core colour	Cable
Blue	1	Brown	Blue sensor cable, 2-pole connection to inductive sensor
	2	Blue	
Green	5	White	Black sensor cable, 4-pole connection to display unit
	6	Not connected	
	9	Brown	
	10	Blue	

The DIP switches of the switching amplifier remain in their factory-set position (switches 1, 2, 3 and 4 in position I).

### 5.4.3 Connecting the power supply and message signals





**Fig. 2:** Connection to the analysing unit

1	Analysing unit
2	M12 socket <b>IN1</b>

3	M12 socket <b>IN2</b>
4	M12 connector <b>EXT</b>

- The analysing unit is connected via a 5-pin M12 plug-type connection for the power supply and message signals.
    - Use the M12 connector **EXT**.
  - The leakage sensor is connected via a 3-pin M12 plug-type connection.
    - Use the M12 socket **IN1**.
  - The optional analog output signal "leakage rate" can be connected via a 3-pin M12 plug-type connection.
    - Use the M12 socket **IN2**.
1. Precisely align the M12 plug-type connections and completely screw them into the analysing unit.
  2. Tighten the screwed connections hand-tight. Observe a tightening torque of 0.4 - 0.6 Nm.
  3. Fasten the analysing unit to a level surface with an M5 screw, screw length = 8 mm. Observe a tightening torque  $\leq 2$  Nm.

#### 5.4.4 DIP switch configuration

	<b>NOTE</b>
	Behind the service interface a leakage rate for analysis can be configured using the four micro switches. After this configuration, securely close the access with the screw plug. Enclosure IP65 only applies when the service interface is closed and the sensors are connected correctly.
	<b>NOTE</b>
	The setting of the DIP switches must only be adjusted after the analysing unit has been de-energised.

**Table 8:** Setting 8 fixed warning levels and alarm levels using the DIP switches:

ON_ECE				Level	Warning threshold	Alarm threshold
1	2	3	4		g/h	g/h
■	■	■	X	1	0,1	2
■	■	■	X	2	0,2	3
■	■	■	X	3	0,3	3
■	■	■	X	4 <sup>4)</sup>	0,3	5
■	■	■	X	5	0,3	8
■	■	■	X	6	0,5	8
■	■	■	X	7	1	12
■	■	■	X	8	2	30
X	X	X	■	Mute	Acoustic signal deactivated	





















<sup>4</sup> Factory setting

## 5.5 Display functions during operation

### 5.5.1 Display

The display of the analysing unit indicates the status of the leakage sensor with light signals (LEDs).

**Table 9:** Overview of light signals and open collector signals

Display	Light signal (LED)	Open collector signal	Description
   	GREEN lit continuously	Signal 3, green, connected	Ready for operation, leakage monitoring active
   	GREEN lit continuously YELLOW lit continuously	Signal 3, green, connected Signal 2, yellow, connected	Warning, set warning threshold exceeded
   	RED lit continuously Acoustic warning	Signal 1, red, connected	Alarm, set alarm threshold exceeded
   	BLUE lit for 1 second	-	Inductive sensor triggered
   	BLUE lit continuously YELLOW flashing	Signal 2, yellow, flashing frequency applied	Warning, contact to inductive sensor interrupted or balance scale jammed / in incorrect position

### 5.5.2 Analog output

The analog output supplies a 4 - 20 mA signal, indicating the averaged leakage rate depending on the sensitivity level set via the DIP switches (⇒ Section 5.4.4, Page 19) as per the following table.

**Table 10:** Calculation factors

Level	Leakage rate at 4 mA	Leakage rate at 20 mA	Calculation factors	
	[g/h]	[g/h]	A	B
1	≤ 0,02	≥ 4	269730	13432,5
2	≤ 0,04	≥ 6	134820	6705
3	≤ 0,06	≥ 6	89820	4455
4 <sup>5)</sup>	≤ 0,06	≥ 10	89892	4473
5	≤ 0,06	≥ 16	89932,5	4483,125
6	≤ 0,1	≥ 16	53932,5	2683,125

<sup>5</sup> Factory setting

Level	Leakage rate at 4 mA	Leakage rate at 20 mA	Calculation factors	
	[g/h]	[g/h]	A	B
7	≤ 0,2	≥ 24	26955	1338,75
8	≤ 0,4	≥ 60	13482	670,5

The following formula can be used to calculate the leakage rates based on the analog signal.








Select the calculation factors from the Calculation factors table depending on the set sensitivity level.

$$L = \frac{4320}{A - (B \times I)}$$

**Fig. 3:** Formula for calculating the leakage rate in [g/h]

A	Calculation factor A [-]
B	Calculation factor B [-]
I	Analog signal [mA]
L	Leakage rate [g/h]

## 6 Commissioning / Start-up

	<div data-bbox="507 241 683 286">  <b>DANGER</b> </div> <p><b>Carrying out work on a running pump</b> Risk of injury: Limbs can be pulled into or crushed by machinery!</p> <ul style="list-style-type: none"> <li>▷ De-energise the motor.</li> <li>▷ Take steps to ensure that the motor cannot be switched on again unintentionally.</li> </ul>
	<div data-bbox="507 517 683 562">  <b>DANGER</b> </div> <p><b>Electric shock</b> Danger to life!</p> <ul style="list-style-type: none"> <li>▷ De-energise the mains connections of all devices (e.g. pump, PumpDrive, PumpMeter, leakage sensor).</li> <li>▷ Ensure that the mains connections cannot be re-energised unintentionally.</li> </ul>
	<div data-bbox="507 792 703 837">  <b>WARNING</b> </div> <p><b>Fluid may escape!</b> Risk of burns!</p> <ul style="list-style-type: none"> <li>▷ Make sure that any leakage that occurs is collected in the site-supplied leakage collector.</li> </ul>
	<div data-bbox="507 1028 639 1072"> <b>CAUTION</b> </div> <p><b>Incorrect commissioning/start-up</b> Damage to property!</p> <ul style="list-style-type: none"> <li>▷ Ensure that all local applicable regulations and directives – particularly the EC Machinery Directive and EC Directive on Low-voltage Equipment – are fulfilled.</li> <li>▷ Before commissioning/start-up, check all connected cables against the wiring diagram.</li> </ul>

### 6.1 Carrying out a functional test


Carry out a functional test for every commissioning/start-up.

(⇒ Section 9.2, Page 29)

- ✓ The mechanical and electrical connection have been completed as described in (⇒ Section 5.3, Page 15) and (⇒ Section 5.4, Page 17) .
  - ✓ At the analysing unit the green LED is lit. At inductive sensor 69-8 the orange indicator lamp is lit.
1. Turn measuring instrument 690 (bullseye level) anti-clockwise to remove it from the upper housing half 105.01 of the KSB Leakage Sensor.
    - ⇒ The free tapped hole in the upper housing half 105.01 allows indicator 620 (balance scale) to tip. To do so, apply several short bursts of compressed air through the tapped hole. Alternatively, a liquid can be dripped through the tapped hole. This liquid has to be clean and compatible with the fluid handled.
    - ⇒ Every time the balance scale tips the orange indicator lamp is extinguished briefly and the blue LED lights up.
    - ⇒ The sensor input is then locked for one second. This is signalled by the blue LED being lit for an extended time.
    - ⇒ If the scale tips again during the locking period, this will be ignored by the analysing unit.

- ⇒ After the balance scale has tipped four to five times, the alarm of the display unit is triggered. The red LED lights up, and an acoustic signal is emitted.
- 2. To acknowledge the alarm, place the supplied magnetic clip on the KSB logo at the display unit. (⇒ Section 7.3.4, Page 26)
  - ⇒ The acoustic signal stops.
  - ⇒ The green LED lights up.
- ⇒ The KSB Leakage Sensor is ready for operation.
  - Analog signal option: After a reset with the magnetic clip or after power has returned, the analog output supplies a 4 mA current signal.

## 6.2 Measures to be taken for shutdown


	<p><b>NOTE</b></p> <p>Observe the original operating manual of the pump (set).          Comply with the safety regulations specified for the pump (set).          Comply with the instructions for shutdown of the pump (set).</p>
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1. Perform the shutdown procedure described in the original operating manual.
2. Undo the M12 connector from connection **EXT** at the analysing unit.
  - ⇒ The analysing unit has been de-energised.
3. Disconnect the sensor cable **IN1** and the cable for analog signal **IN2** from the analysing unit.
  - ⇒ The KSB Leakage Sensor can be removed from the pump casing.

## 7 Servicing/Maintenance

### 7.1 Safety regulations

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	<b>⚠ DANGER</b>
	<b>Electric shock</b> Danger to life! <ul style="list-style-type: none"> <li>▷ De-energise the mains connections of all devices (e.g. pump, PumpDrive, PumpMeter, leakage sensor).</li> <li>▷ Ensure that the mains connections cannot be re-energised unintentionally.</li> </ul>

Never use force when dismantling and reassembling the pump set.

	<b>NOTE</b>
	All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit " <a href="http://www.ksb.com/contact">www.ksb.com/contact</a> " on the Internet.


### 7.2 Maintenance/inspection

The KSB Leakage Sensor is essentially maintenance-free.

Carry out the functional test once per year as a minimum. (⇒ Section 6.1, Page 22)

When using a fluid that can lead to clogging of the drop capillary in the sensor housing, regularly check the free passage of the drop capillary. This applies especially to fluids handled containing solids and fluids handled liable to resinify or crystallise.

#### 7.2.1 Cleaning the drop capillary

	<b>⚠ WARNING</b>
	<b>Hot surface</b> Burns, scalding! <ul style="list-style-type: none"> <li>▷ Allow the pump set and sensor housing to cool down to ambient temperature.</li> </ul>

Regularly check the free passage of the drop capillary in the sensor housing.

- ✓ The mains connection has been de-energised and secured against being energised.
1. Turn measuring instrument 690 (bullseye level) to remove it from the upper sensor housing.
  2. Insert a suitable long, thin cleaning tool (e.g. pipe cleaner or solid probe with a diameter of 2.5 mm maximum) approx. 2.5 cm into the tapped hole of the measuring instrument. Then pull it out again.
  3. Repeat this process several times.
  4. In the case of severe incrustation remove the upper sensor housing 105.1 and clean it.



### 7.3 Dismantling and reassembly

#### 7.3.1 Dismantling and reassembling the KSB Leakage Sensor

- ✓ All power cables as well as the electrical devices connected to them have been de-energised.
- 1. Disconnect the M12 connector from connection **EXT** at the analysing unit.
- 2. Disconnect the sensor cable **IN1** and the cable for analog signal **IN2** from the analysing unit.
- 3. Remove the KSB Leakage Sensor from the pump set.
- 4. Fit the KSB Leakage Sensor again in the required position.
- 5. Re-connect the sensor cable **IN1** and the cable for analog signal **IN2** to the analysing unit.
- 6. Re-connect the M12 connector **EXT** to the analysing unit.
  - ⇒ The KSB Leakage Sensor is now connected.
- 7. Return the KSB Leakage Sensor to service.

#### 7.3.2 Rotating the upper half of the sensor housing

If the leakage inlet 8E is to be positioned on the same side as the leakage drain 8B, the upper half of the sensor housing can be taken off, rotated by 180° and mounted in this position.

- ✓ All power cables as well as the electrical devices connected to them have been de-energised.
- 1. Undo the hexagon socket head cap screws 914.2 at the upper housing half 105.01.
- 2. Remove the upper housing half, turn it by 180°, and mount it in this position.
- 3. Screw in hexagon socket head cap screws 914.2 and tighten them hand-tight.
- 4. Carry out a functional test. (⇒ Section 6.1, Page 22)

#### 7.3.3 Removing and re-mounting the inductive sensor

Inductive sensor 69-8 is supplied fitted in the upper housing half with the required distance to indicator 620 (balance scale). The position of the measurement transmitter must not be changed by turning it.

If it has been turned or if the measurement transmitter is to be replaced, carry out the following steps to position it correctly:

- 1. Undo hexagon socket head cap screws 914.2 at the upper housing half 105.01.
- 2. Remove the upper housing half 105.01.
- 3. Undo the locknut of inductive sensor 69-8.
- 4. Unscrew inductive sensor 69-8 from the upper housing half 105.01.
- 5. Place the upper housing half in a level work area with measuring instrument 690 (bullseye level) on top. Fasten it with suitable clamping equipment.

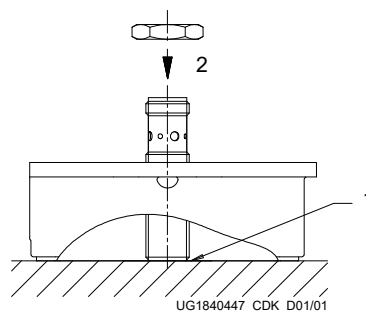



Fig. 4: Mounting the inductive sensor

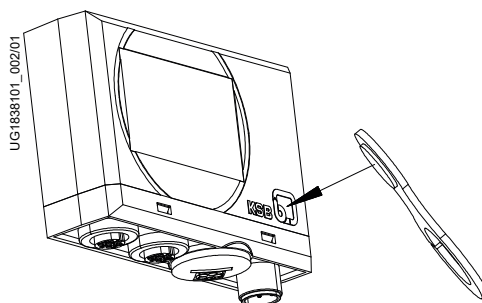
6. Screw inductive sensor 69-8 in from the top (2), until it touches the work area (1).
7. The lower edge of upper housing half 105.01 and the active face of inductive sensor 69-8 are now on the same level.

	<p><b>NOTE</b></p> <p>The lengths of the inductive sensors in the standard design differ from those of the variant for use in potentially explosive atmospheres. For this reason, the sensors protrude from the upper housing half at different lengths.</p>
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8. Screw the locknut on from the top and tighten it. The inductive sensor must not be turned during this process.
9. Place upper housing half 105.01 on lower housing half 105.02. Observe the position of leakage inlet 8B in relation to leakage drain 8E.
10. Screw in hexagon socket head cap screws 914.2 and tighten them hand-tight.
11. Carry out a functional test. (⇒ Section 6.1, Page 22)


#### 7.3.4 Resetting the analysing unit

The alarm status can be reset with the supplied magnetic clip.





**Fig. 5:** Triggering a reset with the magnetic clip

1. Place the magnetic clip on the KSB logo until the LEDs change from red to green.
- ⇒ The analysing unit immediately starts to monitor the leakage rate again.

	<p><b>NOTE</b></p> <p>The warning status <b>cannot</b> be reset with the magnetic clip.</p> <p>If the leakage rates sink below the warning threshold the analysing unit clears the warning status automatically.</p>
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## 8 Trouble-shooting

	<p><b>⚠ DANGER</b></p> <p><b>Carrying out work on a running pump</b></p> <p>Risk of injury: Limbs can be pulled into or crushed by machinery!</p> <ul style="list-style-type: none"> <li>▸ De-energise the motor.</li> <li>▸ Take steps to ensure that the motor cannot be switched on again unintentionally.</li> </ul>
	<p><b>⚠ WARNING</b></p> <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>

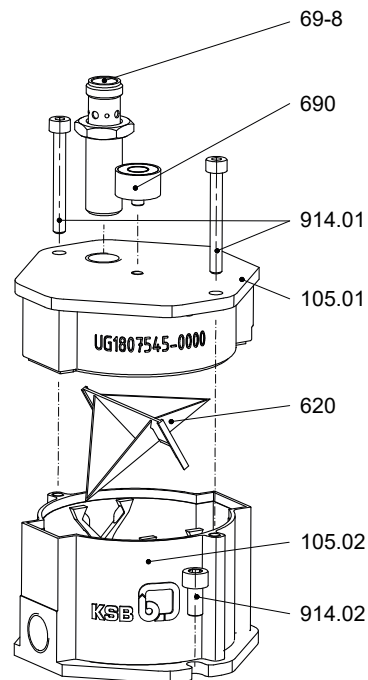
If problems occur that are not described in the following table, consultation with the KSB service is required.

**Table 11:** Trouble-shooting

Error / defect description	Possible cause	Remedy
None of the four LEDs are lit.	No power supply	Check power supply at <b>EXT</b> pin 1 and 3 (10 - 30 V DC).
	KSB Leakage Sensor defective	Contact KSB.
Blue LED not lit despite tipped indicator	The inductive sensor in the sensor housing does not recognise the tipping movement.	Check the length of engagement of the inductive sensor. Adjust it if required.
The blue LED lights up for 3 seconds and then starts flashing together with the yellow LED.	Balance scale in sensor housing is jammed.	Clean the sensor housing.
	Sensor cable at <b>IN1</b> defective	Replace the sensor cable.
	Inductive sensor defective	Replace the inductive sensor.
The orange indicator lamp at the inductive sensor is not lit during standstill.	The sensor cable is not correctly connected to connection <b>IN1</b> .	Check the plug-type cable connection at <b>IN1</b> . Correct it if required.
	The sensor cable is not correctly connected to the inductive sensor.	Check the plug-type connection at the inductive sensor. Correct it if required.
	Inductive sensor defective	Replace the inductive sensor.
	Balance scale in sensor housing is jammed.	Clean the sensor housing.
The red LED is lit but no acoustic alarm is emitted.	DIP switch 4 is set to ON.	Set DIP switch 4 to OFF.

## 9 Related Documents

### 9.1 General assembly drawing with list of components



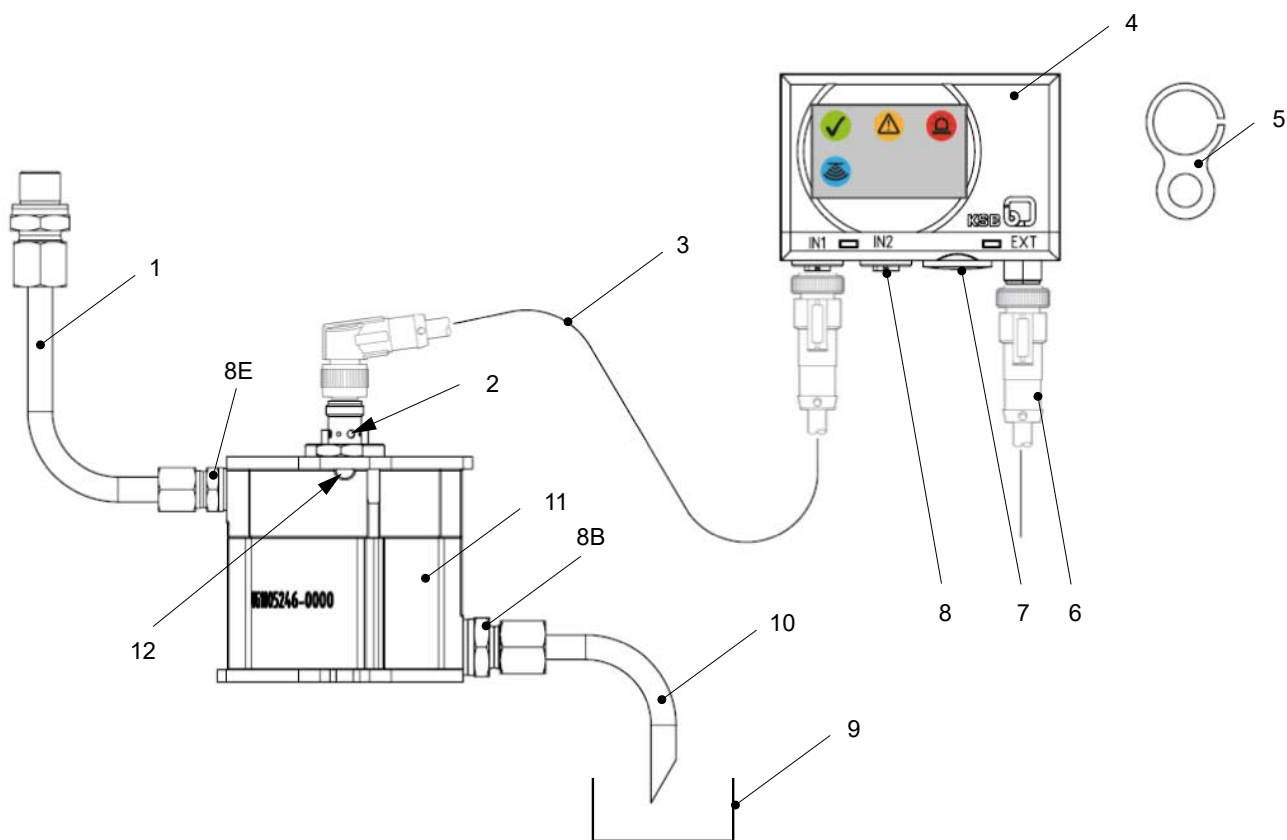
**Fig. 6:** General assembly drawing of the KSB Leakage Sensor

**Table 12:** List of components

Part No.	Description
105.01	Upper housing half
105.02	Lower housing half
69-8	Measurement transmitter (inductive sensor)
620	Indicator (balance scale)
690	Measuring device (bullseye level)
914.01	Hexagon socket head cap screw
914.02	Hexagon socket head cap screw

## 9.2 Layout / connection diagram

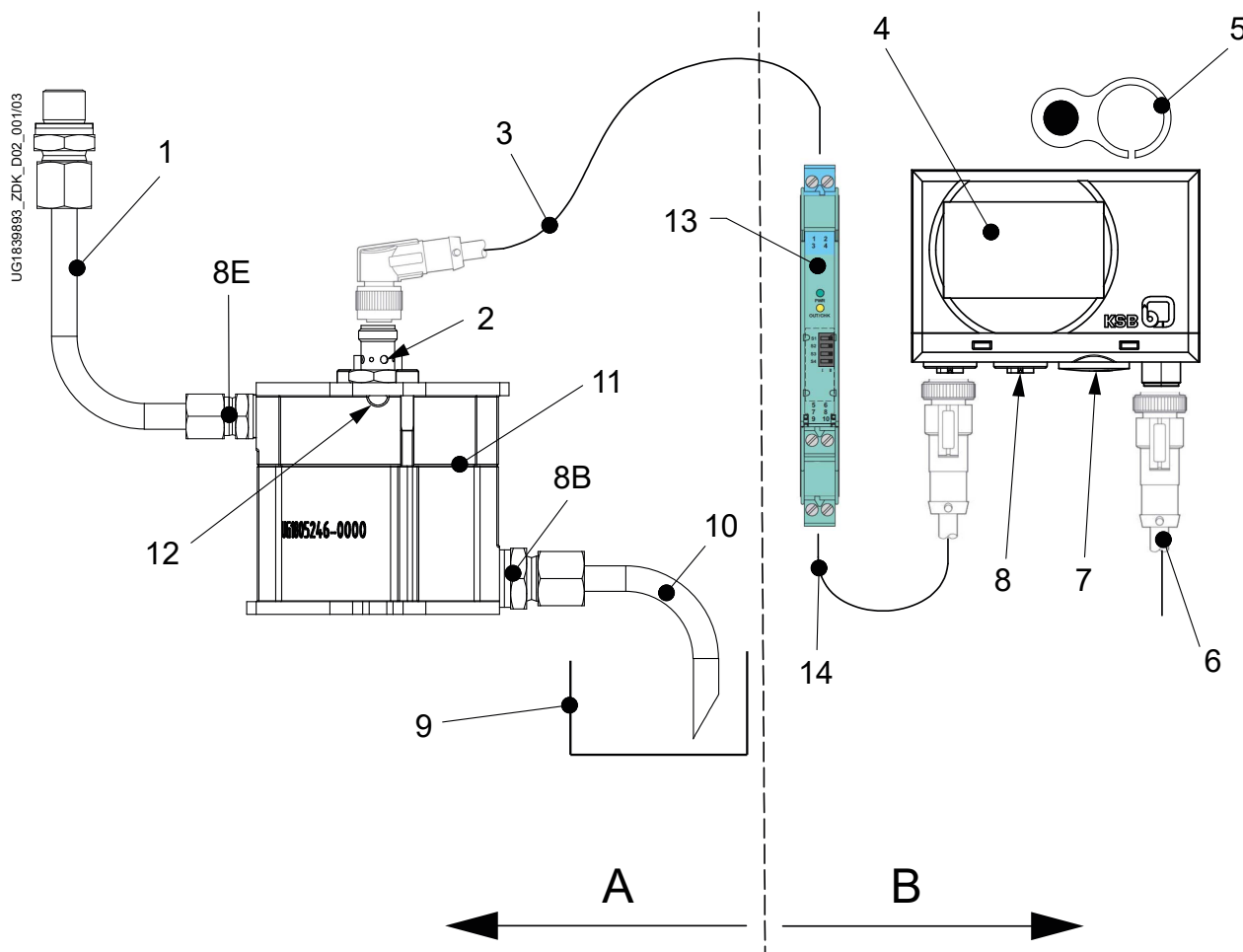
### 9.2.1 Standard design



**Fig. 7:** Connection diagram of the KSB Leakage Sensor (standard design)

1	Leakage line from the pump
2	Indicator lamp, orange
3	Sensor cable
4	Analysing unit
5	Magnetic clip (for resetting the analysing unit)
6	Power cable
7	Screw plug (access to the DIP switches)
8	Connection for analog output signal (leakage rate)
9	Site-supplied leakage collector
10	Leakage line from the sensor housing
11	Leakage sensor
12	Vent opening
8B	Leakage drain
8E	Leakage inlet

### 9.2.2 Variant for use in potentially explosive atmospheres



**Fig. 8:** Connection diagram of the KSB Leakage Sensor (variant for use in potentially explosive atmospheres)  
A = potentially explosive atmosphere  
B = non-potentially explosive atmosphere

1	Leakage line from the pump
2	Indicator lamp, orange
3	Blue sensor cable
4	Analysing unit
5	Magnetic clip (for resetting the analysing unit)
6	Power cable
7	Screw plug (access to the DIP switches)
8	Connection for analog output signal (leakage rate)
9	Site-supplied leakage collector
10	Leakage line from the sensor housing
11	Leakage sensor
12	Vent opening
13	Switching amplifier
14	Black sensor cable
8B	Leakage drain
8E	Leakage inlet

## 10 EU Declaration of Conformity

Manufacturer:

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

The manufacturer herewith declares that the product:

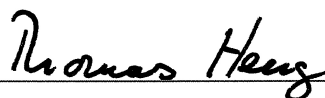
### KSB Leakage Sensor

**Serial number range:** SN V13 01 0001 to SN V13 99 9999

- is in conformity with the provisions of the following Directives as amended from time to time:
  - Electromagnetic Compatibility Directive 2014/30/EU
- Applied national technical standards and specifications, in particular:
  - EN 61326-1
  - EN 55011
- Applied national technical standards and specifications, in particular:
  - ISO 14121-1
  - IEC 61000-4-2
  - IEC 61000-4-3
  - IEC 61000-4-4
  - IEC 61000-4-5
  - IEC 61000-4-6

The EU Declaration of Conformity was issued in/on:

Frankenthal, 19 March 2020



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1984.8/02-EN (05058108)