Original installation and operating manual

EN-US

ZL Drain 31 IF BI

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Table of contents

1. Information on documentation

This documentation describes all steps necessary for the use and operation of the product and the accessories.

1.1 Contact

Manufacturer	Service and tools
SULLIVAN PALATEK AIR COMPRESSORS 1201 West US Highway 20 Michigan City, Indiana 46360 Phone: 219.874.2497 Fax: 219.809.0203 info@palatek.com www.sullivan-palatek.com	SULLIVAN PALATEK AIR COMPRESSORS 1201 West US Highway 20 Michigan City, Indiana 46360 Phone: 219.874.2497 Fax: 219.809.0203 info@palatek.com www.sullivan-palatek.com

INFORMATION	Country specific manufacturer representation
	The contact to the country-specific manufacturer's representative can be found in the address section on the back or can be established via the contact form on the manufacturer's website.

1.2 Installation information and operating manual

INFORMATION	Copyright protection
	The content of this installation and operating manual, in the form of text, images, photos, drawings, diagrams, and other illustrations, is copyright protected by the manufacturer. Unless expressly permitted, the dissemination and reproduction of this document, as well as the exploitation and disclosure of its contents, are strictly prohibited.

Publication date	Revision	Version	Reason for change	Scope of change
1 May 2024	00	00	New document	New document

The installation and operating manual, referred to as the manual in the following, must be kept near the product at all times and must always be in a legible condition.

The manual must be included if the product is sold or handed over to another party.

NOTICE	Observe the manual!
	This manual contains all basic information required to safely operate the product, and operators must read the manual before carrying out all work. Failure to follow the manual may cause risk to people and materials and may result in malfunctions and disruption to operations.

2. Safety

2.1 Use

The **ZL Drain 31 IF BI**, hereafter also referred to as the product or **ZL Drain**, is an electronically level-controlled condensate drain and is used to discharge condensate in pressurized systems. The **ZL Drain** discharges condensate under operating pressure without any pressure loss.

2.1.1 Intended use

Any other use besides that described in this manual is deemed improper and poses a risk to personnel and the environment.

The following must be observed for proper use:

- Read and observe this manual.
- Use the product and accessories indoors only.
- Only use the product and accessories within the operating parameters indicated in the technical data.
- Only use the product and accessories within the operating parameters specified in the “Technical data” section of this manual and in accordance with the terms of supply.
- Only use the product and the accessories with fluids free of caustic, aggressive, corrosive, toxic, flammable, oxidizing, and inorganic components. In case of doubt, analyze the media or accessories.
- Only use the product and accessories in an environment where at a maximum, only splash water may occur. The splash water must be free of corrosive components.
- Only use the product and accessories in areas that are free from toxic and corrosive chemicals and gases.
- Only use the product and accessories within a pipeline system designed for the operating parameters specified in section “4. Technical data” on page 19, with appropriate connections, pipe diameters and installation clearances.
- Only use the product and accessories outside of explosion hazard areas.
- Only use the product and accessories away from direct sunlight and heat sources, and outside of areas that may frost.
- Only combine the product and the accessories with the recommended products and components from the manufacturer indicated in this manual.
- Comply with the specified maintenance plan.

Before using the product and accessories, the operator must ensure that all conditions and requirements for ensuring proper use are available.

The product and accessories are designed only for stationary use in commercial or industrial areas. All of the assembly, installation, operation, maintenance, disassembly and disposal work described must be performed exclusively by qualified skilled technical personnel.

2.1.2 Foreseeable misuse

If the product or accessories are used in a manner other than as described in the “Intended use” section, this will be considered a case of foreseeable misuse. Foreseeable misuse includes using the product or accessories in a manner that is not intended by the manufacturer or suppliers but that may occur due to foreseeable human behavior.

Foreseeable misuse includes:

- Carrying out modifications of all kinds, especially constructive and process-related alterations.
- Disabling or failing to use available or recommended safety equipment.
- The use of the product and accessories in systems with carbon dioxide as the operating medium.

This list does not claim to be exhaustive, since it is not possible to indicate all possible misuses in advance. If the operator knows of misuses of the product or accessories that are not listed here, the manufacturer must be informed of these promptly.

2.2 Responsibility of the operator

The operator must ensure the following in order to avoid accidents, disruptions and environmental impacts:

- Before taking any action, check whether this manual belongs to the product.
- The product and accessories are used, maintained and serviced properly.
- The product and accessories are used only with recommended and functional safety equipment.
- All assembly work, installation work, and maintenance work is carried out exclusively by qualified skilled technical personnel.
- Personnel have the required personal protective equipment, and this equipment is used.
- Suitable technical safety measures are taken to ensure that the permissible operating parameters are observed.
- Keep all safety labels and the type plate on the product in legible condition. Replace damaged and illegible markings immediately.

2.3 Target group and personnel

This manual is intended for the personnel listed below who are involved in working on the product or its accessories.

INFORMATION	Personnel requirements
	Personnel may not undertake any actions involving the product or accessories if they are under the influence of drugs, medications, alcohol or other substances that may impair their perception.

Operating personnel

Operating personnel are persons who are able to safely operate the product and accessories through their knowledge of the manual and through instruction on the product and accessories. The operating personnel is able to recognize possible malfunctions and dangerous situations independently and to initiate appropriate measures.

Skilled technical personnel - Transport and storage

"Skilled technical personnel - Transport and storage" are personnel whose training, professional experience, and qualifications have provided them with all the skills necessary to safely complete any work associated with transportation, identify potential hazards independently, and take measures to prevent those hazards.

These skills include, in particular, experience handling hoists, forklifts, lifting equipment, and lifting devices, as well as familiarity with all regionally applicable regulations, standards and directives related to transportation and storage.

Skilled technical personnel specialized in pressure equipment and systems

"Skilled technical personnel specialized in pressure equipment and systems" refers to personnel whose training, professional experience, and qualifications have provided them with all the skills necessary to safely complete any work associated with pressurized fluids and systems, provide instructions, identify potential hazards independently, and take measures to prevent those hazards.

These skills include, above all, experience with the use of measuring equipment, control equipment, and regulation equipment, as well as familiarity with all regionally applicable regulations, standards, and directives for pressurized systems.

Skilled technical personnel - Trained electricians

"Skilled technical personnel - Trained electricians" refers to personnel whose basic and advanced training, professional experience, and qualifications have provided them with all the skills necessary to safely complete any work involving electricity, identify potential hazards independently, and take measures to prevent those hazards.

These skills include, in particular, experience handling electrical equipment, measuring equipment, control equipment, and regulation equipment, as well as familiarity with all regionally applicable regulations, standards, and directives (such as VDE 0100 / IEC 60364 / ATEX) for handling electrical equipment.

Skilled technical personnel - Service

"Skilled technical personnel - Service" are persons who have the skills and qualifications for all the aforementioned definitions concerning professional technicians. "Skilled technical personnel - Service" must be verifiably trained and authorized for all work on the product.

2.4 Explanation of the symbols used

The symbols used in the following indicate important and safety-related information that must be observed in handling the product and to ensure safe and optimal operation.

Symbol	Description / explanation
	General warning symbol (danger, warning, caution)
	Warning of pressurized system
	Warning of electrical voltage
	Observe the installation and operating manual
	General mandatory sign
	Wear safety shoes
	Wear protective gloves (cut-resistant and liquid-resistant)
	Wear safety glasses with side protection (goggles)
	General information

2.5 Safety instructions and warning notices

This section provides an overview of all important safety aspects for the protection of persons and for the safe and trouble-free operation of the product and accessories.

The following sections list the dangers that arise from this product and the accessories even when used as intended. To minimize the risk of personal injury and property damage and to avoid dangerous situations, observe the safety instructions listed and comply with the warning notices in the other sections of this manual.

Basic warnings and required qualifications of the technical personnel are listed at the beginning of each section in the section “Warning notices".

Action-specific warning notices are located directly before descriptions of potentially dangerous actions or action sequences.

2.5.1 Basic safety instructions

- Before starting work, consult the technical documents for the entire system and make sure to observe the general operating manual.
- Before starting work, carry out a last minute risk assessment.
- Use appropriate personal protective equipment for all work.
- A safe area must be set up around the work area during all installation, maintenance and repair work.
- Use existing system-specific lockout/tagout (LOTO) procedures in order to safely de-energize and isolate the system or system sections.

2.5.2 Safe operation

The following actions may result in serious injury or death:

- Starting up and operating the product and accessories outside the permissible limits and operating parameters
- Unauthorized tampering and unauthorized modifications to the product and accessories

To guarantee the safe operation of the product and accessories, observe the following:

- Observe the limits and operating parameters specified on the type plate and in the manual.
- Check whether operating parameters are changed or restricted through the use of permitted accessories.
- Observe the installation conditions and ambient conditions.
- Observe the maintenance intervals.

2.5.3 Sudden escape of pressurized fluids

The following situations may result in serious injury or death:

- Contact with fluids that escape quickly or abruptly
- Bursting system components
- Pressurized hose and pipe whipping as a result of disconnection

For the safe handling of pressurized systems, observe the following:

- Observe the following safety rules for all work:
  1. Shut down the system or system section.
  2. Secure the system or system section against restarting.
  3. Reduce the pressure in the system or all system sections to the ambient pressure.
  4. By slowly releasing the pressure in a controlled manner with relief valves, for example
- Lock out and tag out the system or system section so that it cannot be pressurized again.
- Check the system or system section for safety issues, contamination and possible damage.
- Before pressurization, check all system connections for leak tightness and retighten them if necessary.
- Make absolutely sure to charge the system or system section with pressure slowly.
- Avoid pressure surges and high pressure differentials.
- Compensate vibrations occurring in the pipeline network by using vibration dampers.

2.5.4 Electrical voltage

Contact with live components may result in serious personal injury or death.

To ensure the safe handling of live components, observe the following:

- Connect the product and accessories to a power supply only if they are in proper working order.
- Comply with all regionally applicable regulations and requirements during installation.
- The power supply must have a disconnect device that is easily accessible and close to the product.
  → This disconnect device must disconnect all live cables.
- Connect the equipment protective conductor (earthing) in accordance with applicable regulations.
- Only operate the product and accessories with a complete and closed cover, closed electronic housing, or closed control cabinet.
- Before starting work on the product:
  1. De-energize
     → Disconnect the product from all poles and all sides
  2. Lock out and tag out
  3. Check to make sure that the product is completely de-energized
     → With an appropriate and approved measuring device (e.g., two-pole voltage tester)
  4. Ground and short circuit

2.5.5 Transport and storage

Improper transport or storage can lead to personal injury or damage to property.

In order to ensure safety during the transport and storage of the product and accessories, observe the following:

- Use personal protective equipment for all work with packaging material.
- Handle the packaging of the product and the accessories with care.
- Transport and handle the product and accessories according to the labeling on the packaging.
- Only use transportation, hoisting and lashing equipment that is suitable and in proper working order.
- Only use transportation, hoisting and lashing equipment that is rated for the total weight of the product.
- Observe the permissible transport parameters and storage parameters.
- Do not store the product and accessories exposed to direct sunlight and heat sources.

2.5.6 Installation

The improper assembly or electrical installation of the product and accessories may result in personal injury and property damage and impair operation.

For safe assembly and electrical installation, observe the following:

- Mount the product, the accessories, all parts and materials used free of mechanical tension.
- Check all plug connections are correctly fitted.
- Avoid any risk of tripping by using appropriate cable guides and hose guides.
- Avoid mechanical stress on the cables.
- Fasten and fix all hoses in such a way that they cannot make any percussive movements.
- Securely pipe the inlet and drain lines.

2.5.7 Maintenance

Improper performance of maintenance and repair work can result in serious injury or death.

For safe maintenance and repairs, observe the following:

- Before starting work, bleed the pressurized product and accessories and lock them out so that they cannot be pressurized by accident.
- Before starting work, de-energize the product and the accessories and lock and tag them out.
- Only use materials approved for the respective application.
- Use only suitable tools in perfect condition.
- Only use cleaned pipes and hoses that are free of dirt and corrosion.
- Do not use abrasive or aggressive cleaning agents or solvents that could damage the external coating (e.g. labels, type plate, corrosion protection, etc.).
- Do not clean or operate the device with hard or pointed implements.
- Make sure to only use the specified materials and fluids for cleaning.
- Comply with all applicable hygiene regulations and regional and internal hygiene rules and standards.
- Ensure order and cleanliness during maintenance and repair work. Prevent impurities from penetrating into the opened product or accessories. Store dismantled components and accessories directly in a safe place.
- After completing maintenance and repair work, remove all tools and cleaning agents used, as well as all parts that are no longer needed, from the work area.
- Only dispose of the product and accessories once they have been cleaned and are free of any residual fluids.
- All components, assemblies, operating, auxiliary materials and cleaning agents must be disposed of appropriately and according to regional statutory specifications and provisions.
- Dispose of electrical and electronic components through a specialized disposal company or return them to the manufacturer.

2.5.8 Handling hazardous substances

Substances contained in the condensate that are hazardous to health and the environment can irritate and damage the skin, eyes and mucous membranes on contact. In addition, condensate contaminated with pollutants must not be allowed to enter the sewerage system, water bodies or the ground.

For the safe handling of polluted condensate, observe the following:

- Use suitable protective equipment when handling condensate.
- Collect and dispose of leaked or spilled condensate in accordance with the locally applicable legal requirements and regulations.

2.5.9 Work on electronic components

Electrostatic discharge (ESD) can cause damage to electronic components and result in malfunctions, disruption to operations, and damage to materials.

- Take proper measures to prevent electrostatic discharge (e.g., grounding, equipotential bonding, anti-static mats, etc.).

2.5.10 Use of spare parts, accessories or materials

The use of incorrect spare parts, accessories or materials, as well as auxiliary and operating materials, may pose a mortal danger or the danger of severe injuries. It may also result in malfunctions, disruption to operations, and damage to materials.

- Only use undamaged original parts, auxiliary and operating materials specified by the manufacturer in carrying out all work.
- Only use materials permitted for the specific purpose and suitable tools in proper condition.
- Only use cleaned pipelines free from dirt and corrosion.
- Only use electrical components and materials that comply with the regionally applicable legal requirements and regulations (standards, directives, etc.) for electrical safety.

2.6 Warning notices

Warning notices caution against dangers in handling the product and accessories.

Failure to observe warning notices may result in personal injury, damage to property, and impairment to operations.

Structural design:

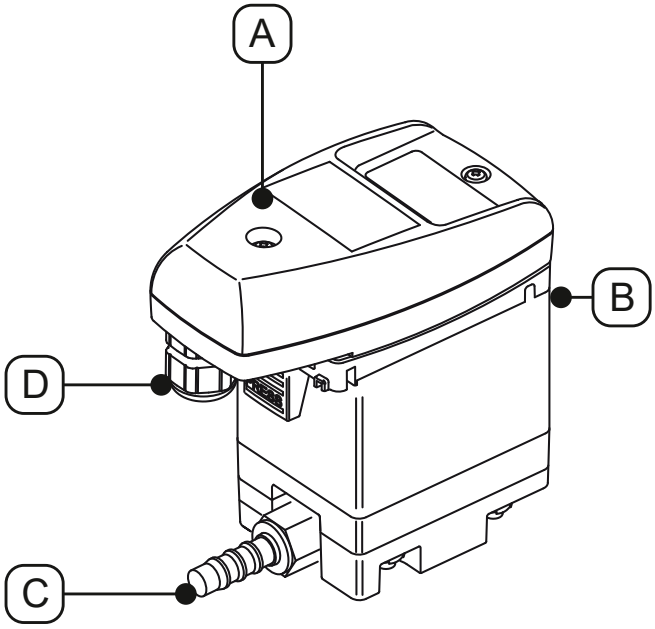
SIGNAL WORD	Type and source of danger
 Symbol	Possible consequences if the hazard is not observed • Measures to avoid the hazard

Signal words:

DANGER	**Imminent danger** Consequences of non-compliance: Death or severe personal injury
WARNING	**Imminent danger** Consequences of non-compliance: Death or severe personal injury are possible
CAUTION	**Potential danger** Consequences of non-compliance: Personal injury or damage to property is possible
NOTICE	**Additional information** Consequences of non-compliance: Property damage and disadvantages in operation are possible. No danger to personnel or safe operation.

3. Product information

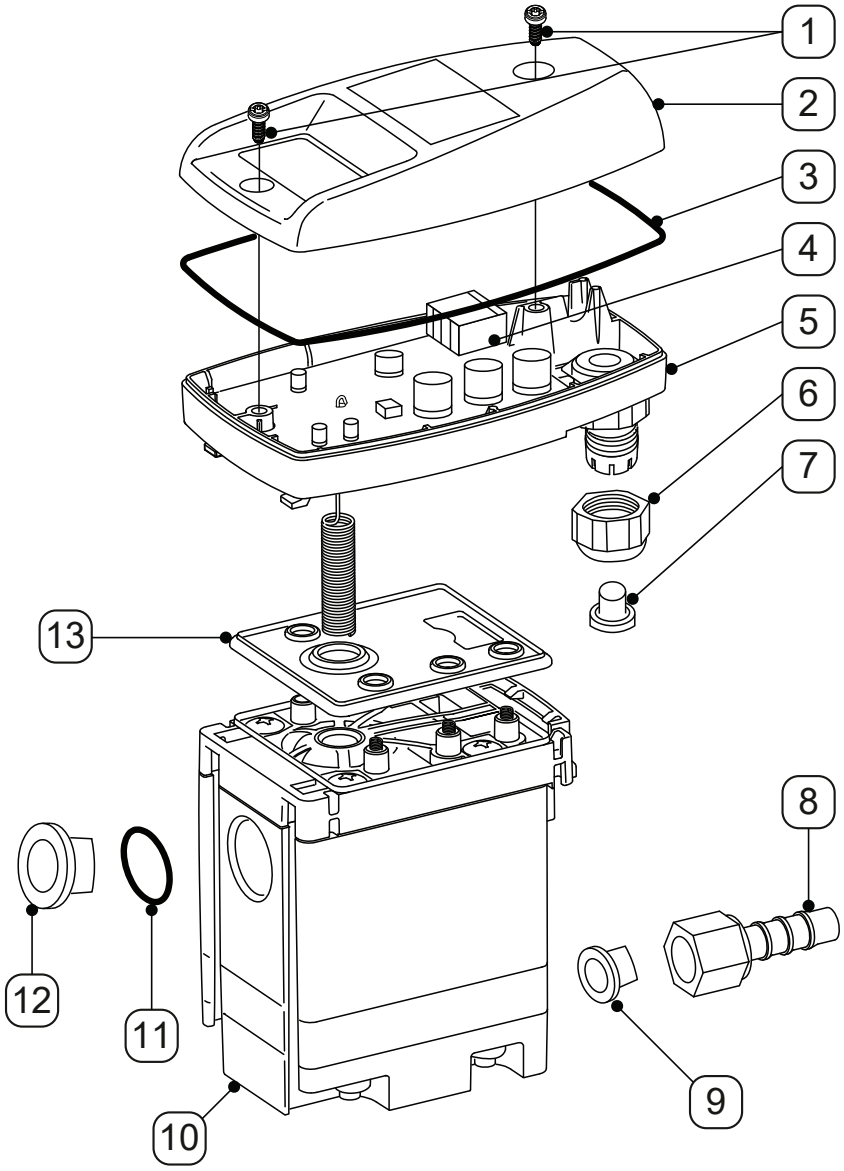
3.1 Product overview



Item	Description / explanation
[A]	Control unit, complete
[B]	Condensate inlet

Item	Description / explanation
[C]	Condensate drain
[D]	Cable gland

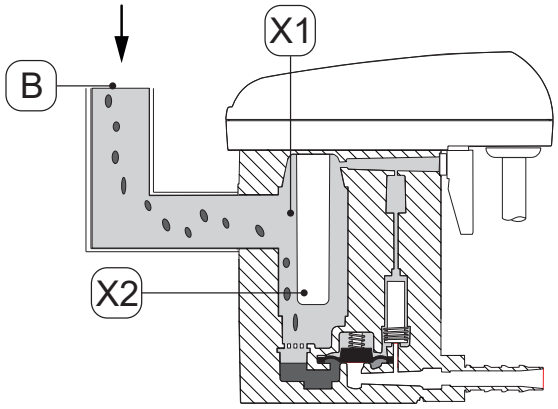
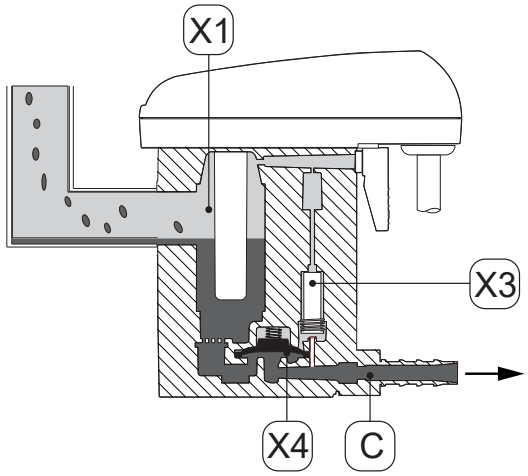
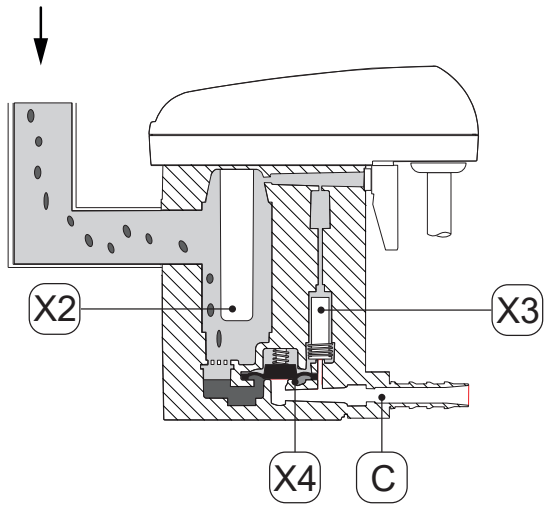
3.2 Exploded view



Pos. no.	Description / explanation
[1]	Screw, 0.138 x 0.394 in
[2]	Top cover
[3]	Molded seal
[4]	Sensor board
[5]	Bottom cover
[6]	Screw connection
[7]	Plug

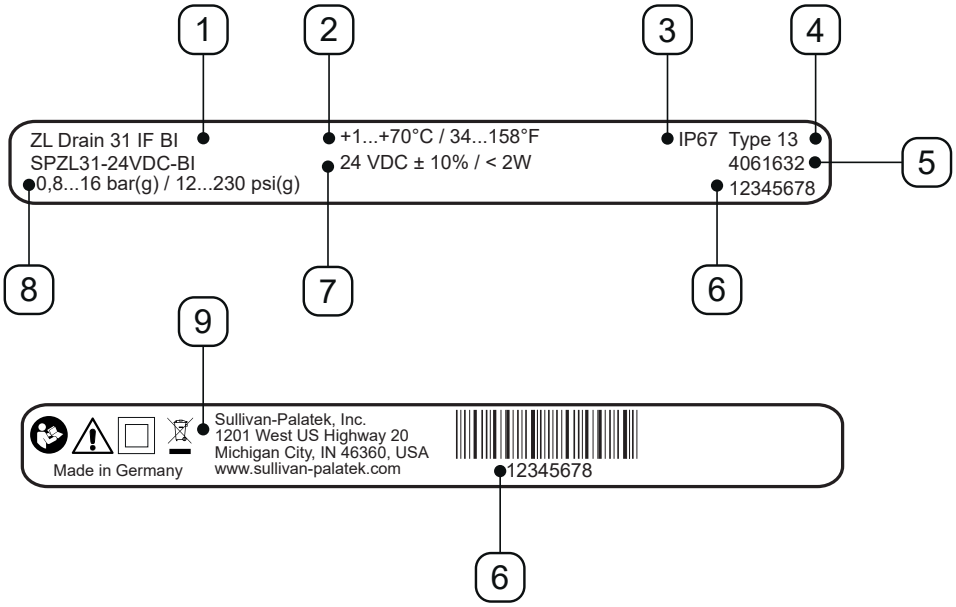
Pos. no.	Description / explanation
[8]	Barbed hose fitting
[9]	Tapered plug
[10]	Service-Unit
[11]	O-ring 0.787 x 0.079 in
[12]	G1/2" sealing plug
[13]	Sealing mat

3.3 How it works

Image	Description / explanation
	The condensate flows into the **ZL Drain** via the condensate inlet **[B]** and accumulates in the housing **[X1]**. The fill level in the housing **[X1]** is continuously monitored by a capacitive sensor in the sensor tube **[X2]**.
	As soon as the condensate has reached the maximum fill level, the pilot valve **[X3]** is switched via the control system. The pilot valve **[X3]** switches and the area above the membrane **[X4]** is vented. The membrane **[X4]** lifts off the valve seat and the overpressure in the housing **[X1]** forces the condensate into the condensate drain **[C]**.
	When the sensor in the sensor tube **[X2]** is no longer covered by condensate, the control switches the pilot valve **[X3]** and pressure builds up above the membrane **[X4]**. The membrane **[X4]** is pressed onto the valve seat and the condensate drain **[C]** is tightly closed. A switching cycle starts again with the supply of condensate.

3.4 Type plate

The type plate, which contains identification information and operating parameters for the product, is located on the bottom cover.



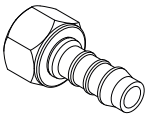
Example image

Pos. no.	Description / explanation
[1]	Product designation
[2]	Operating temperature
[3]	IP protection class
[4]	Enclosure rating
[5]	Material number
[6]	Serial number
[7]	Operating voltage
[8]	Operating pressure
[9]	Manufacturer

For more information, refer to section “2.4 Explanation of the symbols used” on page 8.

3.5 Scope of delivery

The following table shows the scope of delivery for the product:

Image	Description / explanation
	**ZL Drain 31 IF BI**
	Original installation and operating manual
	1 x nozzle

4. Technical data

4.1 Operating parameters

ZL Drain	31 IF BI
Relative ambient humidity	10 ... 80 %, without condensate formation
Maximum operating height	3280.84 yd 3000 m
Min. / max. operating pressure	12 ... 230 psi(g) 0,8 ... 16 bar(g)
Min. / max. operating temperature	+34 ... +158 °F +1 ... 70 °C
Average discharge rate	0.17 gal/h 0,63 l/h
Maximum discharge rate (short-time)	1.45 gal/h 5,5 l/h
Condensate inlet port*	1 x G1/2", female, maximum screw-in depth: 1/2 in (13,5 mm)
Condensate drain port	1 x G1/4", male, barbed hose fitting for inside hose diameter of 0.31 ... 0.39 in (8 ... 10 mm)
Fluids	Condensate, oily or oil-free
Empty weight	1.32 lbs 0,6 kg
Operating voltage	24 VDC ±10% (see type plate)
Power consumption	0.6 ... 3 VA (W)
Degree of protection	IP67
Enclosure rating	Type 13
Overvoltage category (IEC 61010-1)	II
Degree of pollution (IEC 61010-1)	2
Recommended cable diameter	0.23 ... 0.33 in 5 ... 10 mm
Recommended wire cross-section	AWG 18 ... 24 0.25 ... 1 mm²
Recommended cutting of the cable sheath	~ 1.97 in ~ 50 mm
Recommended stripping length for cable wires	~ 0.24 in ~ 6 mm

* NPT thread version is available as an option.

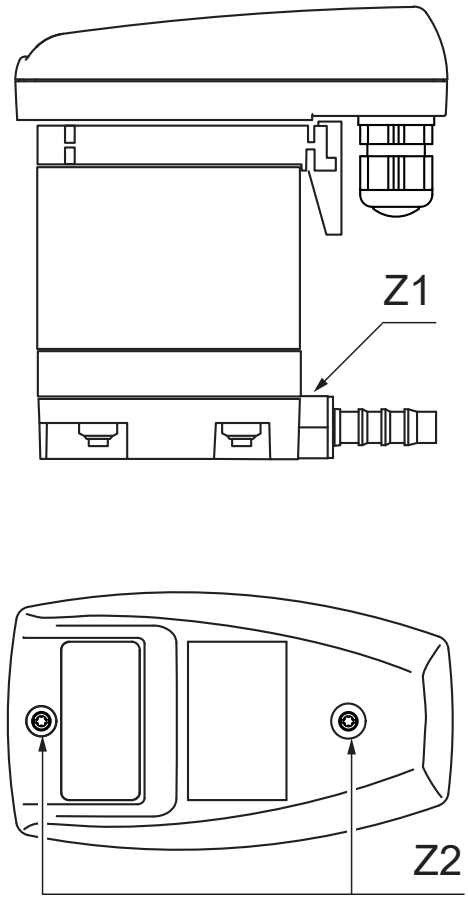
4.2 Storage and transport parameters

ZL Drain	31 IF BI
Minimum / maximum temperature, storage and transport	+34 ... +158 °F +1 ... +70 °C

4.3 Materials

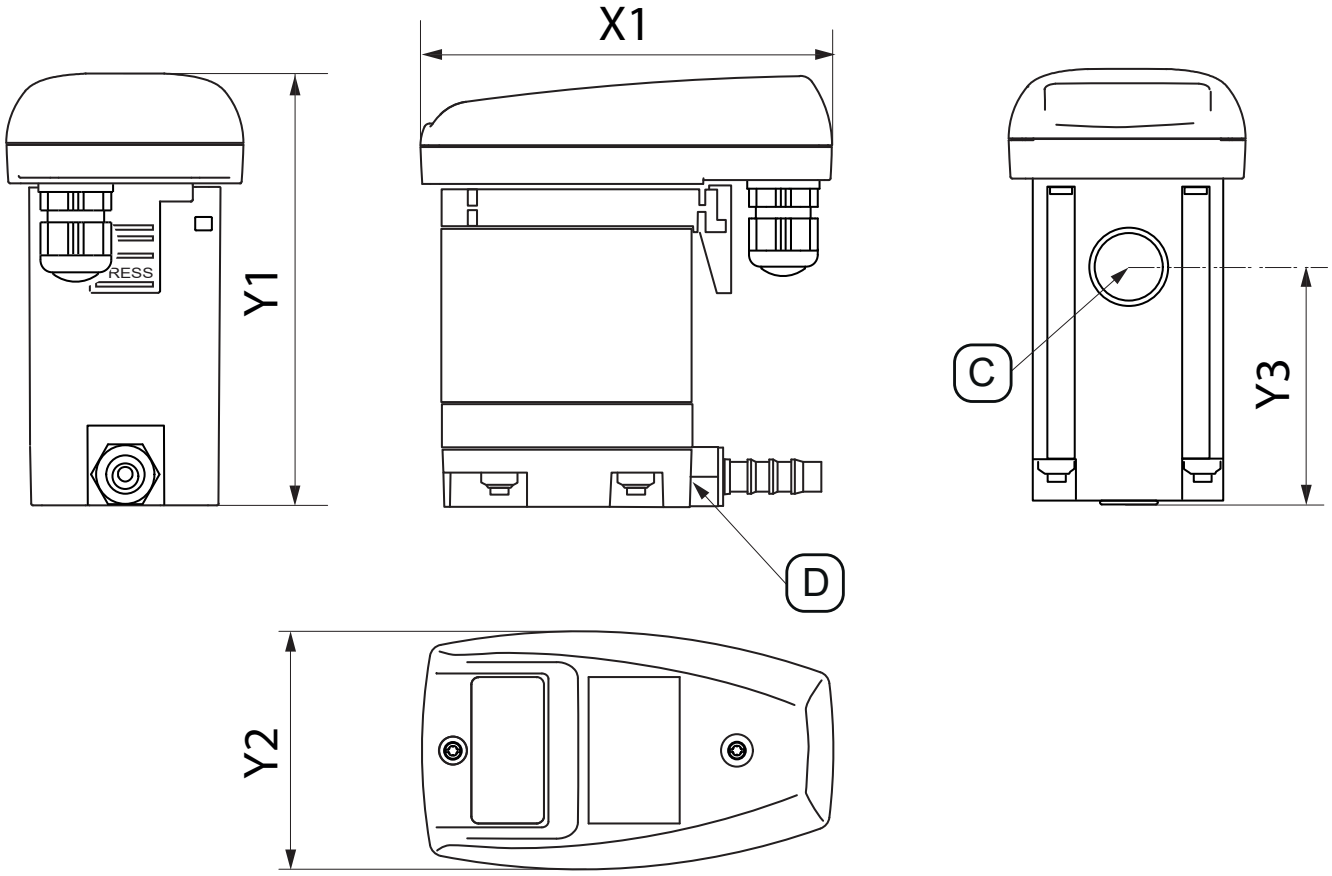
ZL Drain	31 IF BI
Housing	Aluminum and plastic, glass fiber reinforced
Membrane	FKM

4.4 Screw tightening torques



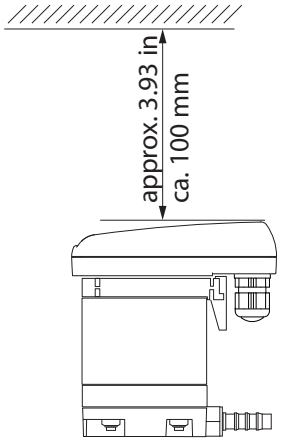
Pos. no.	Description / explanation	Tightening torques
[Z1]	Barbed hose fitting, condensate drain	2.21 ... 2.95 ft-lb (3 ... 4 Nm)
[Z2]	Screws, top cover	0.66 ft-lb +0.37 ft-lb (0.9 Nm +0.5 Nm)

4.5 Dimensions

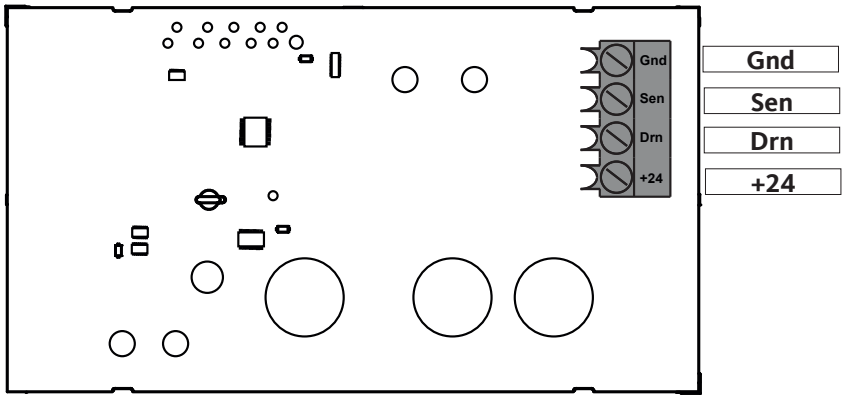


Pos. no.	ZL Drain 31 IF BI
[X1]	4.45 in 113 mm
[Y1]	4.65 in 118 mm
[Y2]	2.56 in 65 mm
[Y3]	2.46 in 62,5 mm
[C] - Condensate inlet port	G 1/2 (NPT1/2")
[D] - Condensate drain port	G1/4" dia 0.32 - 0.39 (Ø 8-10)

4.6 Installation dimensions

Image	Description / explanation
	During installation, leave sufficient mounting space above the top cover so that the LEDs are visible and the TEST button can be actuated.

4.7 Terminal diagram

Abbildung


5. Transport and storage

WARNING	Insufficient qualification
	If personnel have insufficient qualifications, this may result in accidents, personal injury and property damage as well as operating disruptions while working on the product or its accessories.
	• The work on the product and accessories described in the following may only be carried out by transportation and storage skilled technical personnel and must be documented.

CAUTION	Improper transportation or storage
 	Improper transportation or storage may result in personal injury.
	• Use personal protective equipment for all work with packaging material. • Handle the packaging of the product and the accessories with care. • Transport and handle the product and accessories according to the labeling on the packaging. • Only use transportation, hoisting and lashing equipment that is suitable and in proper working order. • Only use transportation, hoisting and lashing equipment that is rated for the total weight of the product. • Observe the permissible transport parameters and storage parameters. • Do not store the product and accessories exposed to direct sunlight and heat sources.

NOTICE	Handling packaging materials
	The improper disposal of packaging materials may result in environmental damage.
	• Dispose of the packaging material in accordance with the applicable legal requirements and regulations of the country of use.

5.1 Transport

Check the product after transport and after removing the packaging material for possible transit damage. If you detect any such damage, immediately notify the carrier company and the manufacturer or one of its agents.

Transport the product as follows:

- Only transport the product in its original packaging.
- Handle the packaging and the product carefully.
- Observe the transport weight information and markings on the packaging.
- Secure the packaging and the product against slipping and falling during transport.

5.2 Storage

Store the product and accessories as follows:

- Observe the storage parameters in section “4.2 Storage and transport parameters” on page 20.
- Store in a closed, dry and frost-free room.
- Store away from external weather conditions, direct sunlight and heat sources.
- Secure against falling over and vibrations at the storage location.

6. Installation

6.1 Warning notices

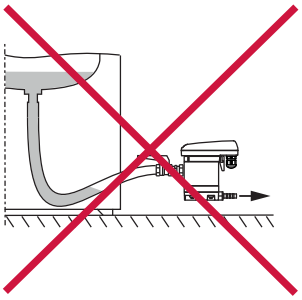
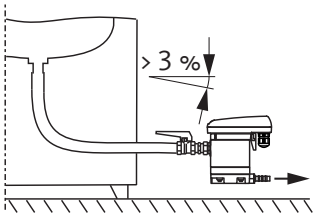
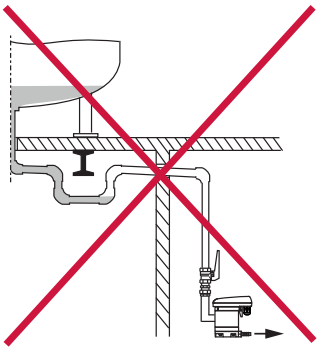
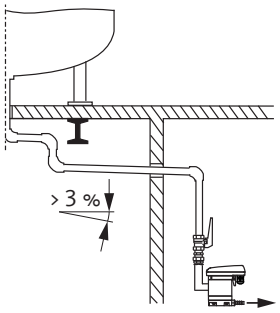
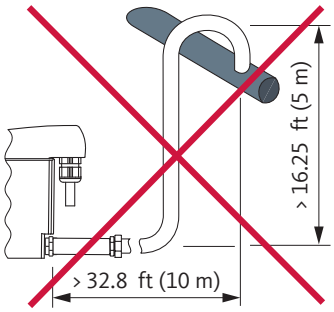
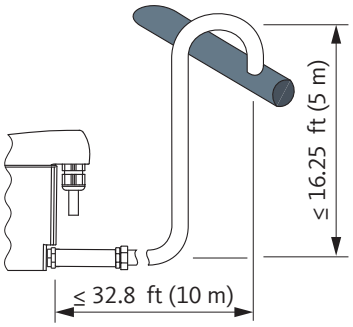
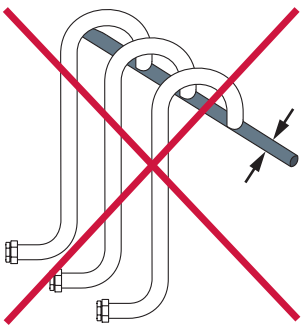
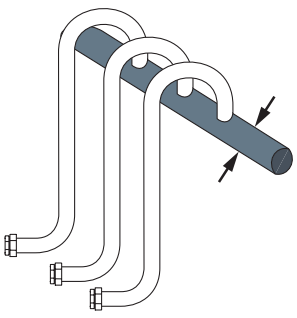
DANGER	Use of incorrect replacement element, accessories or materials
	The use of incorrect spare parts, accessories or materials, as well as auxiliary and operating materials, may pose a mortal danger or the danger of severe injuries.
	• Only use undamaged original parts, auxiliary and operating materials specified by the manufacturer in carrying out all work. • Only use materials permitted for the specific purpose and suitable tools in proper condition. • Only use pipelines free from dirt, damage and corrosion.

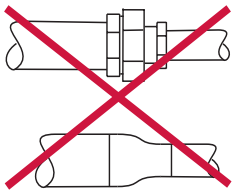
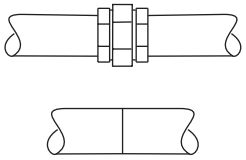
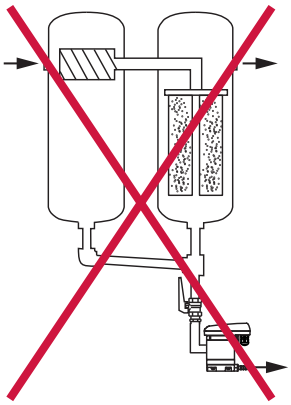
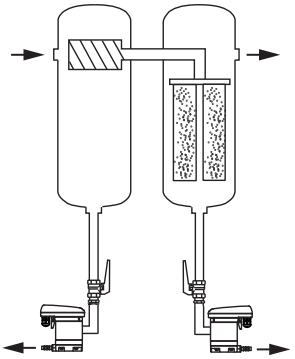
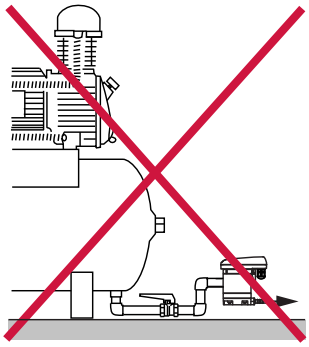
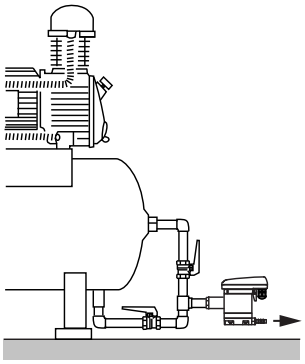
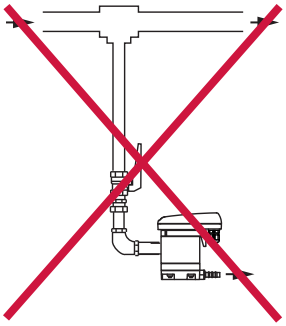
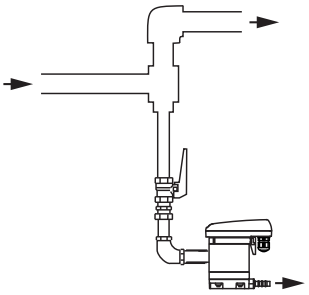
DANGER	Sudden escape of pressurized fluids
	Bursting system parts or contact with rapidly or suddenly escaping fluids can result in death or serious injury.
	• Before starting work, bleed the pressurized system and secure it against unintentional pressurization. • A safe area must be set up around the work area during all assembly, installation, maintenance and repair work. • Assemble all pipes and hoses free of mechanical stress. • Before pressurization, check all system connections for leak tightness and retighten them if necessary. • Pressurize the system slowly. • Avoid pressure surges and high pressure differentials.

WARNING	Insufficient qualification
	If personnel have insufficient qualifications, this may result in accidents, personal injury and property damage as well as operating disruptions while working on the product or its accessories.
	• All work on the product and accessories must be carried out exclusively by skilled technical personnel specialized in pressure equipment and systems.

WARNING	Improper installation
	Improper assembly of the product and accessories can result in personal injury.
	• Mount the product, the accessories, all parts and materials used free of mechanical tension. • Fasten and fix hoses in such a way that they cannot make any percussive movements.

6.2 Installation conditions

Incorrect	Correct	Description / explanation
		**Continuous slope > 3 % in hose lines** • Ensure a continuous slope > 3% when using hoses as inlet lines. • Make sure that no water pockets form.
		**Continuous slope > 3 % in pipe lines** • Ensure a continuous slope of > 3 % when piping the inlet lines. • Make sure that no water pockets form.
		**Drain line characteristics** • Do not use shut-off valves in the drain line. • Connect the **ZL Drain** only with a hose to the drain line. → The hose will compensate for assembly tolerances, vibrations, and thermal expansion. • Do not install the drain line on storage areas or transport areas. • The drain line can have a maximum length of 32.8 ft (10 m) and be routed a maximum of 16.25 ft (5 m) upwards. → The minimum operating pressure increases by 1.5 psi(g) (0,1 bar(g)) for each meter of slope.
		**Collecting line characteristics** • The cross-section of the collecting lines must be at least equal to the sum of the individual cross-sections of the connected inlet lines. • Install the collecting line with a continuous slope > 3 %.

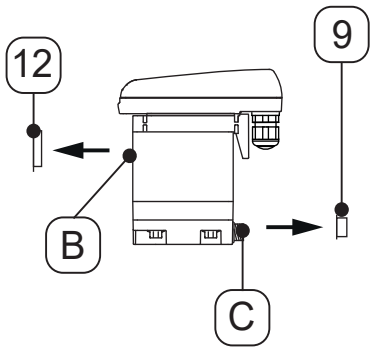
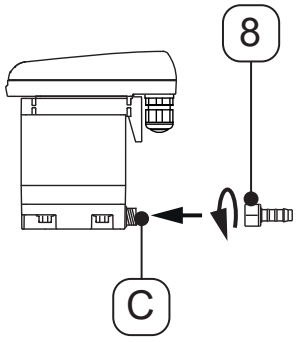
Incorrect	Correct	Description / explanation
		**Maintain the minimum pipe diameter** • The minimum inner diameter for the inlet line and the drain line is 0.5 in (13 mm). • Do not restrict or reduce the (minimum) pipe diameter with reducers (reducing nipples).
		**Bypassing filters** • Drain each condensate accumulation point separately with a **ZL Drain**. • Do not create filter bypasses.
		**Ensure venting** • In the event of insufficient slope in the inlet or other inlet problems, install a vent line.
		**Discharge from pressurized pipelines** • By diverting the gas flow, create a deflecting surface for the discharge of the liquid components in the gas.

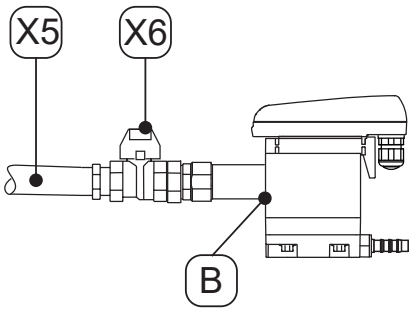
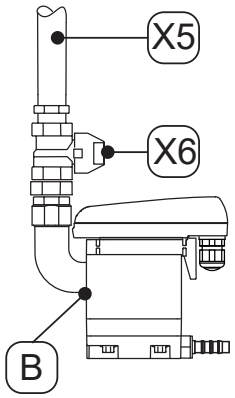
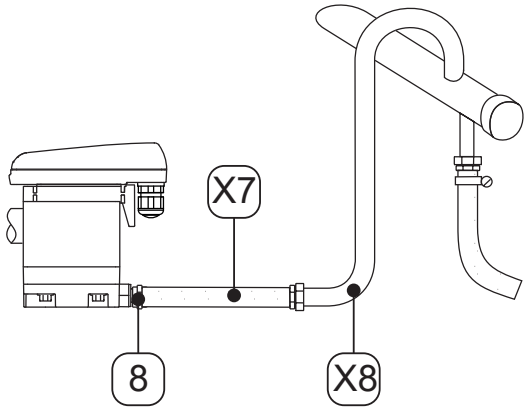
6.3 Installation work

The following prerequisites must be met before carrying out assembly work, and all preparation work must be completed first.

Preconditions		
Tool	**Material**	**Protective equipment**
• Open-end wrench or adjustable wrench	• Sealing materials e.g. PTFE • Inlet line • Drain line • Hose, inside diameter of 0.31 to 0.39 in (8 to 10 mm), approx. length of 1 ft (30 cm)	**To be worn at all times:** 

Preparatory work	
1.	Depressurize the pressurized system or the corresponding system section and secure it against unintentional pressurization.

Installation work	
Image	**Description / explanation**
	1. Remove the plugs **[9, 12]** from the condensate inlet **[B]** and condensate drain **[C]**.
	2. Screw the supplied barbed hose fitting **[8]** onto the condensate drain **[C]**. 3. Tighten the barbed hose fitting **[8]** with a torque of 2.21 ... 2.95 ft-lb (3 ... 4 Nm).

Installation work	
Image	**Description / explanation**
	**Recommendation:** 4. To allow easy maintenance of the product, install a shut-off valve **[X6]** in the condensate inlet line **[X5]**. 5. For the condensate inlet line **[X5]**, seal the end of a pressure-resistant pipe and screw it in at the condensate inlet **[B]**.
	
	6. For the condensate drain, push the hose **[X7]** provided onto the barbed hose fitting **[8]** and fasten it with a hose clamp. 7. Connect the other end of the hose **[X7]** to the condensate drain line **[X8]**.

7. Electrical installation

7.1 Warning notices

DANGER	Use of incorrect replacement element, accessories or materials
	The use of incorrect spare parts, accessories or materials, as well as auxiliary and operating materials, may pose a mortal danger or the danger of severe injuries.
	• Only use undamaged original parts, auxiliary and operating materials specified by the manufacturer in carrying out all work. • Only use materials permitted for the specific purpose and suitable tools in proper condition. • Only use electrical components and materials that comply with the regionally applicable legal requirements and regulations for electrical safety.

DANGER	Electrical voltage
	Components in contact with electrical voltage may pose a mortal danger or the danger of severe injuries.
	• Always disconnect the product and accessories from the power and secure them against unintentional restart before commencing any installation, maintenance or repair work on them. • A safe area must be set up around the work area during all installation, maintenance and repair work. • Comply with all regionally applicable regulations and requirements during installation. • The power supply must have a disconnect device that is easily accessible and close to the product. This disconnect device must disconnect all live cables. • Connect the protective conductor (earthing) according to regulations.

WARNING	Insufficient qualification
	Allowing insufficiently qualified personnel to work on the product or accessories may lead to accidents and personal injury.
	• All work on the product and accessories may only be carried out by qualified electricians.

CAUTION	Improper electrical installation
	Improper electrical installation of the product and accessories can lead to personal injury and property damage as well as impairments in operation.
	• Check all plug connections are correctly fitted. • Avoid danger of tripping by routing the cables accordingly. • Avoid mechanical stress on the cables.

WARNING	Ingress of moisture or foreign objects!
	Removing components or opening the product can result in water or foreign objects entering the opened product. The ingress of water or foreign objects can result in accidents, personal injury and property damage, and problems during operation.
	• Protect the product from splash water and moisture. • Only open the product and/or remove components in a dry place. • Do not introduce any foreign objects into the product's openings. • Keep all contact surfaces and openings free of impurities and moisture.

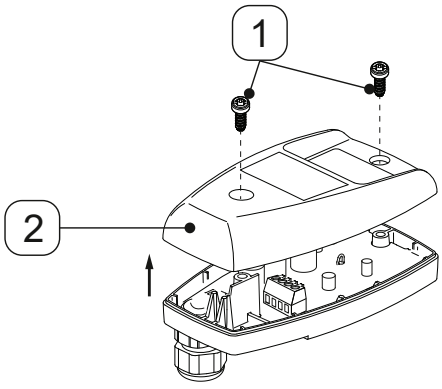
7.2 Connection work

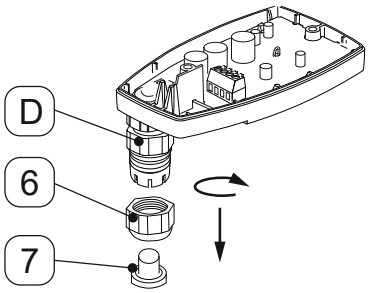
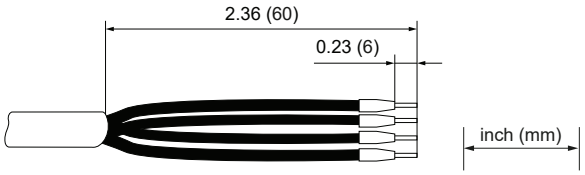
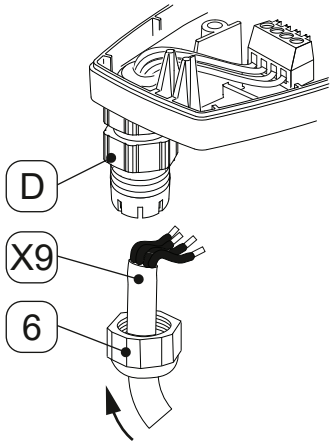
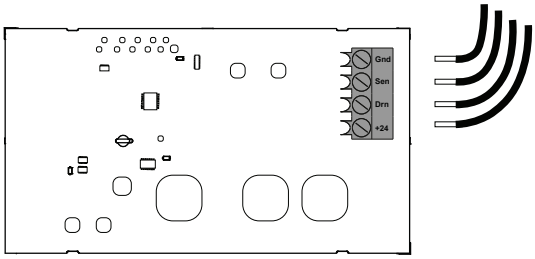
The following requirements must be fulfilled to carry out connection work and preparatory work must be completed.

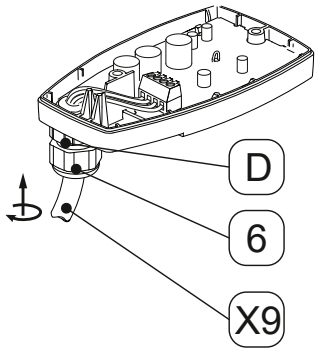
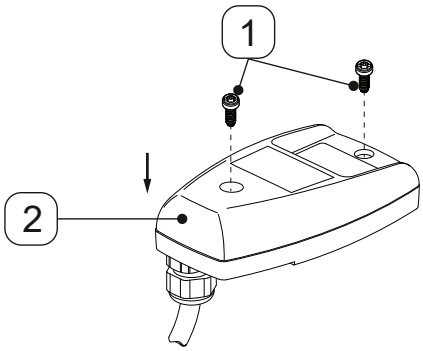
Preconditions		
Tool	**Material**	**Protective equipment**
• Stripping tool • Crimping pliers for connecting lines • Screwdriver - Flathead size 0.09 in (2.5 mm) • Torx screwdriver – T15	• 2-wire cable for 230 V power supply • 2-wire cable for 24 V power supply • Connecting lines	**To be worn at all times:** 

Preparatory work	
1.	The installation is completed.

7.2.1 Power supply connection

Connection work	
Image	**Description / explanation**
	1. Remove the 2 screws **[1]**. 2. Lift the top cover **[2]**.

Connection work	
Image	**Description / explanation**
	3. Unscrew the locknut **[6]** from the cable fitting **[D]**. 4. Remove the plugs **[7]** from the locknut **[6]**.
Connection cable **[X9]** 	5. Prepare the connection cable **[X9]**.
	6. Insert the locknut **[6]** over the connection cable **[X9]**. 7. Insert the connection cable **[X9]** into the cable fitting **[D]**.
Connection cable **[X9]** 	8. Connect the connection cable **[X9]** according to the terminal diagram (see “4.7 Terminal diagram” on page 22).

Connection work	
Image	**Description / explanation**
	9. Tighten the connection cable **[X9]**. 10. Screw the locknut **[6]** onto the cable fitting **[D]**.
	11. Put the top cover **[2]** in place and insert the screws **[1]**. 12. Tighten the screws **[1]** with a torque of 0.66 ft-lb +0.37 ft-lb (0.9 Nm +0.5 Nm).

8. Commissioning

8.1 Warning notices

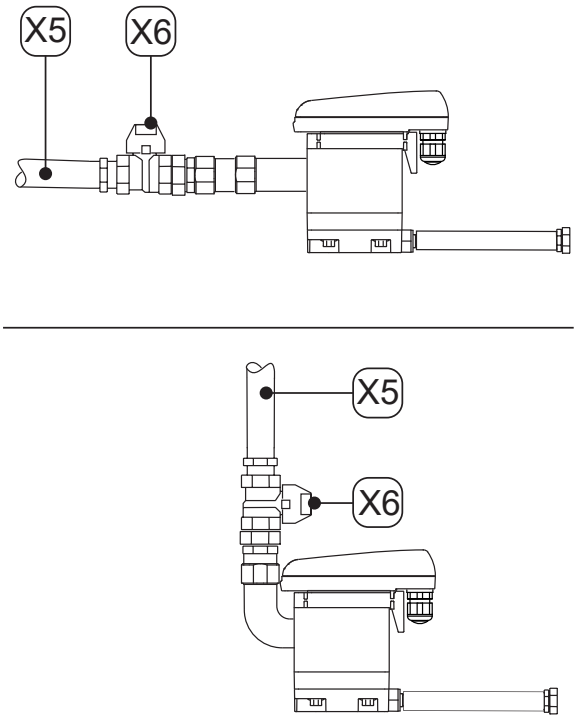
DANGER	Operating outside of permitted limit values
	Operating the product and accessories outside of the permitted limit values and operating parameters, unauthorized modifications and changes may pose a mortal hazard or the danger of severe injuries.
	• Observe the limit values and operating parameters specified on the type plate and in the instructions. • Check whether operating parameters are changed or restricted through the use of accessories.

DANGER	Sudden escape of pressurized fluids
	Bursting system parts or contact with rapidly or suddenly escaping fluids can result in death or serious injury.
	• Before pressurization, check all system connections for leak tightness and retighten them if necessary. • Pressurize the system slowly. • Avoid pressure surges and high pressure differentials.

DANGER	Electrical voltage
	Contact with electrically live components may result in death or serious injury, as well as malfunctions, disruption to operations, or damage to materials.
	• Only operate the product and accessories with a complete and closed cover, closed electronic housing, or closed control cabinet. • Check the product and accessories before placement into operation in accordance with all regionally applicable regulations.

WARNING	Insufficient qualification
	Allowing insufficiently qualified personnel to work on the product or accessories may lead to accidents and personal injury.
	• All work on the product and accessories must be carried out exclusively by skilled technical personnel specialized in pressure equipment and systems and trained electricians.

8.2 Commissioning work

Image	Description / explanation
	1. Establish power supply. 2. Slowly pressurize the system section (e.g., slowly open the recommended shut-off valve **[X6]** in the condensate inlet line **[X5]**). 3. Perform a function test (see “10.3.2 Function test” on page 42).

9. Operation

9.1 Warning notices

DANGER	Operating outside of permitted limit values
	Operating the product and accessories outside of the permitted limit values and operating parameters, unauthorized modifications and changes may pose a mortal hazard or the danger of severe injuries.
	• Observe the limit values and operating parameters specified on the type plate and in the instructions. • Observe the installation conditions and ambient conditions. • Check whether operating parameters are changed or restricted through the use of accessories. • Observe the maintenance intervals.

DANGER	Electrical voltage
	Components in contact with electrical voltage may pose a mortal danger or the danger of severe injuries.
	• Only operate the product and accessories with a complete and closed cover, closed electronic housing, or closed control cabinet.

NOTICE	Operating personnel
	Inadequate knowledge of the product and its accessories can lead to material and environmental damage as well as disruptions in operation due to incorrect operation.
	• The product and accessories may only be operated and handled by qualified operating personnel.

10. Maintenance

10.1 Warning notices

DANGER	Sudden escape of pressurized fluids
	Bursting system parts or contact with rapidly or suddenly escaping fluids can result in death or serious injury.
	• Before starting work, bleed the pressurized system and secure it against unintentional pressurization. • A safe area must be set up around the work area during all assembly, installation, maintenance and repair work. • Assemble all pipes and hoses free of mechanical stress. • Before pressurization, check all system connections for leak tightness and retighten them if necessary. • Pressurize the system slowly. • Avoid pressure surges and high pressure differentials.

DANGER	Electrical voltage
	Components in contact with electrical voltage may pose a mortal danger or the danger of severe injuries.
	• Do not carry out maintenance and repair work on the product unless it has first been de-energized and locked and tagged out. • Establish a safe area around the work area for all maintenance and repair work. • Comply with all regionally applicable regulations and requirements during installation. • Only operate the product and accessories with a complete and closed cover, closed electronic housing, or closed control cabinet.

DANGER	Use of incorrect replacement element, accessories or materials
	The use of incorrect spare parts, accessories or materials, as well as auxiliary and operating materials, may pose a mortal danger or the danger of severe injuries.
	• Only use undamaged original parts, auxiliary and operating materials specified by the manufacturer in carrying out all work. • Only use electrical components and materials that comply with the regionally applicable legal requirements and regulations (standards, directives, etc.) for electrical safety. • Only use materials permitted for the specific purpose and suitable tools in proper condition. • Only use cleaned pipelines free from dirt and corrosion.

WARNING	Insufficient qualification
	If personnel have insufficient qualifications, this may result in accidents, personal injury and property damage as well as operating disruptions while working on the product or its accessories.
	• All work on the product and accessories may only be carried out by qualified service technicians.

DANGER	Water coming into contact with live parts
	Water contact with live parts may result in death or serious injury. It may also result in malfunctions, disruption to operations, and damage to materials.
	• Protect the product from splash water and moisture. • Do not clean the product using pressure washers or steam jet cleaners.

10.2 Maintenance plan

Maintenance	Interval
Change the Service-Unit	After 2 x 8760 operating hours or 1 million switching cycles*; at the latest every 2 years
Cleaning	Annually
Function test	Monthly
Visual inspection	Weekly
Leak test	After installation work, maintenance work and servicing work on the product

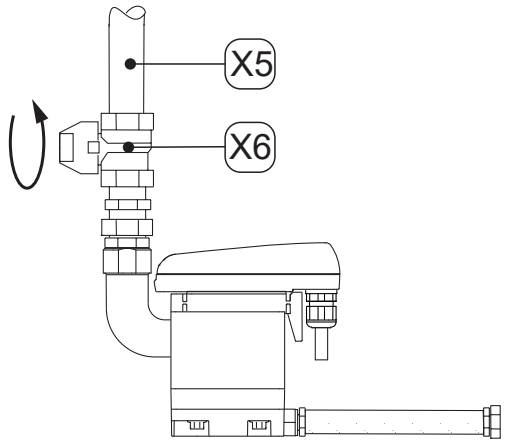
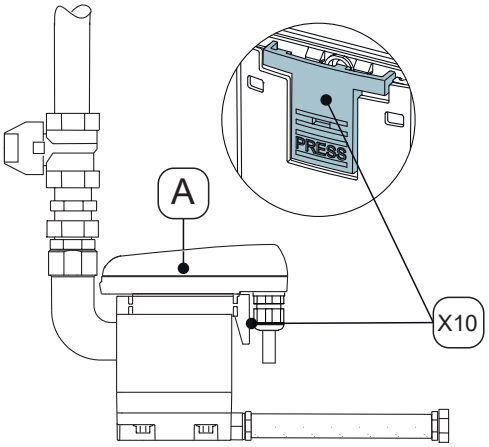
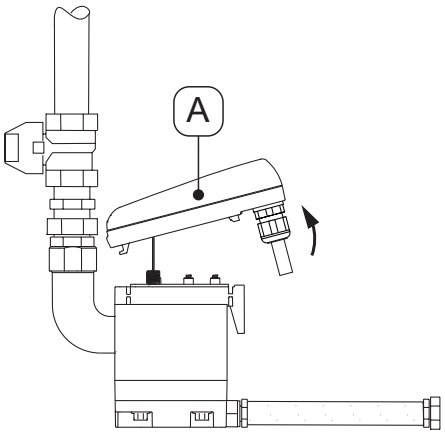
* based on 101.5 psi(g) (7 bar(ü)) and pH-neutral condensate

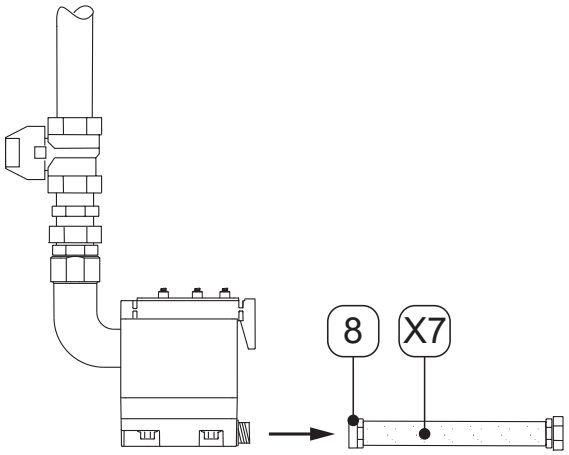
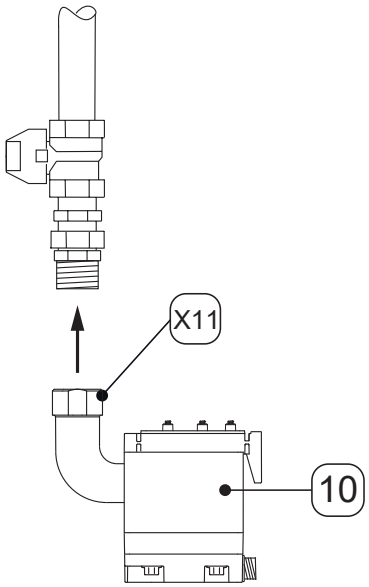
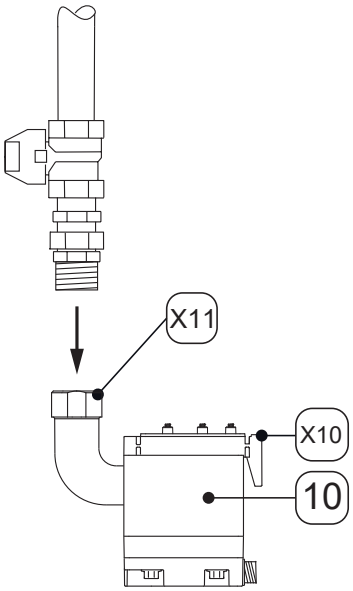
10.3 Maintenance work

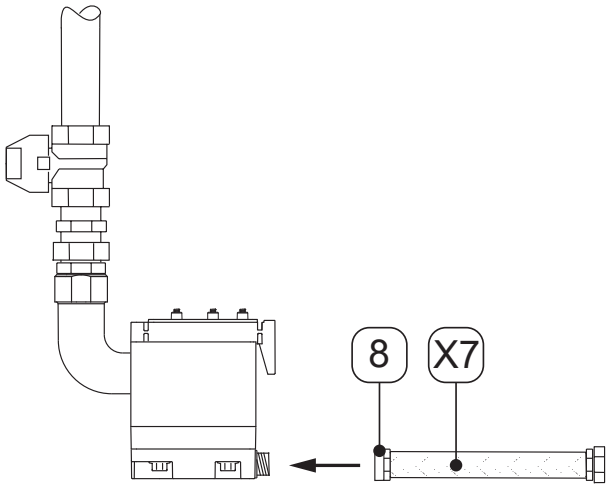
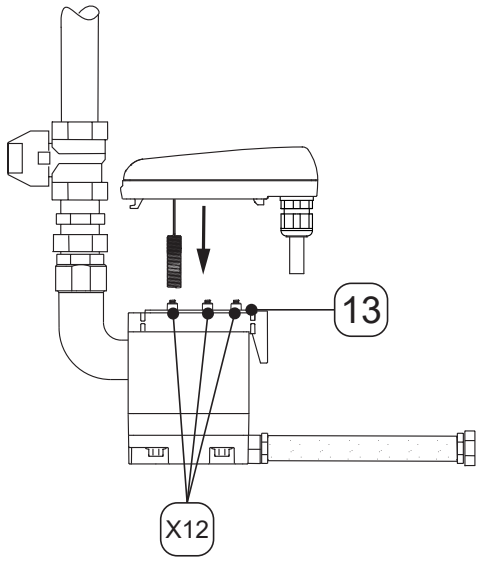
The following requirements must be fulfilled to carry out maintenance work and preparatory work must be completed.

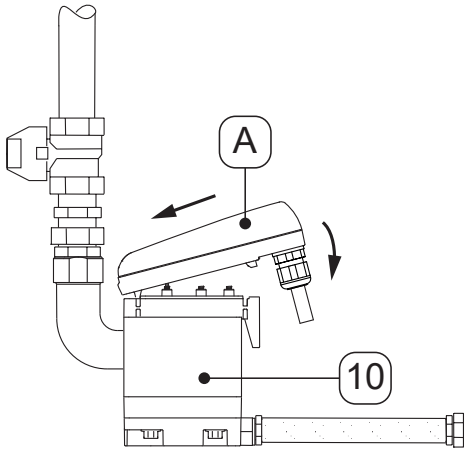
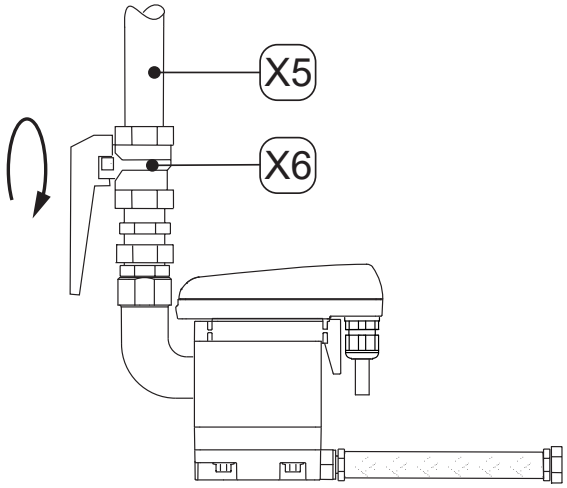
Preconditions		
Tool	**Material**	**Protective equipment**
• Screwdriver - Flathead size 0.09 in (2.5 mm) • Open-end wrench or adjustable wrench	• Sealants • Lubricant for greasing the O-rings • Mild cleaning agent • Cotton cloth or disposable cloth	**To be worn at all times:** 

10.3.1 Service-Unit change

Replacement work	
Image	**Description / explanation**
	1. Shut off the condensate supply through the condensate inlet line **[X5]** (e.g., close the recommended shut-off valve **[X6]**).
	2. Release the control unit **[A]** by pressing the latching tab **[X10]**.
	3. Remove the control unit **[A]**.

Replacement work	
Image	**Description / explanation**
	4. Loosen the barbed hose fitting **[8]** with the hose **[X7]**.
	5. Remove the Service-Unit **[10]** from the pipework at the condensate inlet by loosening the union nut **[X11]**. 6. Dispose of the old Service-Unit properly (see “14. Disposal” on page 48).
	7. Check whether the new Service-Unit **[10]** fits the control unit **[A]**: → Type designation → The color of the latching tab **[X10]** is identical to the color of the control unit. 8. Pipe the new Service-Unit **[10]** to the condensate inlet. 9. Tighten the union nut **[X11]**.

Replacement work	
Image	**Description / explanation**
	10. Mount the barbed hose fitting **[8]** with the hose **[X7]**.
	11. Check that the sealing mat **[13]** with the contact springs **[X12]** is clean, dry, and free of foreign objects. 12. Insert the sensor of the control unit **[A]** into the sensor tube opening.

Replacement work	
Image	**Description / explanation**
	13. Insert the hook of the control unit **[A]**. 14. Press the control unit **[A]** against the Service-Unit **[10]** and snap it into place.
	15. Perform a leak test on all screw connections. 16. Carefully open the condensate supply through the condensate inlet lines **[X5]** (e.g., open the recommended shut-off valve **[X6]**).

10.3.2 Visual inspection

During the visual inspection of the product, check all components for mechanical damage and corrosion. Replace damaged components immediately.

10.3.3 Leak test

The leak test is a non-destructive testing method and is used to prove the leak tightness of vacuum and overpressurized systems. The leak test can be completed in different ways. The manufacturer does not recommend any specific method over another. The selection and determination of the test procedure is the responsibility of the company operating the pressurized system and must be carried out in conformity with the applicable standards and guidelines (e.g., DIN EN 1779).

10.3.4 Cleaning

CAUTION	Risk of personal injury through improper use of cleaning agents
	Improper use cleaning agents may result in minor injuries and damage to health.
	• Never clean the device with a wet cloth. • Do not clean the product using a pressure washer. • Do not use abrasive or aggressive cleaning agents or solvents that could damage the external coating (e.g. labels, type plate, corrosion protection, etc.). • Do not clean or operate the device with hard or pointed implements. • Use an antistatic, damp cloth for external cleaning. • Replace illegible product labels (pictograms, designations) promptly. • Use personal protective equipment. • Use cleaning agents in accordance with the manufacturer's instructions.

NOTICE	Observe the local hygiene regulations
	In addition to the cleaning instructions listed, any regionally applicable or company-specific hygiene regulations must be observed.

Preparatory work	
1.	Decommissioning is completed.

Cleaning work	
1.	Spray mild cleaning agent onto a cotton cloth or disposable cloth until it is damp (not wet).
2.	Wipe the surfaces of the product with the damp cloth.
3.	Put the product into operation.

11. Consumables, accessories and spare parts

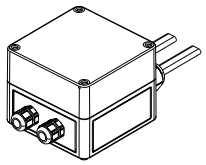
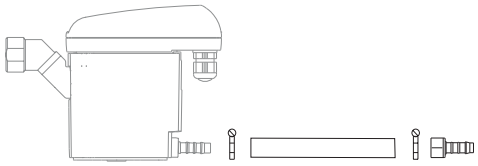
11.1 Order information

The manufacturer's service staff will need the following information for an inquiry or order:

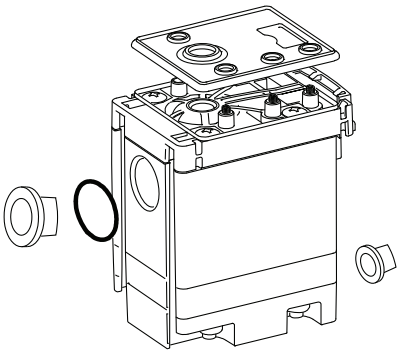
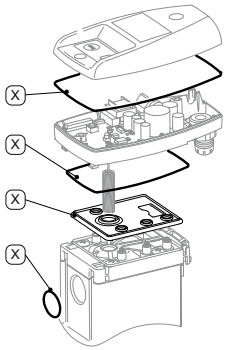
- Serial number (see type plate)
- Material number and designation of the accessory or spare part
- Desired number of accessories or spare parts to be supplied

The contact information for the manufacturer's service department is listed in section "1.1 Contact" on page 4.

11.2 Accessories

Image	Description / explanation	Material no.
	Pipe trace heating 230 VAC	on demand
	Drain kit	on demand

11.3 Spare parts

Image	Description / explanation	Material no.
	**ZL Drain 31 S-unit**	on demand
	Sealing kit (includes the components marked with an **[X]**)	on demand

12. Decommissioning

12.1 Warning notices

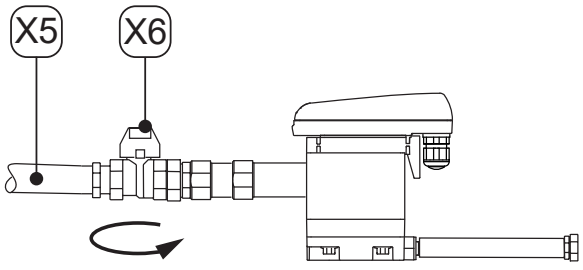
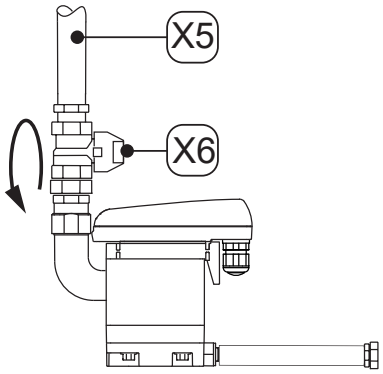
DANGER	Sudden escape of pressurized fluids
	Bursting system parts or contact with rapidly or suddenly escaping fluids can result in death or serious injury.
	• Establish a safe area around the work area before starting work. • Before starting work, bleed the pressurized system and secure it against unintentional pressurization.

DANGER	Electrical voltage
	Contact with electrically live components may result in death or serious injury, as well as malfunctions, disruption to operations, or damage to materials.
	• Establish a safe area around the work area before starting work. • Before starting work, de-energize the product and the accessories and lock and tag them out.

WARNING	Insufficient qualification
	Allowing insufficiently qualified personnel to work on the product or accessories may lead to accidents and personal injury.
	• All work on the product and accessories may only be carried out by qualified service technicians.

WARNING	Ingress of moisture or foreign objects!
	Removing components or opening the product can result in water or foreign objects entering the opened product. The ingress of water or foreign objects can result in accidents and personal injury.
	• Protect the product from splash water and moisture. • Only open the product and/or remove components in a dry place. • Do not introduce any foreign objects into the product's openings. • Keep all contact surfaces and openings free of impurities and moisture.

12.2 Decommissioning work

Image	Description / explanation
	1. Shut off the condensate supply through the condensate inlet line **[X5]** (e.g., close the recommended shut-off valve **[X6]**).
	

13. Disassembly

13.1 Warning notices

DANGER	Sudden escape of pressurized fluids
	Bursting system parts or contact with rapidly or suddenly escaping fluids can result in death or serious injury.
	• Establish a safe area around the work area before starting work. • Before starting work, bleed the pressurized system and secure it against unintentional pressurization.

DANGER	Electrical voltage
	Contact with electrically live components may result in death or serious injury, as well as malfunctions, disruption to operations, or damage to materials.
	• Establish a safe area around the work area before starting work. • Before starting work, de-energize the product and the accessories and lock and tag them out.

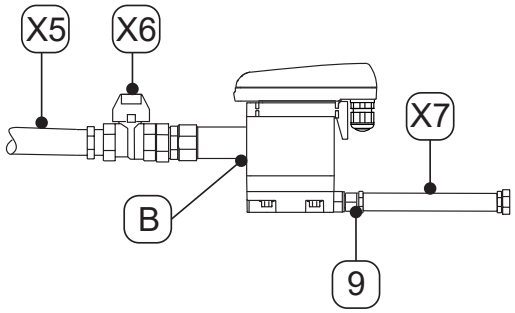
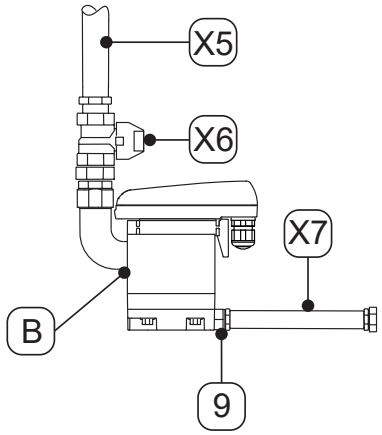
WARNING	Insufficient qualification
	Allowing insufficiently qualified personnel to work on the product or accessories may lead to accidents and personal injury.
	• All work on the product and accessories may only be carried out by qualified service technicians.

13.2 Disassembly work

The following requirements must be fulfilled to carry out disassembly work and preparatory work must be completed.

Preconditions		
Tool	**Material**	**Protective equipment**
• Open-end wrench or adjustable wrench	• No material necessary	**To be worn at all times:** 

Preparatory work	
1.	Decommissioning is completed.
2.	Depressurize the pressurized system or the corresponding system section and secure it against unintentional pressurization.

Disassembly work	
Image	**Description / explanation**
	1. Disconnect the hose **[X7]** from the barbed hose fitting **[9]** and remove it. 2. Disconnect and remove the condensate inlet line **[X5]** and the recommended shut-off valve **[X6]** from the condensate inlet **[B]**. 3. Disassemble all electrical connections.
	

14. Disposal

The product and accessories must be properly disposed of at the end of their useful life, e.g., by a specialized company. Materials such as glass, plastic, and some chemical compounds can be recycled or reused.

14.1 Warning notices

NOTICE	Improper disposal
	Improper disposal of components and assemblies, operating, auxiliary materials and cleaning agents may cause environmental hazards.
	• All components, assemblies, operating, auxiliary materials and cleaning agents must be disposed of appropriately and according to regional statutory specifications and provisions. • Dispose of electrical and electronic components through a specialized disposal company or return them to the manufacturer. • In case of doubt, consult a regional disposal company before disposal.

INFORMATION	Disposal of electrical and electronic products
	Electrical and electronic products (EEE) contain materials, components and substances that can be hazardous and harmful to human health and the environment if the waste from electrical and electronic products (WEEE) is not properly disposed of. Electrical and electronic products are marked with the crossed-out waste container. The crossed-out garbage bin symbolizes that electrical and electronic products must be collected separately and not disposed of together with unsorted household waste. For more information regarding regionally applicable regulations and requirements for the recycling of electrical and electronic products, contact regional waste disposal companies or the appropriate authorities.

14.2 Disposal of operating fluids and auxiliary materials

Operating material / auxiliary material	EU waste code
Adsorbent materials, filter materials, wiping cloths and protective clothing - contaminated with oils or other hazardous substances	15 02 02
Adsorbent materials, filter materials, cleaning wipes and protective clothing, unless classified under 15 02 02	15 02 03
Packaging - Paper and cardboard	15 01 01
Packaging - Plastics	15 01 02
Waste oils - mineral	13 02 05
Waste oils - synthetic	13 02 06

14.3 Disposal of components

The following requirements must be met before disposal:

Preconditions	
1.	The product and accessories have been taken out of service and dismantled.
2.	The product and the accessories are cleaned and freed from existing media residues.

Components	EU waste code
Electrical and electronic equipment - other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	20 01 36
Plastics	20 01 39
Metals	20 01 40

15. Troubleshooting

Error or fault pattern	Possible causes	Troubleshooting
no function detectable	• Fault in voltage supply • Sensor board defective • External control defective	• Read off the operating voltage on the type plate and check it • Check whether voltage is present at the terminals of the sensor board • Check the plug connections of the terminal on the sensor board • Replace the sensor board
Input signal “Drn” is “low”, but no condensate drain	• Feed and/or drain line blocked or closed • Wear • Sensor board defective • Service-Unit defective • Pressure below minimum pressure • Maximum pressure exceeded	• Check the inlet line and the drain lines • Check the plug connections of the terminal on the sensor board • Replace the sensor board • Check the operating pressure
no sensor signal “Sen” (transistor through-connected, Gnd potential) with covered sensor	• Inlet line without sufficient slope • Cross-section too small • Excessively high condensate volume (surge) • Sensor board defective	• Install feed line at a slope >3 % • Install a venting line • Check whether the necessary minimum pressure has been reached (see “4. Technical data” on page 19). • Replace the sensor board • Replace the Service-Unit
Sensor signal "Sen" (transistor open) with empty device	• Dirty sensor • Wire break at the sensor • Sensor board defective	• Disconnect the product from the operating voltage and reconnect after > 5 seconds • Inspect the sensor board for potential damage • Replace the Service-Unit
The ZL Drain discharges continuously.	• Service-Unit defective or dirty	• Replace the Service-Unit

16. Appendices

16.1 Certificates

Symbol	Description / explanation
	FCC marking The FCC mark identifies a product that complies with the requirements of the Federal Communications Commission (FCC) and confirms that basic health and safety requirements have been complied with during the manufacture of the product. The product may be sold on the US market.
	cTÜVus marking The cTÜVus marking identifies a product that meets the requirements of TÜV Rheinland for the Canadian and US markets and confirms that basic health and safety requirements have been complied with during the manufacture of the product. The product may be sold on the Canadian and US markets.
	WEEE marking The crossed-out waste bin marks an electrical or electronic product that must not be disposed of in household waste at the end of its service life. Free collection points for old electrical and electronic products are available for returning the product, as well as other collection points for reusing the product, if necessary. Addresses can be obtained from the local government.

SULLIVAN PALATEK

AIR COMPRESSORS

1201 West US Highway 20
Michigan City, Indiana 46360
Phone: 219.874.2497
Fax: 219.809.0203
info@palatek.com
www.sullivan-palatek.com