BARTEC

Manual Ex p Control Unit

SILAS^{pz}

BARTEC

Operating instructions - Ex p control unit

SILASpz, Version II
Type: A7-37S2-2111/*520

ATEX / IECEx Zone 2 / 22
Document: A1-3741-7D0001
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1 General information

1.1 Manufacturer

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1.2 Purpose of these operating instructions

ATTENTION
Please read the enclosed operating instructions carefully before starting up the Ex p control unit SILAS^{pz}.

These operating instructions contain the required information for the intended use of the Ex p control unit SILAS^{pz}.

The operating instructions are intended for those individuals who are qualified to assemble, install, start up and maintain the product.

They are addressed to technically qualified personnel. The operating instructions are an integral part of the product. They should always be kept in the immediate vicinity of the device and accessible to the installation, operating and maintenance personnel.

If applicable, the guidelines and standards for areas with gas or dust atmospheres must be observed before starting any work, e.g.: RL 2014/34/EU, EN / IEC 60079-17 and EN / IEC 60079-19.

Knowledge and technically correct implementation of the safety instructions and warnings described in these operating instructions are a prerequisite for safe installation and commissioning. The safety instructions and warnings in these operating instructions are kept general and only qualified personnel have the necessary knowledge to interpret and implement them correctly in specific individual cases.

These operating instructions are an integral part of the scope of delivery, even if they can be ordered and delivered separately for logistical reasons.

- If you require any further information, please request it from your local or responsible BARTEC subsidiary. Please read the operating instructions and, in particular, the safety instructions carefully before using the device.
- Keep the operating instructions for the entire service life of the device.
- It must be ensured that these operating instructions are available to all persons entrusted with handling the device.

1.3 Languages

The original user manual is written in German. All other available languages are translations of the original user manual.

The user manual is available in German and English. If there are any other languages which are required, these must be requested from BARTEC or specified when ordering.

1.4 Technical changes

BARTEC reserves the right to change the contents of this document without prior notice. No guarantee is given for the correctness of the information. In case of doubt, the German safety instructions apply, as translation and printing errors cannot be ruled out. In the event of any legal dispute, the “General Terms and Conditions” of the BARTEC Group shall apply in addition.

1.5 Additional documents

The current versions of data sheets, operating instructions, certificates and EC Declarations of Conformity as well as information on accessories can be downloaded from www.bartec.com or requested directly from BARTEC GmbH.

1.6 Conformity to standards and directives

For certificates and EU Declaration of Conformity, please see www.bartec.com.

1.7 Explanation of the individual markings

1.7.1 Markings in the operating instructions

DANGER
This symbol indicates a hazard that will result in death or serious injury if not avoided.

WARNING
This symbol indicates a hazard that can result in death or serious injury if not avoided.

CAUTION
This symbol indicates a hazard that may result in injury if not avoided.

ATTENTION
This symbol indicates measures to avoid any material damage.

Note
This symbol indicates important notes and information on effective, economical and environmentally friendly handling.

1.7.2 Markings on the device

	CE marking according to the currently valid directive.
	Device certified in accordance with the marking for potentially explosive atmospheres.
	Marking according to WEEE directive 2012/19/EU

2 Safety

2.1 Handling the product

The product described in these operating instructions has left the factory in a technically safe and tested condition. In order to maintain this condition and to achieve perfect and safe operation of this product, it may only be used in the manner described by the manufacturer. Furthermore, proper and safe operation of this product requires proper transportation, storage and careful operation.

Safe and proper installation of the SILAS^{pz} control unit to the pressurized enclosure is a prerequisite for faultless and correct operation.

2.2 Intended use

2.2.1 Exclusive intended use

The control unit SILAS^{pz} control unit is used exclusively as a control and monitoring system for pressurized enclosures and is intended for use in explosion group II, category 3G/D and temperature class T4.

The permissible operating data of the device used must be observed.

2.2.2 Non-intended use

Any other use is not in accordance with the intended purpose and can lead to damages and accidents. The manufacturer is not liable for any use beyond the exclusive intended use.

2.3 Warranty

WARNING

No modifications or conversions may be made without the written approval of the manufacturer.

Explosion protection is no longer guaranteed if non-specified components are used. In the case of externally supplied parts, there is no guarantee that they have been designed and manufactured to withstand the stresses and to meet the safety requirements.

- Please contact the manufacturer and obtain approval before making any changes or conversions.
- Only use original spare and wear parts.

Note

The manufacturer provides the complete warranty service only and exclusively for the spare parts which have been ordered from him.

In principle, our “General Conditions of Sale and Delivery” apply. These are available to the operator at the latest when concluding the contract. Any warranty and liability claims for personal injury and property damage are excluded if they are due to one or more of the following causes:

- Improper use of the SILAS^{pz} control unit
- Improper installation, commissioning, operation and maintenance of the SILAS^{pz} control unit
- Failure to observe the instructions in the manual regarding transport, storage, assembly, commissioning, operation and maintenance
- Unauthorised structural modifications to the SILAS^{pz} control unit
- Inadequate monitoring of parts which are subject to wear and tear
- Improperly performed repairs
- Any catastrophic events which are caused by foreign bodies and force majeure

We grant a warranty period of one year on the SILAS^{pz} control unit and its accessories from the date of delivery from the Bad Mergentheim factory. This warranty covers all parts of the delivery and is limited to the replacement or repair of the respective defective parts free of charge at our Bad Mergentheim factory. For this purpose, delivered packaging must be kept as far as possible. If necessary, the goods have to be sent to us after written agreement. There shall be no requirement for any rectification at the place of installation.

2.4 Operator's obligations

The operator is obligated to ensure that only persons work with the SILAS^{pz} control unit who:

- are familiar with the basic regulations on safety and accident prevention and have been instructed in the use of the SILAS^{pz} control unit;
- have read and understood the documentation, safety chapter and warnings.
- The operator is responsible to ensure that the safety and accident prevention regulations applicable in the respective case of use are observed.
- have a level of knowledge of the relevant national standards and regulations.
- The entire system must be tested and certified in accordance with the requirements of IEC / EN 60079-2.

2.5 Safety instructions

2.5.1 General safety instructions

- General statutory regulations or guidelines on occupational safety, accident prevention regulations and environmental protection laws must be observed, e.g. Ordinance on Industrial Safety and Health (BetrSichV) or the nationally applicable ordinances.
- It is required to wear suitable clothing and footwear with regard to the risk of dangerous electrostatic charges.
- All work steps in areas with potentially explosive atmosphere must be always carried out with the utmost care!

2.5.2 Safety instructions for the operation

When setting up or operating explosion-protected electrical systems, IEC / EN 60079-14 and the relevant installation and operating regulations must be observed.

Maintenance

- The relevant installation and operating regulations must be observed for electrical systems! (e.g. Directive 99/92/EC, Directive 2014/34/EU, Ordinance on Industrial Safety and Health (BetrSichV) or the nationally applicable regulations IEC / EN 60079-14 and DIN VDE 0100 series)!
- The national waste disposal regulations must be observed when disposing of the device.

Periodic inspections

- Pursuant to IEC /EN 60079-19 and IEC / EN 60079-17, the operator of electrical systems in potentially explosive atmospheres is obligated to have them inspected by a qualified electrician in order to ensure that they are in proper condition.
- If the device is operated correctly and the installation instructions and ambient conditions are observed, maintenance service is required at 3-year intervals in accordance with IEC / EN 60079-17. See Section “Maintenance and care”.

Repairs

- Repairs to explosion-protected equipment may only be carried out by authorised persons by using original spare parts and in accordance with the state of the art. The applicable regulations must be observed.

Commissioning

- Before commissioning, it must be ensured that all components and documents are available.

3 Product description

3.1 Type of protection "Ex p - pressurized enclosure"

The type of protection Ex p, called “pressurized enclosure”, is based on the measure that explosive gases present in a closed volume are flushed out and then an overpressure is generated and maintained compared to the surrounding atmosphere. Due to the higher pressure inside the enclosure compared to the atmosphere, explosive gases cannot penetrate the inside of the enclosure at any time. This creates an explosion-free area in which electrical devices, which are not themselves explosion-proof, can be installed and operated.

The SILAS^{pz} control unit described in these operating instructions use the “pressurized enclosure with leakage loss compensation” technique. In detail, this means maintaining an overpressure in an enclosure by supplying purge gas in order to compensate for the leakage losses occurring in the enclosure.

In order to prevent the explosive atmosphere which has penetrated during downtimes from becoming a hazard, the enclosure must be purged with purge gas (compressed air or inert gas) before commissioning. The quantity depends on the flow rate determined during initial commissioning. As a safe condition in the enclosure is only achieved at the start of the operating phase, the SILAS^{pz} control unit and its components as well as the purge gas valve must be designed to be explosion-proof.

3.2 SILAS^{pz} control unit, type A7-37S2-2111/*520

The SILAS^{pz} control unit with its system components is an automatically operating control unit for monitoring, controlling and regulating pressurized enclosures in Zone 2 and Zone 22 potentially explosive atmospheres.

The SILAS^{pz} control unit is suitable for all common applications.

The electrical installations inside the pressurized enclosure are enabled directly by the SILAS^{pz} control unit or indirectly by an additional switching device.

Once the SILAS^{pz} control unit, purge gas valve and pressure switch have been fitted to the pressurized enclosure and the mains voltage and purge gas have been connected, the pressurized system starts automatically.

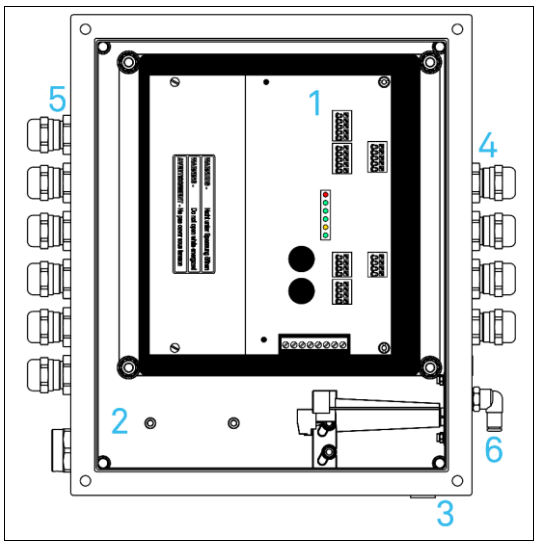
The SILAS^{pz} control unit regulates the purge gas flow and the internal pressure of the enclosure during the purge phase. When the operating phase is initiated, the SILAS^{pz} control unit automatically activates the components mounted in the pressurized enclosure. The internal pressure of the pressurized enclosure is automatically maintained during the operating phase and any leakage losses are compensated.

3.2.1 Design type SILAS^{pz} A7-37S2-2111/*520

The associated pressure measuring card is integrated in this enclosure version.

Ex p control units of this enclosure version are mainly mounted externally on the pressurized enclosure, but can also be mounted inside the Ex p equipment.

In terms of explosion protection, the protective enclosure provides Ex e protection for gas and Ex t protection for dust.



No.	Designation
1	Ex p functional unit
2	Ex e protective enclosure
3	External earthing connection
4	Cable entry Ex i
5	Cable entry Ex e
6	Pressure measurement connection

3.3 System components of the Ex p control unit SILAS^{pz}

3.3.1 Purge gas valve, type 05-0056-00**

The purge gas valve switches the purge gas supply. It is a pilot-controlled solenoid valve and is used to introduce the purge gas into a pressurized enclosure in zone 2. The SILAS^{pz} control unit controls the purge gas valve in such a way that the purge gas valve opens to purge the pressurized enclosure and closes again once the purge process is complete.

Both digital and proportional valves are available for the purge gas valves.

3.3.2 Pressure monitor, type 17-51P3-1604

The pressure monitor has two functions within the Ex p control unit. Firstly, it serves as a pressure relief valve, which opens if the internal pressure is too high and relieves the excess pressure. Secondly, an orifice is integrated in the pressure monitor, which defines the flow rate during the purge time.

The pressure monitor must be installed separately from the SILAS^{pz} control unit in the pressurized enclosure.

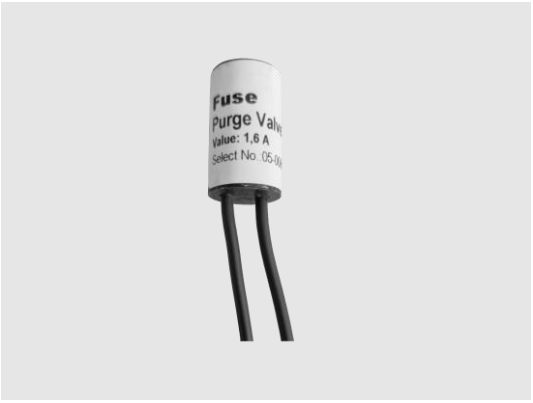
3.3.3 Pressure reducer with pressure gauge, type 05-0056-008*

This upstream pressure reducer is a diaphragm pressure regulator with secondary venting for reducing the pressure of externally supplied purge air. The setting is made via a hand wheel. The set reduced pressure can be read on a pressure gauge.

Pressure reducers in sizes G1/4″ and G1/2″ are available for supplying the pressurized enclosure.

In order to select the pressure reducer, see Chapter 5.6 "Purge gas supply".

3.3.4 Valve fuse, type 05-0080-10**



The valve fuse is used in order to protect the connected purge gas valve and is connected to the Ex e board of the control unit.

3.3.5 p-Operator panel, type 17-51P5-*111

The p-Operator panel is a visualisation unit for the SILAS^{pz} control unit. It can be connected as an option and is used to display the system status and parameterise the control units.

It can be connected or disconnected during operation and it is therefore not necessary for it to be permanently connected to the control unit.

3.3.6 Programming enable/switch, type 05-0003-0089

The programming switch must be connected to the control unit and activated in order to change parameters and switching values.

Values that are changed without a connected programming jumper are not accepted by the SILAS control unit.

While the programming switch is activated, the device is in offline mode. If parameters are to be changed, it is necessary to log in to the user login in addition to the active parameter switch.

3.3.7 Interface cable, type 03-9828-0062

The interface cable is used in order to connect the Ex p control unit to the PC.

It must be connected to the control unit and PC in order to change parameters and switching values.

4 Transport and storage

4.1 Scope of delivery

Note
Any missing parts or any damage must be reported immediately in writing to the carrier, the insurance company or BARTEC GmbH.

Check the completeness of the scope of delivery against the delivery note

Each Ex p control unit is delivered with the following scope of delivery as standard:

- Ex p control unit
- LAN parameterisation cable, parameterisation switch and operating instructions

4.2 Packaging

The Ex p control unit is delivered packed in film, on a pallet and/or in cardboard boxes.

- The packaging materials must be disposed of at the designated disposal points. The applicable national regulations for disposal must be observed.

4.3 Transport

WARNING
Risk of death or injury from falling heavy suspended loads.
- The Ex p control unit must be secured with a suitable fastening (e.g. straps) before being transported)

ATTENTION
Avoid any hard impacts, e.g. from falling or being set down too hard.
The Ex p control unit may become damaged.
- Only use lifting equipment and load handling attachments with sufficient lifting capacity.
- The permissible lifting weight of a lifting device must not be exceeded.
- Put the Ex p control unit down slowly.

Observe the mass of the goods to be transported and select a suitable transport device.

4.4 Storage

Store the Ex p control unit in a horizontal position and at a temperature of -20 °C to +60 °C in its original packaging. The environment must be dry, dust-free and vibration-free.

Store the Ex p control unit for a maximum of 2 years. For storage logistics, we recommend the “first in - first out” principle.

4.5 Disposal

Note
The applicable national regulations for disposal must be observed.

The Ex p control unit must be disposed of at the designated disposal points.

5 Installation

Note

Find out about the general safety instructions before starting work (see Chapter 2 “Safety”).

- Observe the chapters “Installation and Electrical connections”.

There may be deviations in the installation of customer-specific constructions.

Observe the chapters “Installation and Electrical connections”.

DANGER

Unsuitable positioning of the Ex p control unit on the pressurized enclosure.

This will result in improper purge of the pressurized equipment. Gas bubbles may form inside the pressurized enclosure and lead to an explosion when the internals are activated.

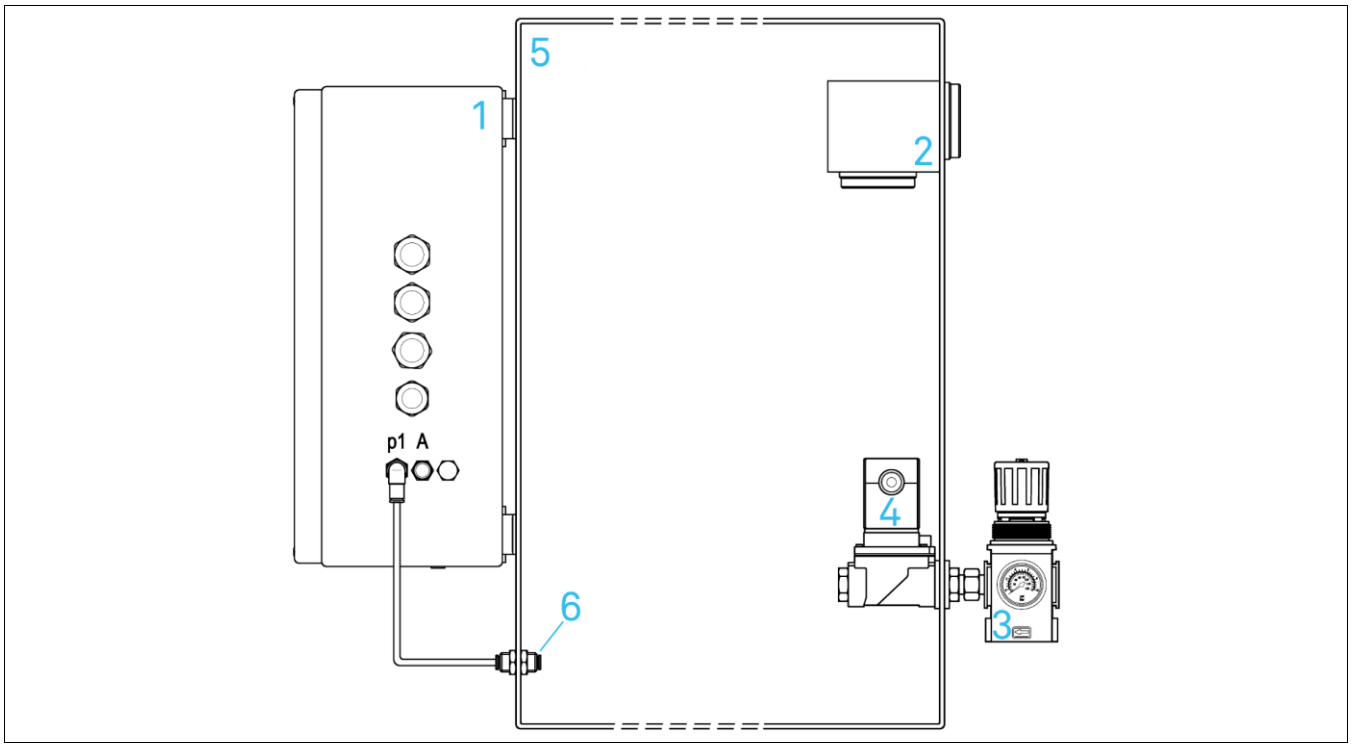
- The exact positioning of the purge gas supply and the pressure switch must be carried out in accordance with EN/IEC 60079-2.
- An ideal purge must be ensured.
- Pay attention to light or heavy gases.

Carry out the installation in accordance with the following sections, unless otherwise agreed for customer-specific control units. The ex p control unit SILAS^{pz} can be mounted in various positions on the pressurized enclosure.

The following sections describe the mounting of the Ex p control unit SILAS^{pz} on the pressurized enclosure. The SILASpz control unit can be mounted internally or externally on the pressurized enclosure. The pressure monitor and the purge gas valve must be installed separately from the SILAS^{pz} control unit.

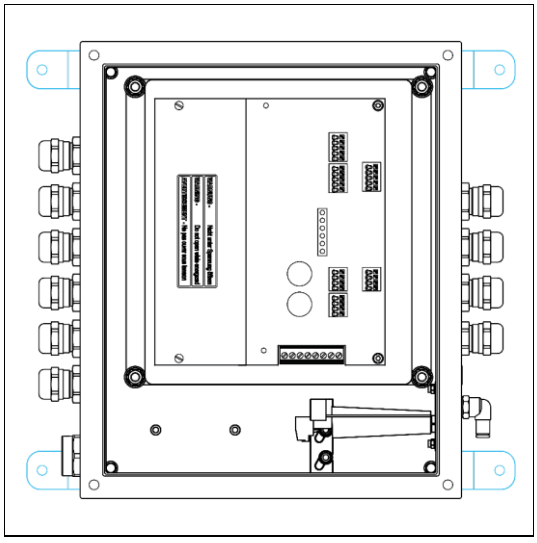
5.1 System design

5.1.1 General



No.	Designation	Remark
1	Ex p control unit SILAS^{pz}	Explosion protection control Ex p
2	Pressure monitor	Purge gas outlet during the purge phase
3	Pressure reducer	Pressure reducing station for purge gas
4	Purge gas valve	Digital or Proportional purge gas valve
5	Ex p protected enclosure	
6	Pressure measurement p1	Pressure monitoring

5.2 Mounting the Ex p control unit SILAS^{pz}

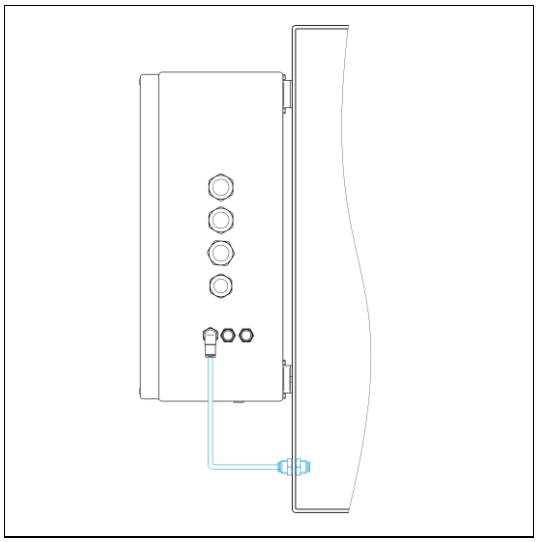


Attach the Ex p control unit SILAS^{pz} to the intended position by using the fixing lugs on the enclosure.

M6 screws with corresponding locking elements can be used as fastening material.

The corresponding dimensions are available in the Appendix.

5.3 Mounting the SILAS^{pz} control unit - external installation



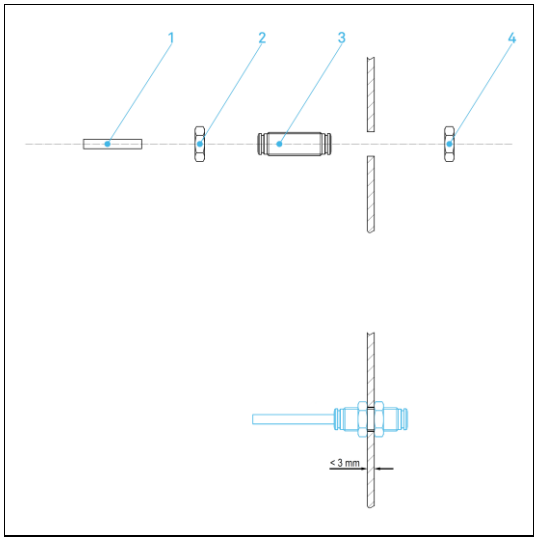
Mount the Ex p control unit SILAS^{pz} in the intended position by using the fastening straps on the enclosure.

In order to ensure that the pressure measurement can take place inside the protected operating equipment, BARTEC recommends the use of the mounting kit for external mounting.

The tubing between the Ex p control unit SILAS^{pz} and the protected equipment is shown in the following diagram.

5.3.1 External installation kit, type 05-0091-0280

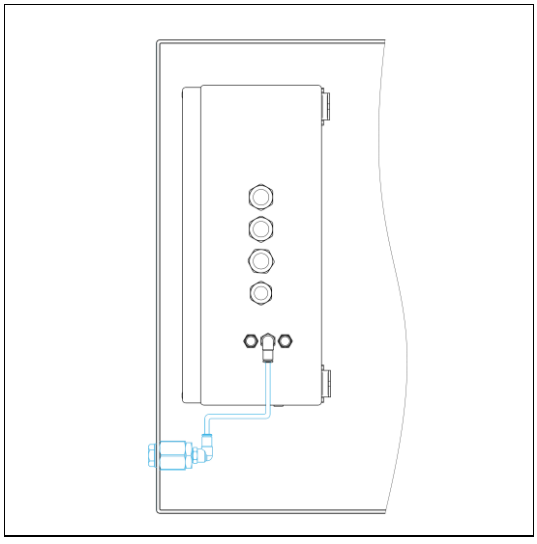
For external installation of the Ex p control unit, a measuring point must be routed into the Ex p control cabinet by using the "External" installation kit.



Procedure:

- Drill a mounting hole at the intended location d=10,5 mm
- Insert the conduit bulkhead fitting Pos. 3 into the hole.
- Fasten the bulkhead fitting in the centre of the hole by using the nuts (No. 2 and 2).
- Insert the hose, No. 1, into the hose bulkhead fitting. The other end is plugged into the hose connection which is provided on the Ex p control unit.

5.4 Mounting the SILAS^{pz} control unit - internal installation

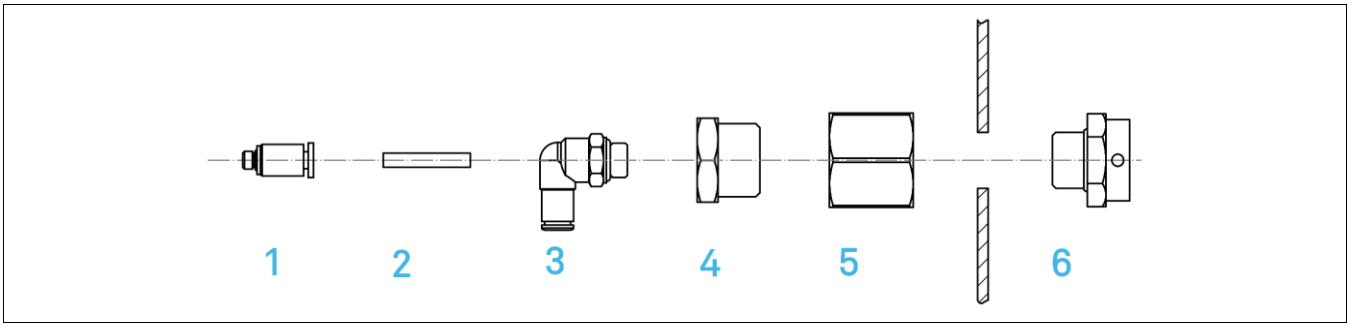


Mount the Ex p control unit SILASpz in the intended position by using the fixing lugs on the enclosure. BARTEC recommends using the mounting kit for internal installation to ensure that the pressure measurement can take place inside the protected Ex p equipment.

In order for the Ex p control unit SILASpz to be able to measure the atmospheric pressure, it is important to carry out the tubing by using the installation kit.

5.4.1 Internal installation kit, type 05-0091-0275

- Drill a mounting hole d=16.5 mm at the intended location on the pressurized equipment
- Screw the bleed screw (6) to the sleeve (5) in the drilled hole
- Screw the reducer (4) into the socket (5)
- Screw the quick connector (3) into the reducer (4).
- Push the hose (2) into the quick connector (4) and guide it to the internally mounted Ex p control unit
- Insert the hose into the atmosphere measuring point (1), which is screwed into the SILAS.



5.5 Mounting the pressure monitor

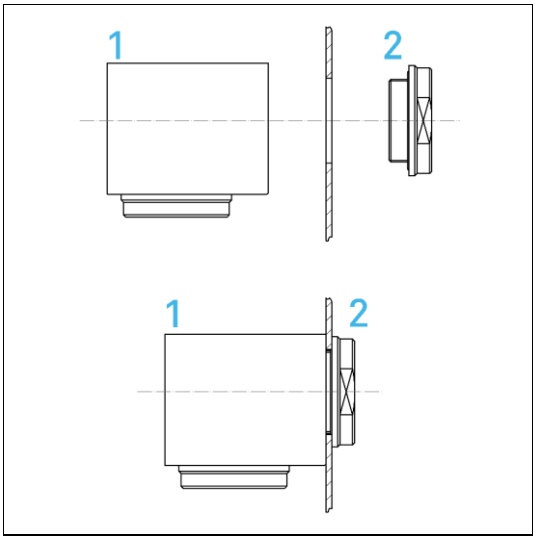
CAUTION

Incorrect installation or contamination of the pressure monitor!

Incorrect installation or heavy soiling will prevent the excess pressure from escaping and lead to a sharp rise in pressure.

- Check and ensure that the pressure switch has a flow direction from the inside to the outside and is free of contamination.

A through-hole of 37 mm is required in the wall of the pressurized enclosure in order to mount the pressure monitor. The outlet screw connection is used for fastening.



- Drill an Ø 37 mm hole at the intended mounting position of the pressurized enclosure.
- Unscrew the outlet fitting (2) from the pressure monitor enclosure (1).
- Position the pressure monitor enclosure (2) in such a way that the air in the pressurized enclosure can flow out.
- Screw the pressure monitor enclosure (2) together with the outlet fitting (1).
- Tighten the outlet screw connection (1) and pressure monitor enclosure (2) until the pressure monitor module is firmly secured.

5.6 Purge gas supply

ATTENTION

Material damage due to a missing purge gas nozzle!

There is a risk that the pressurized enclosure will be overstressed due to the generated internal pressures.

- Check and ensure that the purge gas nozzle is fitted with the correct hole.

Note

Insufficient purge gas due to insufficiently dimensioned purge gas supply line.

The pressurized enclosure does not go into operation due to insufficient flow rate.

- Check the inside diameter of the purge gas supply.

The purge gas supply consists of a pressure reducer, a purge gas valve and a purge gas nozzle. Depending on the volume of the pressurized enclosure, a purge gas supply in sizes G1/4" or G1/2" is available.

The purge gas supply must be selected according to the following table.

Volume	Pressure	Pressure reducer	Pressure monitor	Purge gas nozzle	Supply line
< 50 litres	2 bar	1/4″	1x	2.8 mm	10 mm
50 to 300 litres	2 bar	1/4″	1x	3.9 mm	10 mm
300 to 700 litres	2 bar	1/2″	1x	4.5 mm	15 mm
700 to 1.000 litres	3 bar	1/2″	1x or 2x	4.5 mm	15 mm
from 1.000 litres	3 bar	1/2″	2x	5.5 mm	20 mm

(The values contained in the table are guide values and may vary.)

The pressure reducer for reducing the supplied purge gas pressure is mounted on the outside of the pressurized enclosure. The purge gas valve, which releases the purge gas, is mounted inside the pressurized enclosure. The purge gas nozzle limits the maximum flow rate of the purge gas and thus prevents the maximum pressure increase inside the pressurized enclosure in the event of a defect in the purge gas valve.

The installation of the purge gas supply is shown below. The required installation material is included in the scope of delivery.

5.6.1 Version G1/4", gas

Note
The G1/4" version of the purge gas supply can be used up to a protected volume of 300 litres.

The installation of the purge gas supply must be carried out carefully.

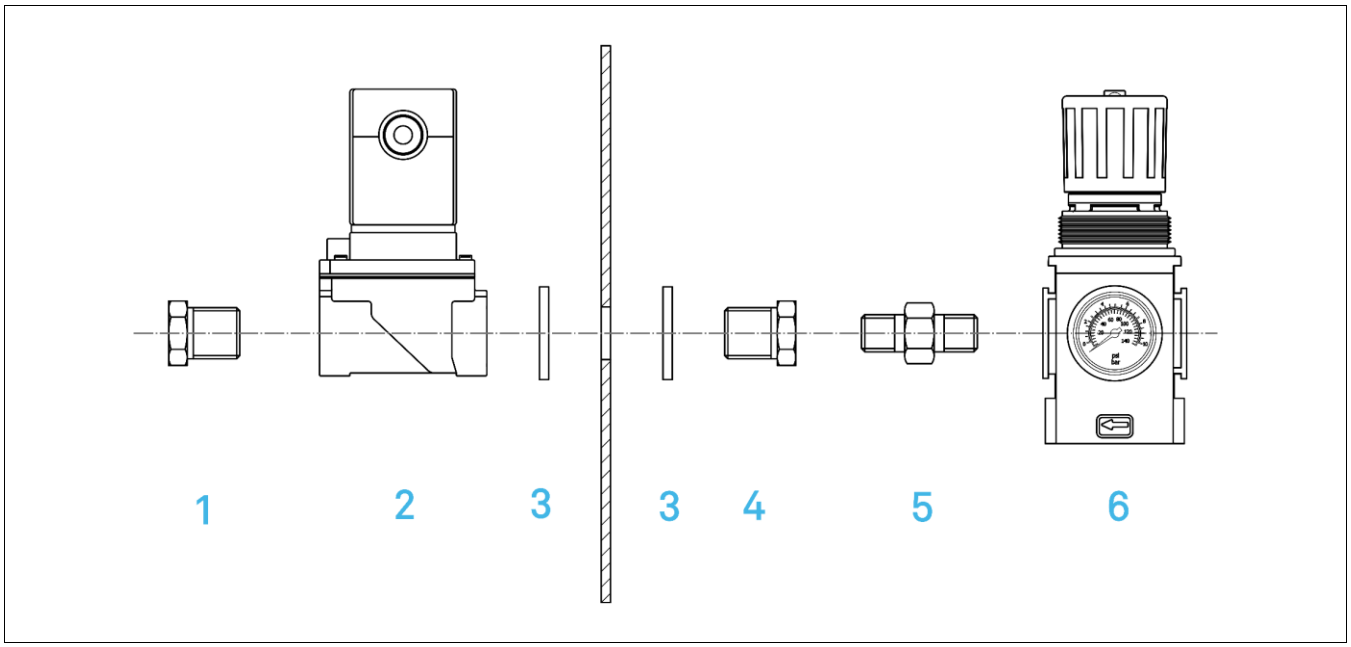
In order to ensure that the screwed parts are tight, they can be sealed by using PTFE sealing tape.

During assembly, care must be taken in order to ensure that no foreign particles are introduced.

Procedure

- Drill an Ø 17 mm hole at the intended mounting position of the pressurized enclosure.
- Install the purge gas valve (2) on the pressurized enclosure by using the reducing sleeve (4) and the sealing washers (3).
- Screw the drilled purge gas nozzle (1) into the outlet of the purge gas valve (2).
- Screw the detachable double nipple (5) into the reducing sleeve (4).
- Screw the pressure reducer G ¼" (6) onto the detachable double threaded nipple (5).

No.	Designation	Remark
1	Purge gas nozzle, drilled	Included in the scope of delivery (2)
2	Purge gas valve	In digital or proportional version
3	Sealing washer	Included in the scope of delivery (6)
4	Reducing sleeve G 1/4”i / G3/8”a	Included in the scope of delivery (6)
5	Detachable double nipple G1/4”	Included in the scope of delivery (6)
6	Pressure reducer G1/4”	For enclosures with a volume of up to 300 litres



5.6.2 Version G1/2“, gas

Note

The G1/2" version of the purge gas supply can be used from a protected volume of > 300 litres.

The installation of the purge gas supply must be carried out carefully.

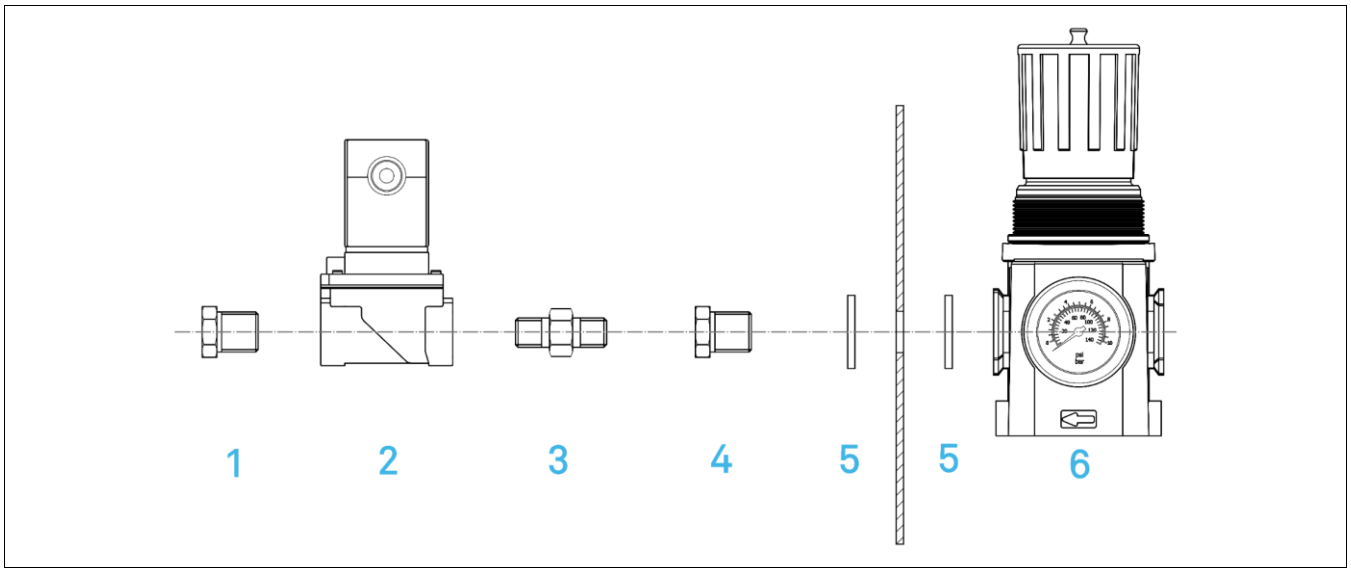
In order to ensure that the screwed parts are tight, they can be sealed using PTFE sealing tape.

During assembly, care must be taken to ensure that no foreign particles are introduced.

Procedure

- Drill an Ø 21 mm hole at the intended mounting position of the pressurized enclosure.
- Install the G1/2" pressure reducer (6) on the pressurized enclosure (6) by using the reducing sleeve (4) and the sealing washers (5).
- Screw the detachable double nipple (3) into the reducing sleeve (4)
- Screw the purge gas valve (2) onto the detachable double nipple (3).
- Screw in the purge gas nozzle (1) at the outlet of the purge gas valve (2).

No.	Designation	Remark
1	Purge gas nozzle, drilled	Included in the scope of delivery (2)
2	Purge gas valve	In digital or proportional version
3	Detachable double nipple G3/8“	Included in the scope of delivery (7)
4	Reducing sleeve G3/8“i / G1/2“a	Included in the scope of delivery (7)
5	Sealing washer	Included in the scope of delivery (7)
6	Pressure reducer G1/2“	For enclosures with a volume greater than 300 litres



5.6.3 Version G1/4“, dust

Ex	For dust applications, a pressurized enclosure does not have a purge phase and is only pressurized with a positive overpressure. Therefore, there is no purge gas valve.

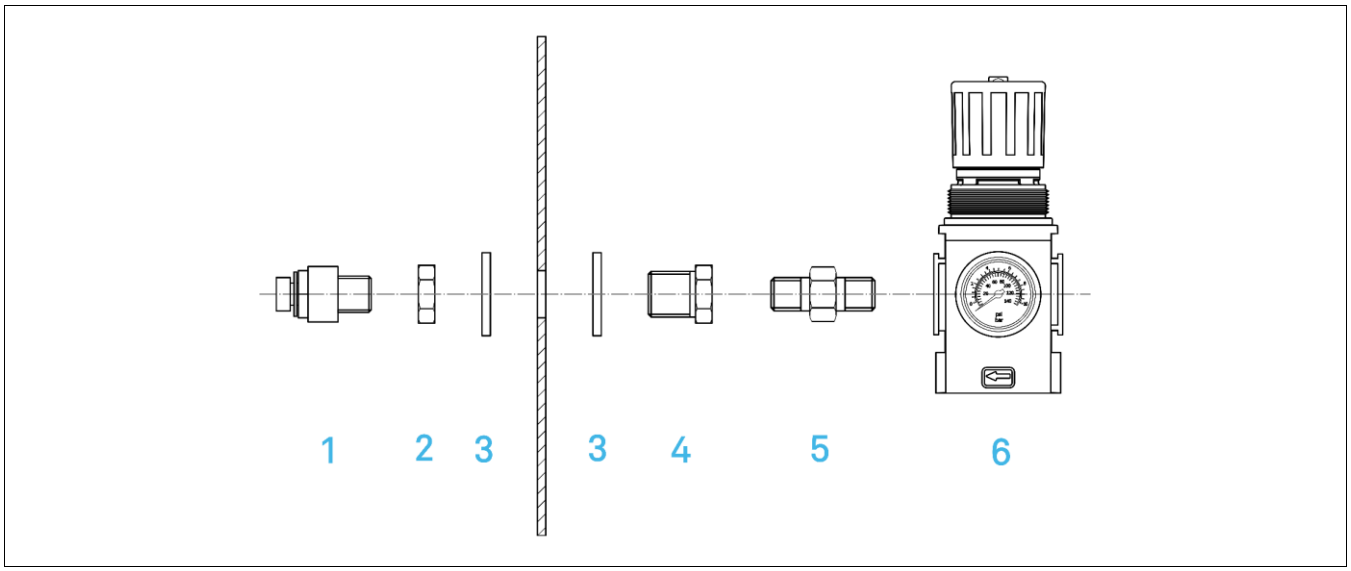
For dust applications, there is no purge phase for a pressurized enclosure and only a positive overpressure is applied. Therefore, there is no purge gas valve. In order to ensure that the screwed parts are tight, they can be sealed by using a PTFE sealing tape.

During assembly, care must be taken to ensure that no foreign particles are introduced.

Procedure

- Drill an Ø 17 mm hole at the intended mounting position of the pressurized enclosure.
- Mount the reducing sleeve (4) with sealing washers (3) in the pressurized enclosure by using the G3/8" nut (2).
- Screw the adjustable purge gas nozzle (1) into the reducing sleeve (4) inside the pressurized enclosure.
- Screw the detachable double nipple (5) into the reducing sleeve (5).
- Screw the pressure reducer G ¼" (6) onto the detachable double threaded nipple (5).

No.	Designation	Remark
1	Adjustable purge gas nozzle	
2	Nut G3/8“	
3	Sealing washer	Included in the scope of delivery (6)
4	Reducing sleeve G 1/4”i / G3/8”a	Included in the scope of delivery (6)
5	Detachable double nipple G1/4”	Included in the scope of delivery (6)
6	Pressure reducer G1/4”	



6 Electrical connections

DANGER

Death or serious injury from working on live parts!

Danger to life due to electric current.

- Observe the 5 safety rules for working on electrical systems: Disconnect; secure against being switched on again; ensure that there is no voltage; earth and short-circuit; cover or isolate any neighbouring live parts.

6.1 Wiring instructions

DANGER

Death or serious injury due to opening the cover of the SILAS control unit in an explosive atmosphere!

Explosion hazard

- Before opening the enclosure cover, check the atmosphere for the presence of any explosive gases.
- Only open for any maintenance and repair work.

DANGER

Death or serious injury due to improper closures!

Explosion hazard

- Close unused cable glands with suitable and approved closures.

DANGER

Death or serious injury due to improper assembly!

Explosion hazard

- Tighten cable glands with 3.0 Nm
- Tighten cover with 1.4 Nm

WARNING

Short circuits due to loose or protruding cables in the SILAS control unit!

An explosion can be triggered.

- Connect all core cables to terminals, even those which are not required.
- Check and ensure that no cables are loose or protruding/stand out.

WARNING

Avoid damaging the seals

Cancel the explosion protection concept.

- Visually check the seal when closing the SILAS control unit (intact, clean and seated).

6.1.1 Inserting and laying connecting cables

The procedure for inserting and laying connecting cables to the SILAS^{pz} control unit is described below:

- Insert the supply, data and release cable through the cable glands into the connection compartment and connect or disconnect the conductors by pressing the actuator.
- Connect the shields and earthing connections to the earthing terminal.
- Tighten the cable glands with 3.0 Nm.

6.1.2 EMC-compliant connection

Note

The electromagnetic compatibility of a complete system in accordance with the EMC Directive must be ensured by the manufacturer (EMC-compliant design of a system) and the user (interference-free design of a complete system).

BARTEC Ex p control units can only operate safely and trouble-free with EMC-compliant wiring. This chapter shall support you in the EMC-compliant design of your system.

During the operation of an electronic or electrical device, interactions with other neighbouring devices occur. The neighbouring devices act as a source of interference, which affects the other device as an interference sink.

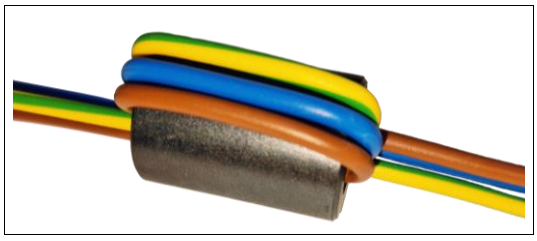
BARTEC Ex p control units are considered to be electromagnetically compatible and have been developed in compliance with the applicable EMC standards and limit values.

A professional, clean cable connection plays a major role in the safe operation of the Ex p control unit under EMC influences.

Cables and connections

The following points must be observed:

- Divide the cables into groups.
  Power cables / signal cables / data cables
- Ensure proper cable routing when wiring. It must be ensured that overcoupling between signal/data lines and power cables is avoided.
- Signal lines and power cables may only cross at right angles
- Route signal and data cables as close as possible to earth surfaces
- If possible, lay short cables. This helps to avoid any coupling capacitances and inductances.
- Use the supplied ferrite core for the power supply.
  In this context, the individual conductors must be routed in a loop through the ferrite core.



Earthing cables

The earthing of a system fulfils protective and functional measures.

The following points must be observed:

- Earthing cables should be as short as possible.
- Avoid any earth loops.
- Use earth straps with a width of at least 10 mm.

Shielding

In order to ensure interference-free operation of a system, cables with the largest possible surface area (not cross-section) are important. High-frequency currents do not flow through the entire cable cross-section, but predominantly on the outer skin of a conductor.

The following points must be observed:

- Always connect the shield over a large area by using metal cable clamps.
- Avoid connecting the shielding with long wires.

6.1.3 Back-up fuse

ATTENTION

Observe the rated current of the release circuit (K1) and add this to the following information. The following values are only for the Ex p control unit!

If the dimensioning is too small, the Ex p control unit may become destroyed.

- Rated current (controller) + rated current of release circuit (K1).

Version	SILAS^{pz}, DC	SILAS^{pz}, AC
Rated current of the control unit	>= 3.15	>= 2
Nominal voltage of the control unit	>= 63 V D	>= 277 V AC
Response time	Inert	Inert
Breaking current	>= 1.5 kA	>= 1.5 kA
Melting integral	12... 34 A²s	9.7... 14.7 A²s

6.1.4 Inductive loads

ATTENTION

Interference from inductive loads can destroy the Ex p control unit!

Overvoltages occur when switching off inductive loads (e.g. contactor coils). Voltage peaks of up to 4 kV can occur at a voltage slope of 1 kV / microsecond.

- Take suitable measures in order to suppress any inductive loads.

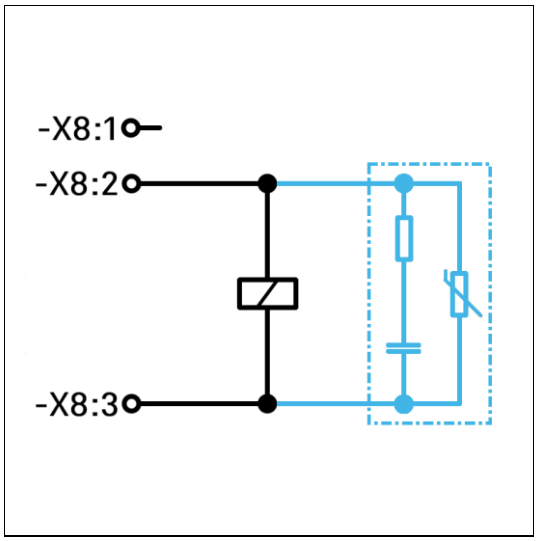
Use protective circuits for inductive loads in order to limit the voltage peaks which occur when switching off.

The consequences of this can be as follows:

- Coupling of interference signals which generate false signals
- Destroying the Ex p control unit.

Protective circuits protect the Ex p control unit from premature failure due to the overvoltage which occurs when the current flowing through an inductive load is interrupted. In addition, protective circuits limit the electrical interference which occurs when switching inductive loads.

Protective circuit for AC-fed inductive loads



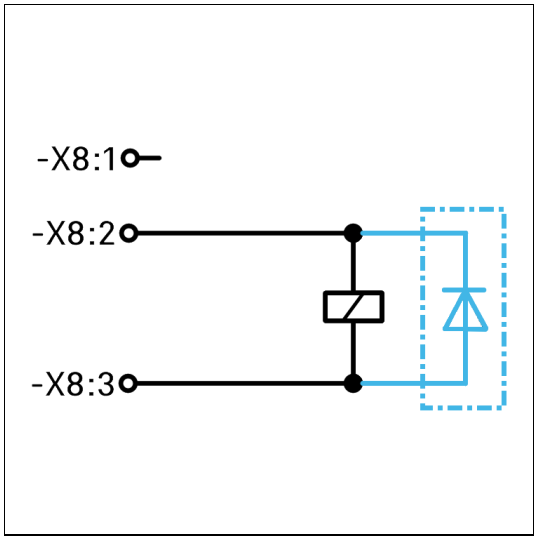
This circuit variant is used for inductive loads AC-fed relays / contactors.

This circuit variant utilises the property of the VDR resistor in order to become low-resistance above a certain threshold voltage. This short-circuits the self-induction voltage.

Any resulting oscillations are cancelled out by the RC cancelling element (snubber).

Interference suppression measure, e.g. BARTEC 07-7311-93GU/K000 RC snubber and varistor

Protective circuit for DC-fed inductive loads



This circuit variant is used for DC-fed relays / contactors. A diode is connected in parallel to the coil in the reverse direction.

Interference suppression measure, e.g. BARTEC 07-7311-61GF/5400 Freewheeling diode

6.2 Electrical wiring

WARNING

Explosion protection is not guaranteed if intrinsically safe (Ex i) signals are connected to relay outputs!

Relay outputs are not suitable for intrinsically safe (Ex i) signals.

- Use suitable isolating relays between relay outputs and Ex i signals!

ATTENTION

Material damage due to incorrect supply voltage!

The internal electronics of the Ex p control unit can become destroyed.

- Before activating the supply voltage, compare the value of the supply voltage with the value printed on the control unit.

ATTENTION

Active protective measure!

- As an active protective measure, the supply voltage must be protected by a fuse (min. 1500 A breaking capacity).

ATTENTION

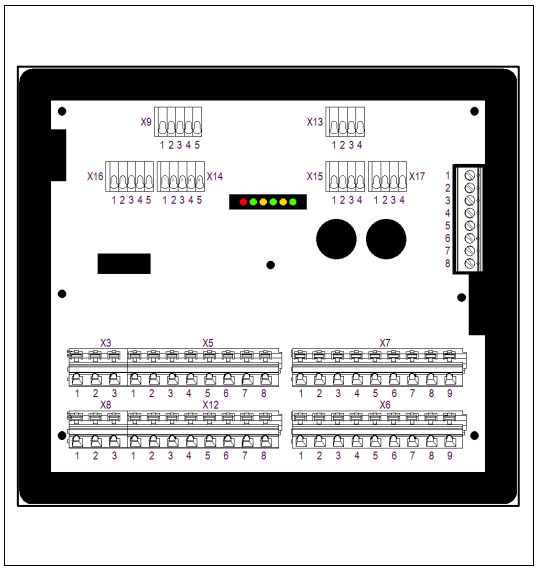
EMC-compliant wiring!

The internal electronics can be disturbed by a lack of EMC measures and cause unforeseen shutdowns.

- Loop the supplied ferrite sleeve into the power supply.
- See “EMC-compliant wiring”

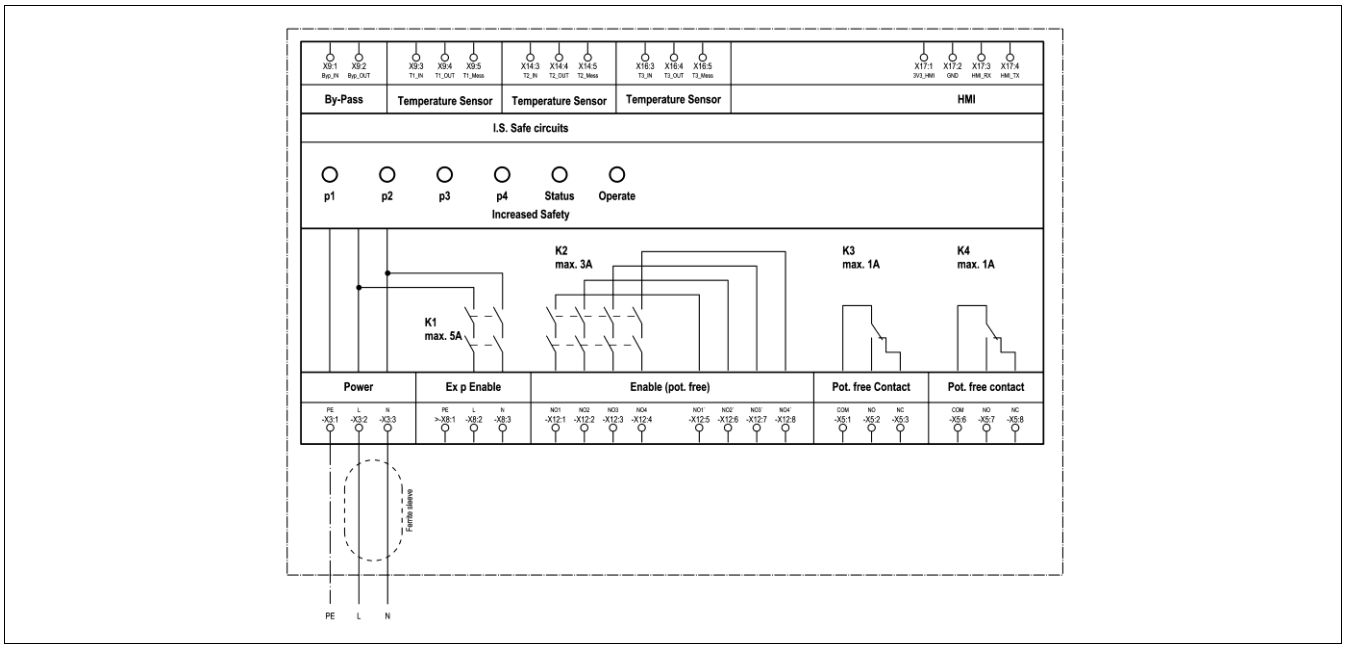
6.2.1 Terminal block overview

The connection board of the Ex p control unit contains the connection terminals designed in type of protection “Ex e” (X3, X5, X8, X12, X7 and X8) or “Ex i” (X9, X16, X14, X17 and pressure measuring card).

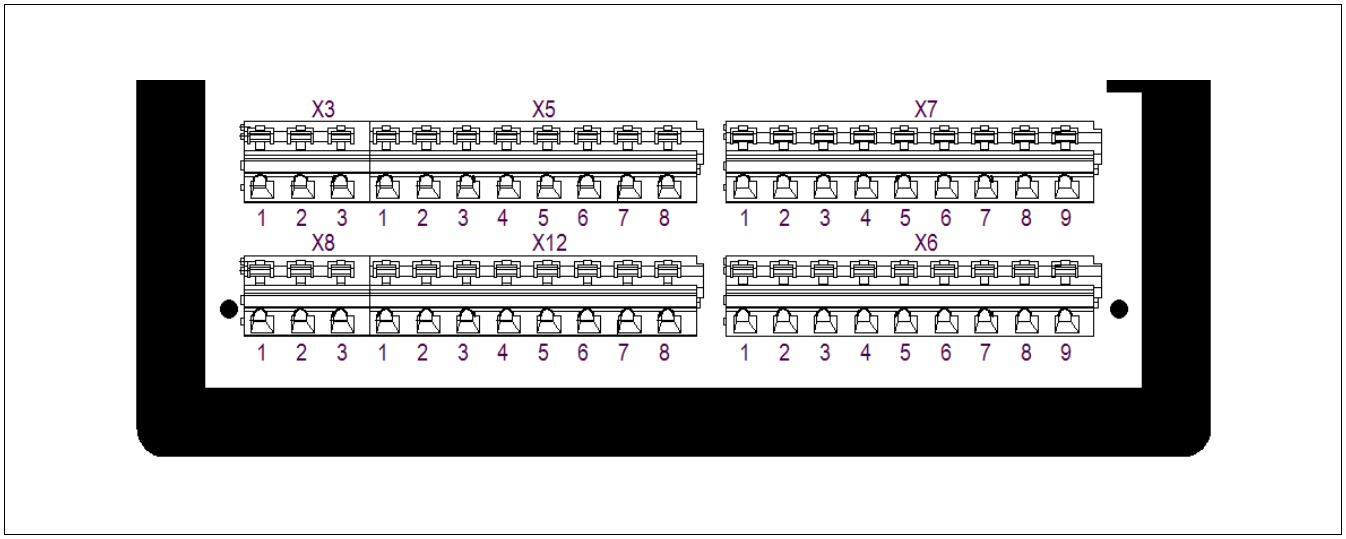


Terminal	Connection
X3	Power supply
X5	2x signalling relay, 1x CO each
X8	Enable, energised
X12	Signalling relay, 4x NO
X7	Purge gas valve, empty contacts
X8	Valve, LAN
X9	Bypass, temperature sensor 1
X14	Optional sensor 1
X16	Main switch, temperature sensor 3
X17	Optional sensor 2
	Parameter release, temperature sensor 2

6.2.2 Wiring diagram



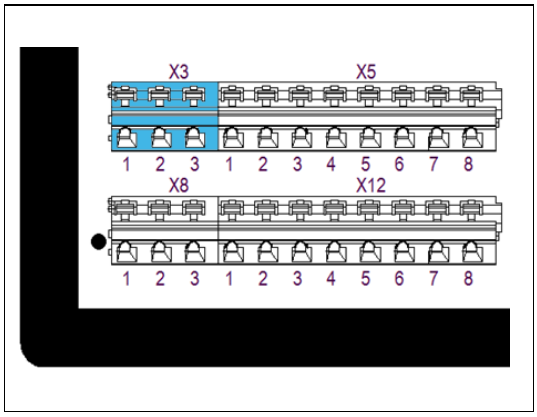
6.2.3 Ex e connection terminals



6.2.3.1 Terminal row “X3”

The supply voltage is connected to terminal row X3.

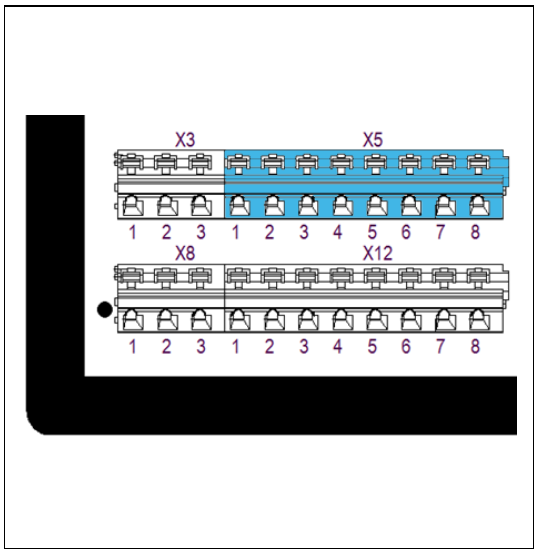
⚠ **Ferrite sleeve assembly!** → Please see Section “EMC-compliant connection”



Terminal	Connection
1	PE
2	Phase (+conductor) power supply
3	Neutral (GND) power supply

6.2.3.2 Terminal row “X5”

A potential-free changeover contact K3 and K4 is available on the Ex p control unit for signalling and processing signals. The associated switching function can be set in the Ex p control unit via the WEB interface and is freely programmable.
The maximum switching current is 1 A.



Terminal	Connection
1	K3 – COM (foot contact)
2	K3 – NO (normally open contact)
3	K3 – NC (normally closed contact)
4 / 5	PE
6	K4 – COM (foot contact)
7	K4 – NO (normally open contact)
8	K4 – NC (normally closed contact)

6.2.3.3 Terminal row “X8”

ATTENTION

Material damage due to overcurrent on the control electronics!

Welding of the release relays or destruction of the electronics due to inductive loads.

- The Ex p release (relay K1, X8 terminals 2 and 3) may only be operated in conjunction with a mains fuse (max. 5 A, 1,500 A switching capacity, fast-acting).
- Supplement inductive loads with suitable interference suppression measures. See Chapter 6.1.4.
- Maximum inrush current 15 A for 20 ms

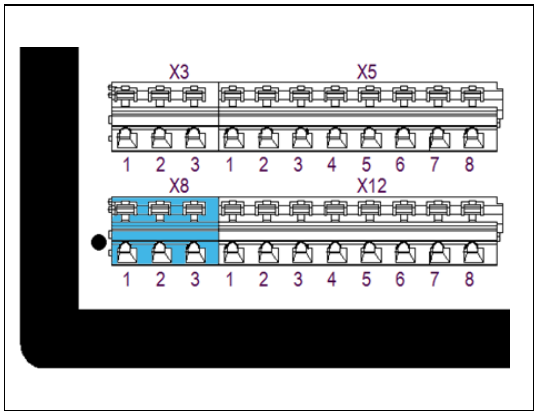
ATTENTION

EMC-compliant wiring!

Internal electronics can be destroyed by a lack of EMC measures.

- See “EMC-compliant wiring”

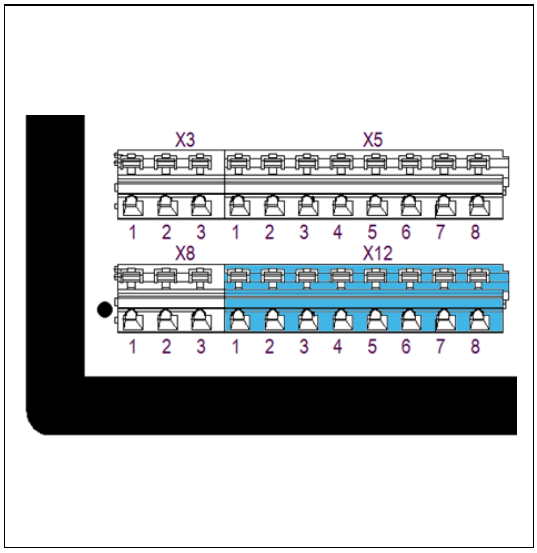
The application inside the pressurized enclosure is enabled by the Ex p control unit by using the enable contact on terminal row X8.



Terminal	Connection
1	PE
2	Phase (+conductor) power supply
3	Neutral (GND) power supply

6.2.3.4 Terminal row “X12”

A potential-free signal (4x NO) is available on the Ex p control unit. This signal can either be used as an enable, which is also safety-related, or it can be used as a potential-free signal.



Terminal	Connection
1	K2_1 - NO (normally open contact)
2	K2_2 - NO (normally open contact)
3	K2_3 - NO (normally open contact)
4	K2_4 - NO (normally open contact)
5	K2_1´ - NO (normally open contact)
6	K2_2´ - NO (normally open contact)
7	K2_3´ - NO (normally open contact)
8	K2_4´ - NO (normally open contact)

6.2.3.5 Terminal row "X7"

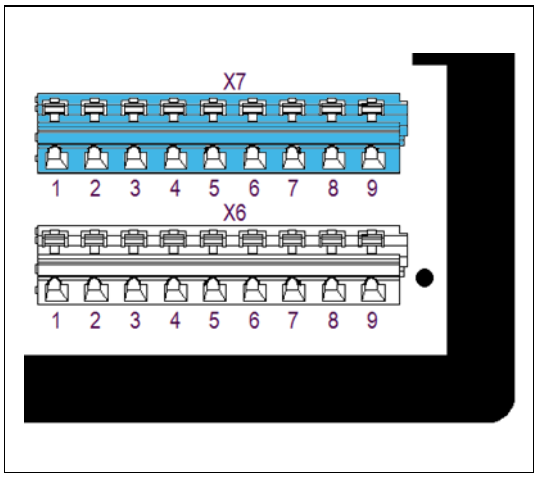
ATTENTION

Material damage due to incorrect back-up fuse!

Valve or Ex p control unit may become damaged.

- Only operate the digital purge gas valve with a 1.0 A back-up fuse and the proportional purge gas valve with a 1.6 A back-up fuse.

Terminal row X7 is used in order to connect the purge gas valve with the associated valve fuse. In addition, terminal points 6 - 9 are intended to accommodate the unused wires of the LAN connection cable.



Terminal	Connection
1	Back-up fuse
2	Back-up fuse
3	Valve +
4	Valve -
5	Valve PE
6	Unused wire LAN cable socket
7	Unused wire LAN cable socket
8	Unused wire LAN cable socket
9	Unused wire LAN cable socket

6.2.3.6 Terminal row “X6”

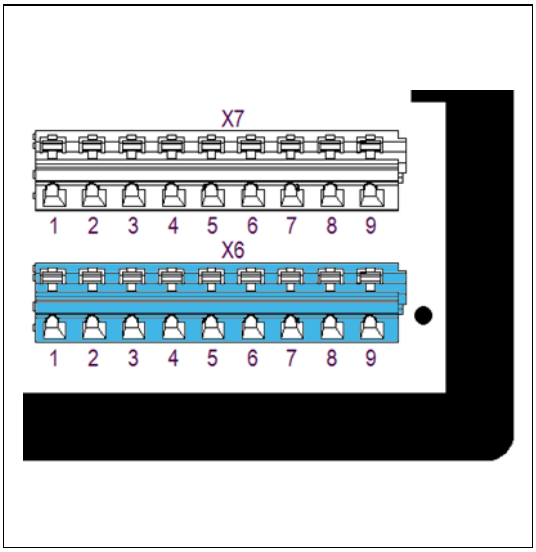
DANGER

Death or serious injury due to connected programming cable!

Explosion hazard

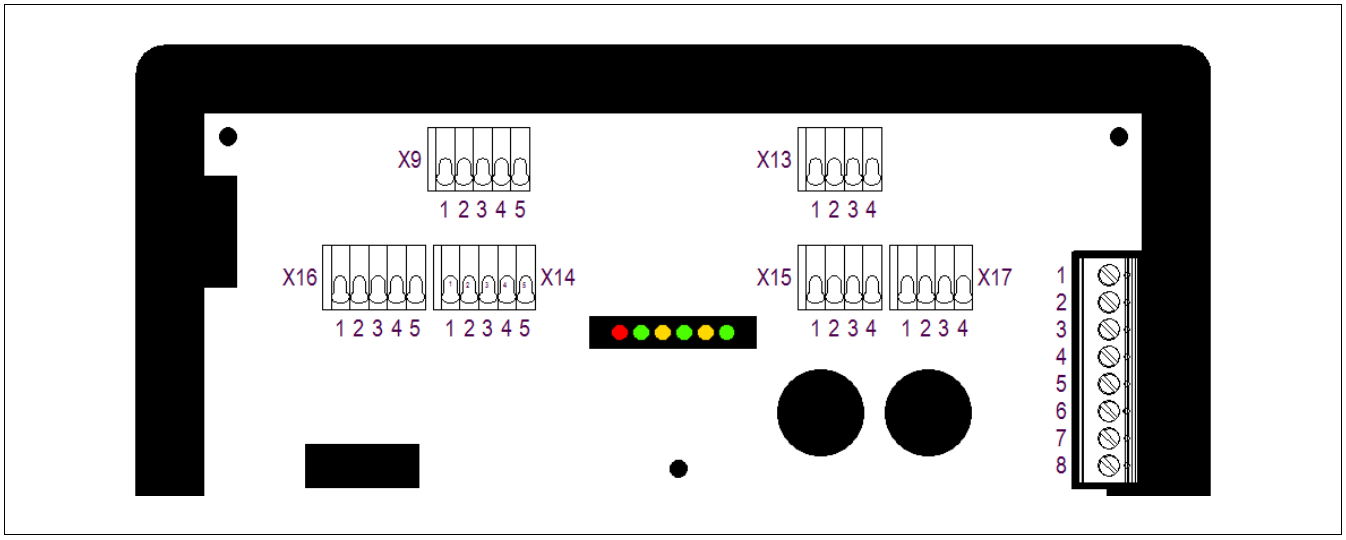
- Disconnect the programming cable after completing any maintenance and programming work.

Terminal row X6 is intended for connecting the LAN connection cable.



Terminal	Connection
1	No function
2	No function
3	No function
4	No function
5	PE
6	GN - Transmit, negative
7	GNWH - Transmit, positive
8	OG- Receive, negative
9	OGWH - Receive, negative

6.2.4 Ex i connection terminals

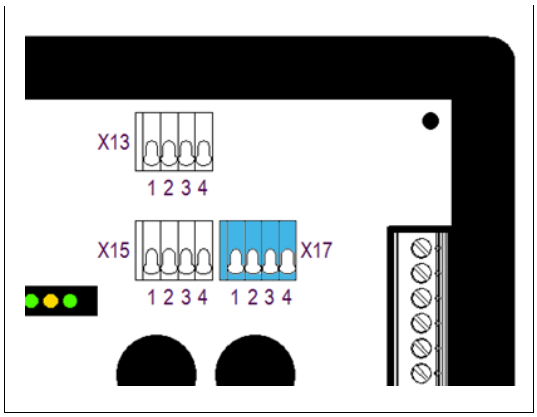


6.2.4.1 Terminal series "X13" and "X15"

The function of the optional 4...20 mA sensors on terminal rows "X13" and "X15" is not available with the SILAS[pz] control unit.

6.2.4.2 Terminal row “X17”

The optionally available p-Operator panel can be connected to the “X17” terminal row.



Terminal	Connection
1	3V3_HMI
2	GND
3	HMI_RX
4	HMI_TX

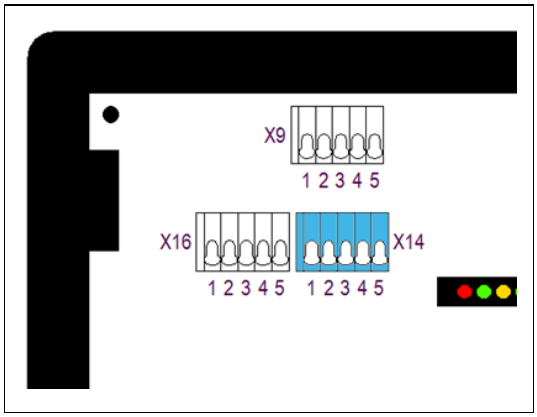
6.2.4.3 Terminal row “X14”

Note

The main switch IN // main switch OUT contact is fitted with a jumper as standard. This jumper has the effect of automatically enabling the system after the purge process.

This “main switch” function enables the operation when the control unit is enabled plus the switch is activated. The switch does not require a resistor combination.

The temperature sensor can be a PT 100 or 1000. Settings for the sensor are made within the device.



Terminal	Connection
1	Main switch IN
2	Main switch OUT
3	Temperature sensor 2 IN
4	Temperature sensor 2 OUT
5	Temperature sensor 2 MESS

6.2.4.4 Terminal row “X16”

WARNING

Risk of death or serious injury due to unintentional changing of Ex-relevant parameters.

The explosion protection is no longer guaranteed.

- Remove the programming authorisation after deliberately changing parameters.
- After changing or adapting parameters, a subsequent function test has to be carried out.

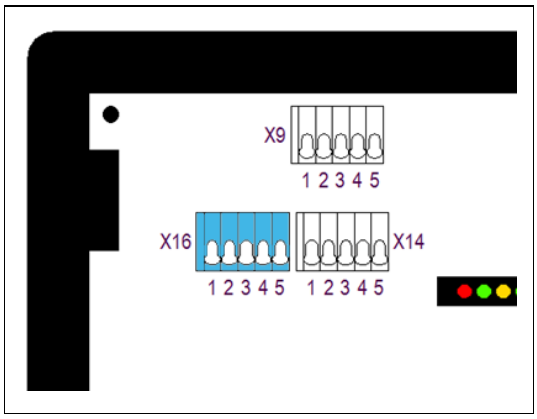
Note

In normal operation, the parameter switch should not be connected to prevent any unintentional parameter changes.

In order to change settings and setpoints on the device, the programming release must be connected and activated. This should only be connected during the deliberate changing of parameters. After changing or adjusting parameters, a subsequent function test has to be carried out.

It must not be connected during normal operation of the Ex p system.

The temperature sensor can be a PT 100 or 1000. Settings for the sensor are made within the device. Two or three wire sensors can be used.



Terminal	Connection
1	Para_IN
2	Para_OUT
3	Temperature sensor 3 IN
4	Temperature sensor 3 OUT
5	Temperature sensor 3 MESS

6.2.4.5 Terminal row “X9”

DANGER

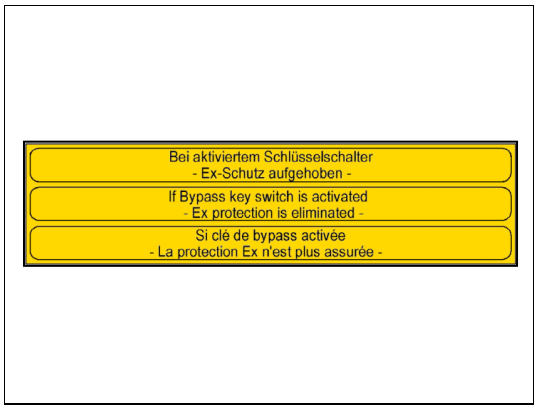
Death or serious injury due to commissioning with bypass key switch in potentially explosive atmosphere!

Explosion hazard

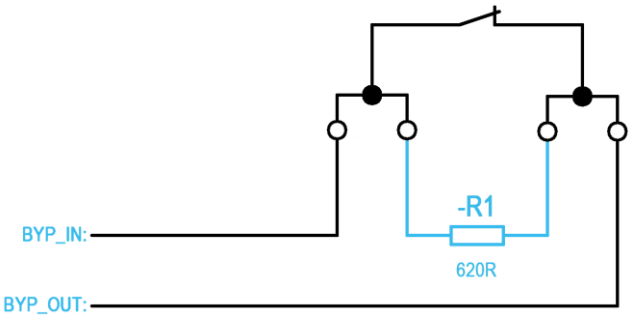
- The commissioning with a bypass key switch must be authorised by the plant manager or his representative. Authorisation may only be granted if it is ensured that there is no potentially explosive atmosphere for the period of commissioning or if the necessary protective measures against the risk of explosion have been taken (fire permit).
- The bypass key switch must be labelled in the direct vicinity of the key switch in order to indicate that the explosion protection is deactivated when the key switch is activated.

For tests that have to be carried out on the protected application under voltage, it is possible to connect a bypass key switch.

The bypass key switch must be labelled with an identification plate and attached in the immediate vicinity of the bypass key switch.

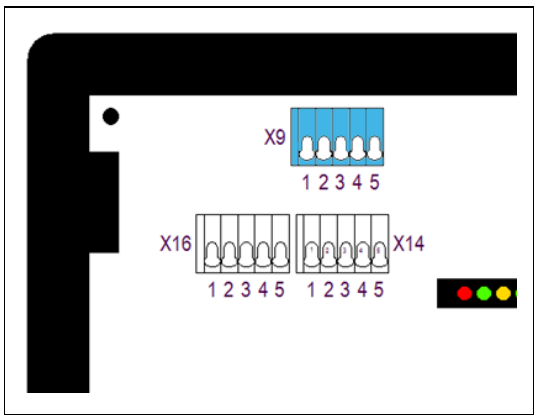


Wiring example:



The position of the bypass key switch is scanned intrinsically safe by the control electronics. In order for the bypass switch to be recognised and the function to be executed, a 620R resistor must be detected by the Ex p control unit via the terminal.

The temperature sensor can be a PT 100 or 1000. Settings for the sensor are made in the device. Two or three wire sensors can be used.



Terminal	Connection
1	Byp_IN
2	Byp_OUT
3	Temperature sensor 1 IN
4	Temperature sensor 1 OUT
5	Temperature sensor 1 MESS

7 Operation

The following chapters describe the operation of the Ex p control unit for the end user. Configuration and setting instructions are described in a separate operating manual.

The complete solution is self-starting once the purge gas supply and supply voltage have been connected. System statuses can be queried via the WEB operating system.

7.1 Configuration of the LAN interface

The Ex p control unit is supplied with a fixed IP address as standard.

Standard IP address (delivery status): 192.168.11.101

7.1.1 Setting the LAN connection

The settings of the LAN interface on the PC (or converter / managed switch) must be parameterised in order to ensure that it can communicate with the Ex p control unit.

Settings:

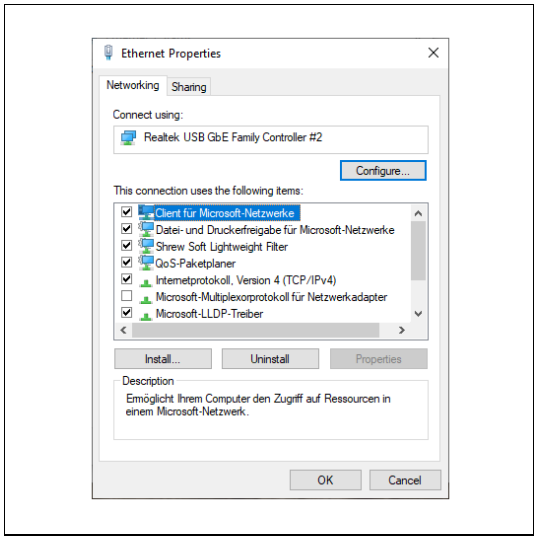
LAN interface configuration:

- Extended / Speed: 100 Mbps Full Duplex

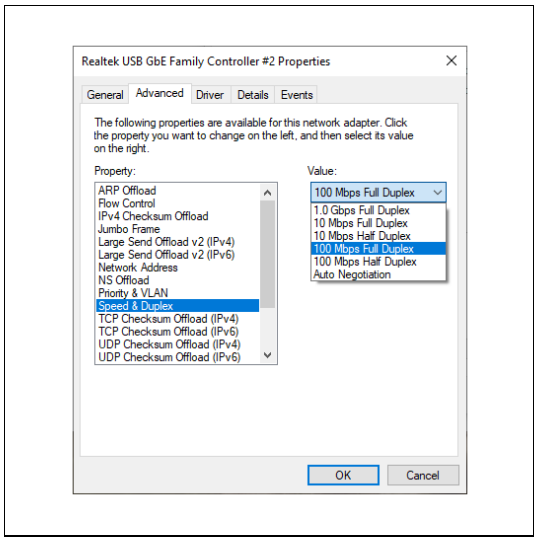
Properties Internet Protocol Ver. 4 (TCP/IPv4):

- Activation of fixed IP address
- IP address: 192.168.11.99
- Subnet mask: 255.255.0.0

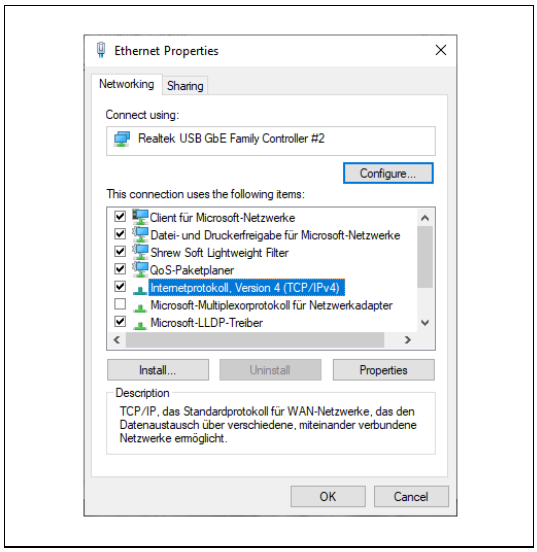
Procedure



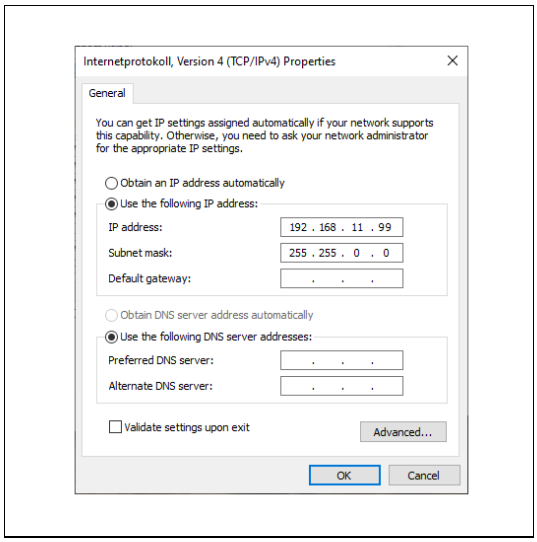
- Open the network settings of the LAN interface on the PC/laptop.
- Select the “Properties” button in order to call up the properties of the LAN connection.



- Using the “Configure...” button. Open the settings for the network adapter and select the “Advanced” tab.
- Click on the “Speed & Duplex” function in the “Property” field on the left.
- Set the “Value” field on the right to “100 Mb Full Duplex” by clicking and selecting from the drop-down menu.
- Confirm the changes with “OK”.



- Double-click in order to call up the Internet Protocol Version 4 (TCP/IP4).



Properties of the Internet Protocol Version 4 (TCP/IPv4):

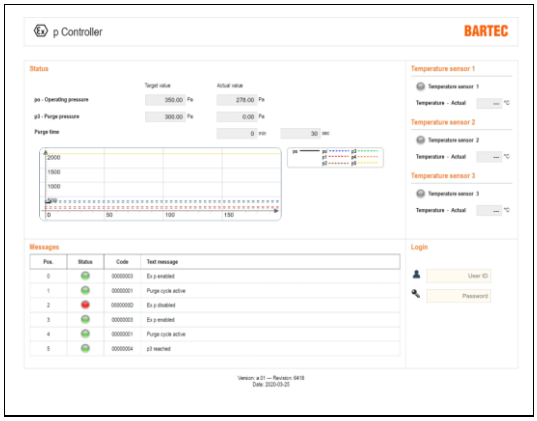
- Change “Obtain IP address automatically” to “Use the following IP address” by clicking on it.
- Enter the IP address 192.168.11.99 under “IP address”
- Enter the subnet mask 255.255.0.0.
- Confirm the entries with OK.

7.2 Operating the WEB operating system

The WEB operating system (WEB-OS) is operated by using the input devices on the PC.

7.3 Logging into the WEB operating system

Two levels are available for logging into the WEB interface



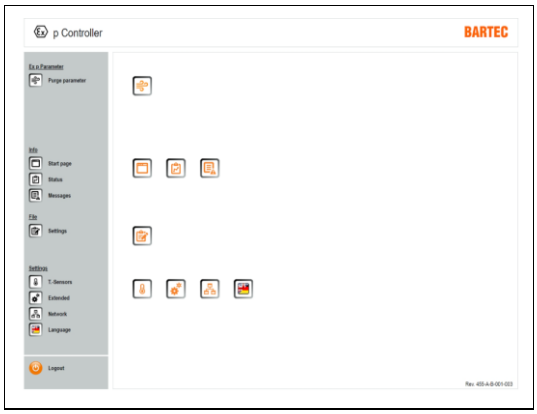
Level 1	=	**Guest access**
User ID	=	guest
Password	=	guest

Note: The settings cannot be changed. Language change and query status and messages are possible.

Level 2	=	**User access**
User ID	=	user
Password	=	0000

Note: Settings can only be changed when the programming switch is set.

7.4 Navigating in the WEB operating system



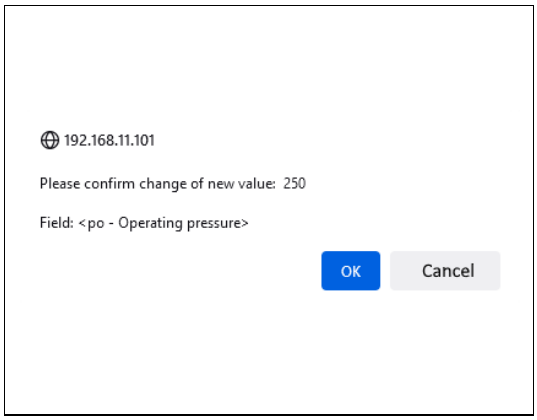
By clicking on the grey navigation bar on the left, you can jump directly to the specific submenus.

The corresponding icons for the submenus are arranged to the left.

At the bottom left is the icon for logging out. By clicking on this button, the WEB operating system logs out and returns to the start page.

7.5 Entering parameters

Parameters must be changed in the web interface in a specific order.

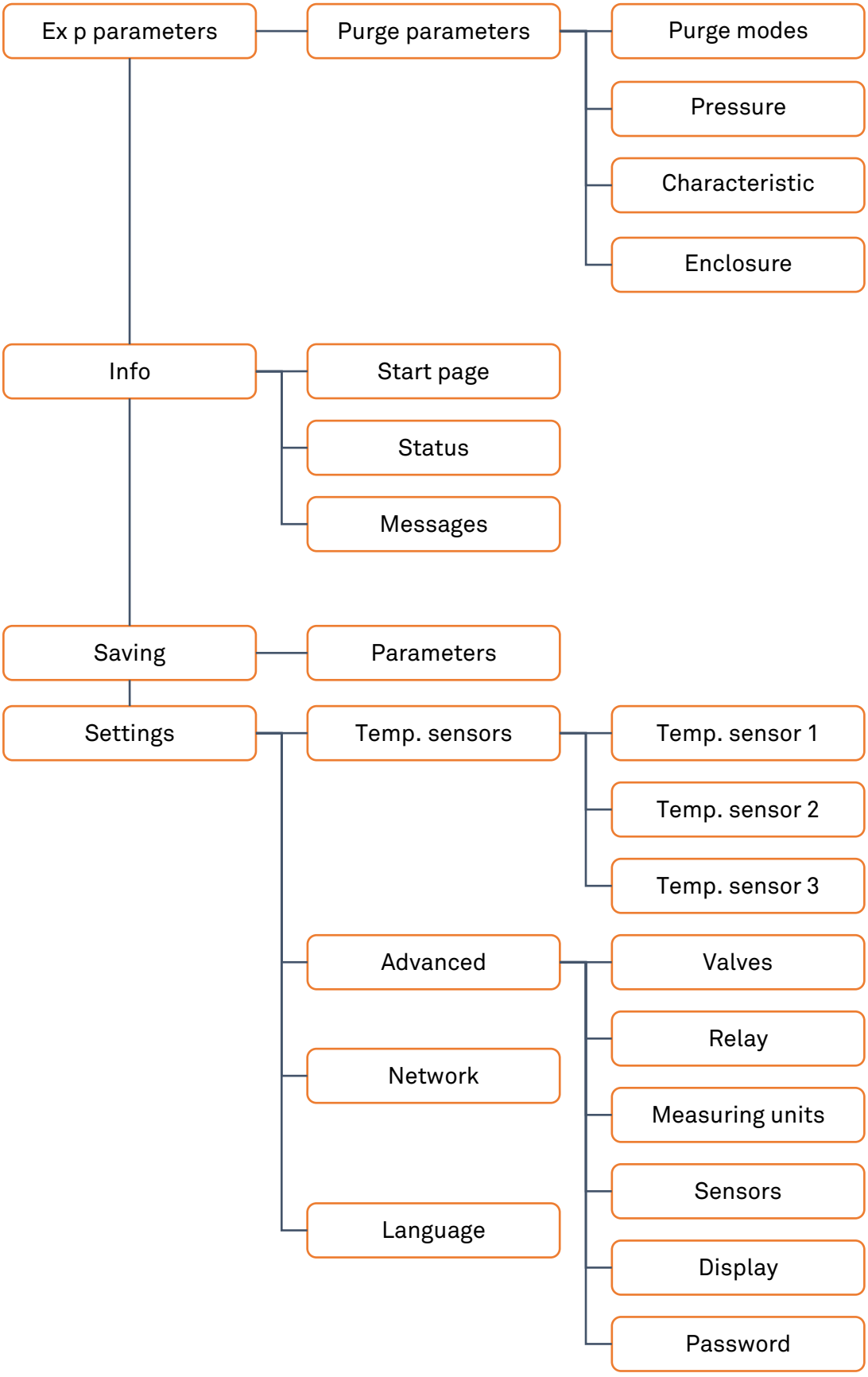


Procedure

- Activate the parameter switch.
- Log into the web operating system.
- Select the desired parameter e.g. po
- Enter the pressure value - e.g. enter value 250
- Confirm with the “Enter” button
- The following window opens. This is to confirm and check the changed parameter value.

7.6 Menu structure of the WEB operating system

The WEB operating system integrated in the Ex p control unit has the following menu structure.



7.7 LED displays on the Ex p functional unit

LED	Colour	Function
p1	Green	**Minimum pressure** – Lights up when the minimum pressure is exceeded
p2	Yellow	**Pre-alarm** – Lights up when the pressure falls below the set value
p3	Green	**Purge pressure** – Lights up during the purge phase and when the set value is exceeded
p4	Red	**Maximum pressure** – Lights up when the maximum pressure p4 or p5 is exceeded
Operate	Green	**Release / flushing process** – Flashing during purge and illuminated when released after purge
Status	Green	**Supply / Bypass** – Illuminated when supply voltage is applied and flashing when bypass is activated

7.8 WEB operating system operating menu

7.8.1 Ex p parameters / Purge parameters

The purge parameters are summarised in the “Ex p parameters / Purge parameters” menu. This includes the purge modes, pressure parameters, characteristic curve and enclosure parameters submenus.

7.8.1.1 Purge modes

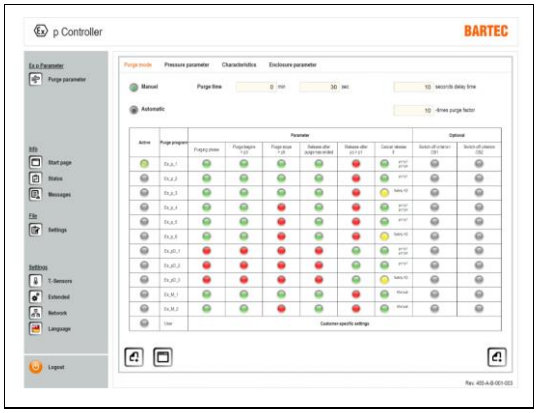
DANGER

Death or serious injury due to use of an unsuitable purge mode!

Explosion hazard

- Only activate purge programmes which are suitable for the application.
- Purge programmes Ex_p_3, Ex_p_6, Ex_M_1 and Ex_M_2 are special purge modes that must not be used for standard applications.

The Ex p sequence control is defined in the “Purge modes” submenu.



Purge time = Fixed purge time of the Ex p device

Delay time = Defines the delay time for switching off the Ex p device in the event of pressure fluctuations.

Purge factor = Parameter for the number of purges of the Ex p volume for automatic averaging of the purge time.

The **automatic purge** automatically calculates the corresponding purge time during the initial phase of purge based on the parameters stored in the Ex p control unit for enclosure size and applied purge gas output.

The **manual purge** is based on the fact that the values for purge time and pressures are permanently stored in the device during initial commissioning. The purge time is calculated and programmed by the commissioning technician based on the determined flow rate and enclosure volume.

Purge programmes at gas application:

Programme	Application	Function				
		Purge phase	Purge time starts when P3 is reached	Purge time stops when p5 is reached	Ex p active at	Ex p inactive at
Ex_p_1	Gas	Yes	Yes	Yes	Purge time expired	po < p1 po > p4
Ex_p_2	Gas	Yes	Yes	Yes	Purge time expired	po < p1
Ex_p_4	Gas	Yes	Yes	No	Purge time expired	po < p1 po > p4
Ex_p_5	Gas	Yes	Yes	No	Purge time expired	po < p1

Ex p programmes at dust applications:

Programme	Application	Function				
		Purge phase	Purge time starts when P3 is reached	Purge time stops when p5 is reached	Ex p active at	Ex p inactive at
Ex_pD_1	Dust	No	No	No	po >= p1	po < p1 po > p4
Ex_pD_2	Dust	No	No	No	po >= p1	po < p1

7.8.1.2 Pressure parameters

The system pressures of the Ex p operating equipment are defined in the “Pressure parameters” submenu.

Value	Description
po	**Operating pressure.** Regulating pressure value during the operating phase.
p1	**Minimum pressure.** Switch-off value, if undershot, the release is cancelled.
p2	**Pre-alarm.** Value at which an alarm can be triggered before switch-off.
p3	**Purge pressure.** Purge time starts when the set value is exceeded.
p4	**Maximum pressure, operation.** The release switches off depending on the mode used.
p5	**Maximum pressure, purge.** The release switches off depending on the mode used.

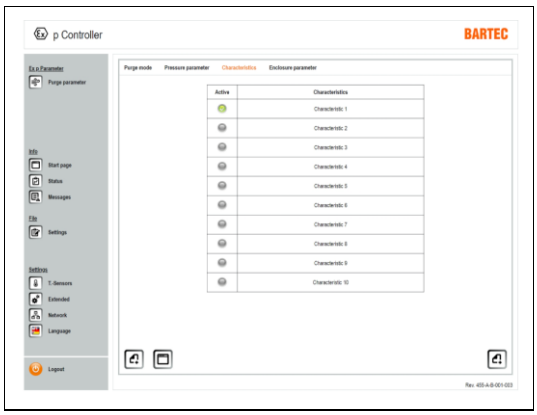
7.8.1.3 Characteristic curve

DANGER

Incorrect parameterisation of the parameters in the Ex p control unit!

The purge process takes place with a too low purge gas flow and there is a risk of residual explosive gases inside the Ex p equipment.

- Check type and set characteristic.



For automatic purge time determination, the characteristic of the pressure monitor in the system must be set in the Ex p control unit.

Value	Function	
Characteristic curve 1	1x Pressure monitor	1x 17-51P3-1604
Characteristic curve 2	2x Pressure monitor	2x 17-51P3-1604

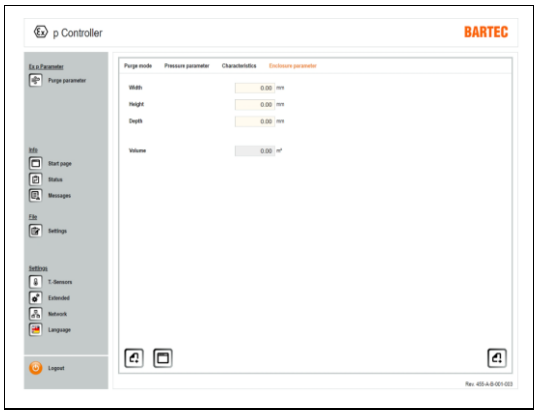
7.8.1.4 Enclosure parameters

DANGER

Incorrect parameterisation of the parameters in the Ex p control unit!

The purge process takes place with a too low flow of purge gas and there is a risk of residual explosive gases inside the Ex p equipment.

- Check the size and volume of the enclosure.

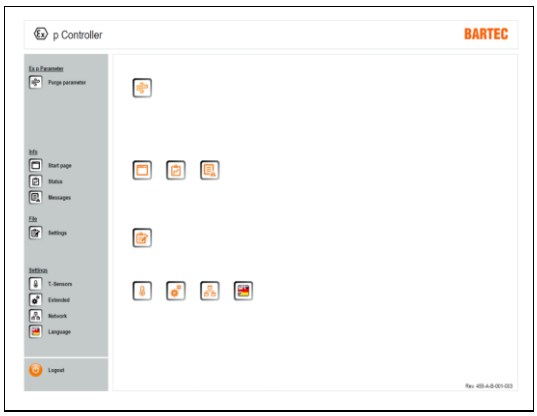


For automatic purge time determination, the size of the protected volume must be set in the Ex p control unit.

This is done by entering the length, width and height in mm.

7.8.2 Info

7.8.2.1 Start page

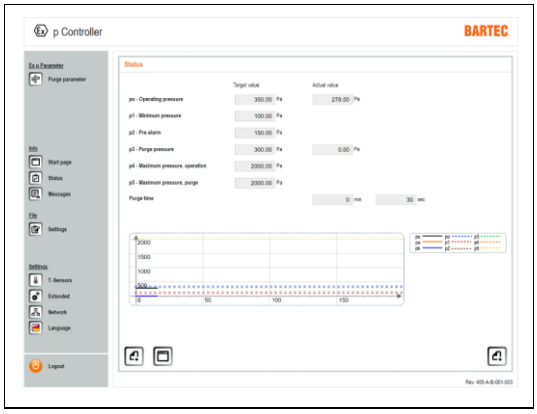


By clicking on the gray navigation bar on the left, you can jump directly to the specific submenus.

The corresponding icons for the submenus are arranged to the left.

At the bottom left is the icon for logging out. By clicking the button, the WEB operating system logs out and returns to the start screen.

7.8.2.2 Status



The “Info / Status” menu provides an overview of the setpoint and measured values.

There is also an internal pressure diagram in the lower area.

7.8.2.3 Messages

In the “Info / Messages”, the current system status is displayed as a plain text message.

Green messages = Positive

Yellow messages = Warning

Red messages = Error messages

7.8.3 Saving

7.8.3.1 Parameters

In the “Save / Parameters” menu, parameters can be saved from the Ex p control unit to a local computer or transferred from the local computer to the Ex p control unit.

Load = Transfer local parameter set to the Ex p control unit

Save = Save parameter set from the Ex p control unit to the local computer

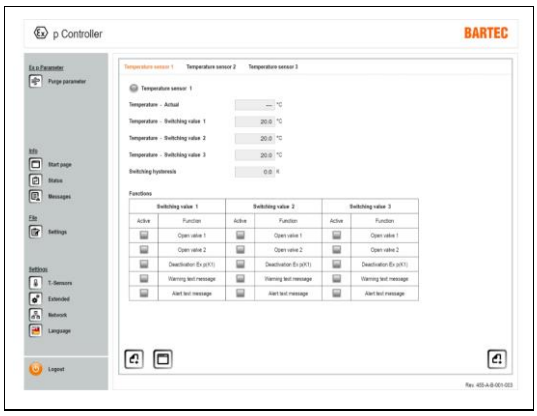
7.8.4 Settings / Advanced

7.8.4.1 Temperature sensors

Note

The temperature sensors are not safety-related!

- This means that if the “Deactivation Ex p” function is activated, the protected equipment is deactivated when the temperature is exceeded and reactivated when the temperature has decreased!



Up to three connected PT100/1000 sensors can be configured in the "T. sensors" menu item.

Various functions can be executed in the control sequence for the recorded temperature.

This function can be used, for example, to monitor and cool frequency inverters.

Temperature sensor	Function
Temperature - actual	Display of the measured temperature
Temperature switching value 1	If the switching value is exceeded, the assigned function is executed.
Temperature switching value 2	
Temperature switching value 3	
Switching hysteresis	Switching hysteresis between activation and deactivation

Switching value	Function
Open valve 1	Cooling via purge air
Open valve 2	Function is not available for SILAS^{pz}
Deactivation Ex p (K1)	Enable Ex p drops
Warning message, plain text	Plain text messages output as warning
Alarm message Plain text	Plain text message output as alarm

Procedure when setting the "Temperature sensors"

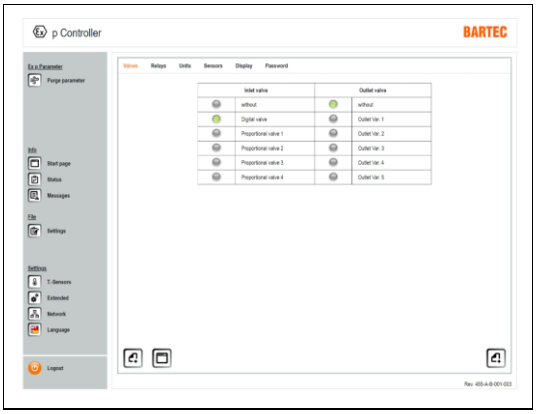
- Connect the computer to the Ex p control unit / control unit
- Activate the programming switch
- Log into the WEB interface with the user level
- Call up the “Advanced / Sensors” menu
- Activate the corresponding button for the required temperature sensor, e.g. temperature sensor 1 by clicking on PT100 or 1000
- The associated button changes to
- Confirm pop-up window with the changed value
- Select the display unit in °C or °F by clicking on the Activate button. The display changes to
- Confirm pop-up window with the changed value
- Call up the “T. sensors / Temperature sensor 1” menu
- Signalling for active sensor is displayed by using the green indicator
- Store switching value 1
  e.g. 25 °C
- Confirm pop-up window with the changed value
- For switching value 2 and switching value 3, proceed in the same way as for switching value 1
- Store switching hysteresis
  e.g. 5 K, Functions are activated or deactivated with a hysteresis of 5 K
- Select function for switching value 1
  e.g. open valve 1 “Cooling via purge air” function
- Confirm pop-up window with the changed value
- Move function to switching value 2 and switching value in the same way as to switching value 1.

7.8.4.2 Valves

Note

The Ex p control unit SILAS^{pz} cannot control an outlet valve

- There is no control of an outlet valve when activated.



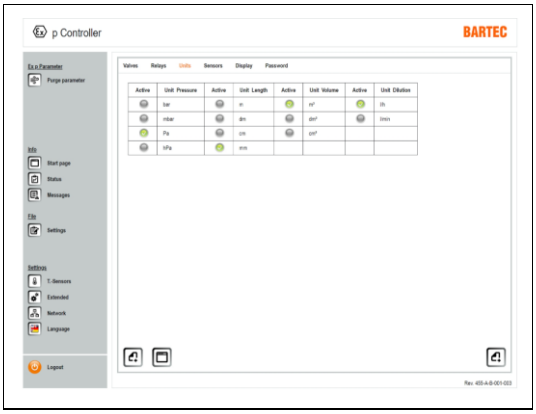
The purge gas valve connected to the Ex p control unit can be set in the “Valves” menu item.

The factory setting is “Digital valve”.

The activated purge gas valve is labelled with the following symbol:

Purge gas valve		
Default	Valve	
	Without	Application for dust application
activated	digital valve	Type 05-0056-0073
	proportional valve 1	
	proportional valve 2	Type 05-0056-0081
	proportional valve 3 and 4	

7.8.4.3 Units of measurement



The display units for pressure, length, volume and dilution can be selected in the "Units of measurement" menu item.

7.8.4.4 Relay

Note

ATTENTION: Switch relay K2 simultaneously with K1!

When switching parameter K1 is activated, the relay functions as an enabling relay. Other activated switching parameters are ignored.

- Programming additional switching parameters on relays K3 or K4

Messages with a “minus sign” indicate that the relay is activated if the value falls below the threshold.

For messages with a “plus sign”, this indicates that the relay is activated when the value is exceeded.

In the “Relay” menu item, relays K2, K3 and K4 can be assigned the corresponding switching functions. One or more switching functions can be assigned to each relay.

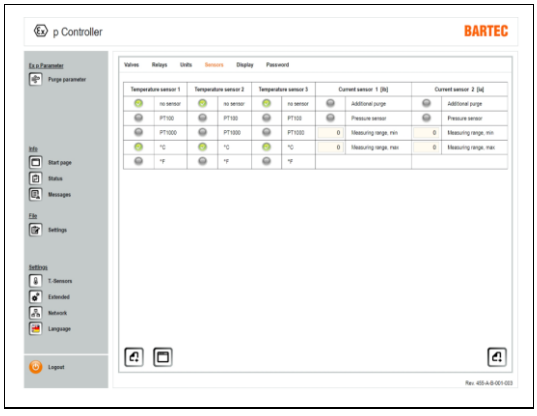
The default setting is switching with K1.

The activated switching function is labelled with the following symbol: ☑

Procedure

- Connect the computer to the Ex p control unit.
- Activate the programming switch.
- Log into the WEB interface with the user level.
- Call up the “Advanced / Relay” menu.
- Activate the specific message(s) in the “of the respective relay” column by clicking on the corresponding button.
  e.g. click on button “K1”. The button changes from ☐ to ☑.
- Confirm pop-up window with the changed value.
- Deactivate the programming switch.

7.8.4.5 Sensors



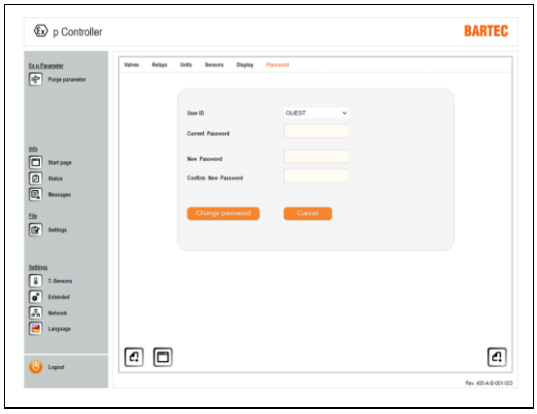
The three additional temperature sensors can be activated in the “Sensors” menu item.

ⓘ The OS1 and OS2 current sensors are not available for the SILAS[pz] version.

7.8.4.6 Display

The contrast and brightness of the LCD display on the p-Operator panel can be set in the “Display” menu item.

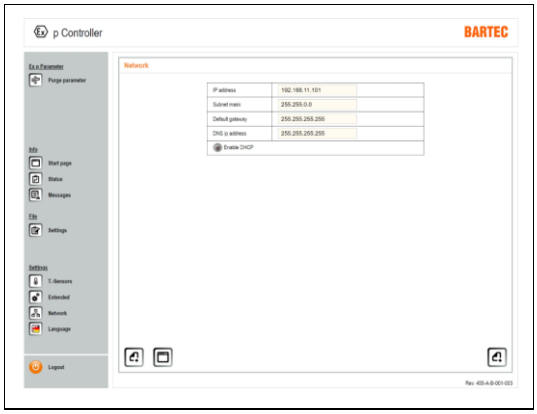
7.8.4.7 Password



A new password can be stored for the guest and user in the “Password” menu item.

The password should consist of a four-digit numerical sequence.

7.8.4.8 Network



All network-specific settings are made in the “Network” menu.

By default, the Ex p control device is set to a static IP address. It is also possible to activate a DHCP mode.

7.8.4.9 Language

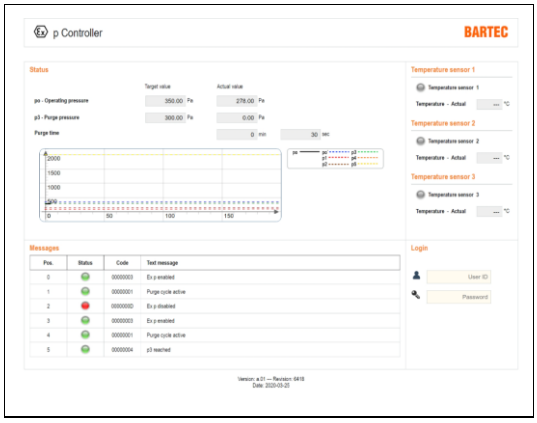
The system language can be selected between German and English in the “Language” menu.

7.9 System status

By connecting the laptop to the Ex p control unit, initial information about the system status can be called up on the start screen.

Procedure

- Log in to the WEB interface by opening the browser and entering the IP address 192.168.11.101



The start screen provides an initial overview of the status of the Ex p system.

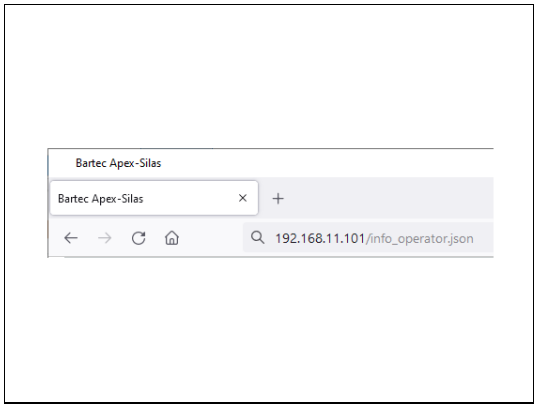
The setpoints for po and p3 and the corresponding measured values are displayed in the top left-hand area. In addition, plain text messages, pressure diagram and the values for optionally connected temperature sensors are displayed.

7.10 Reading out data containers

The data for the control room is retrieved via a web browser or using an appropriate software tool to be provided by the customer, which is able to send an HTML GET message equivalent to a browser request to the SILAS Ex p control unit via the network.

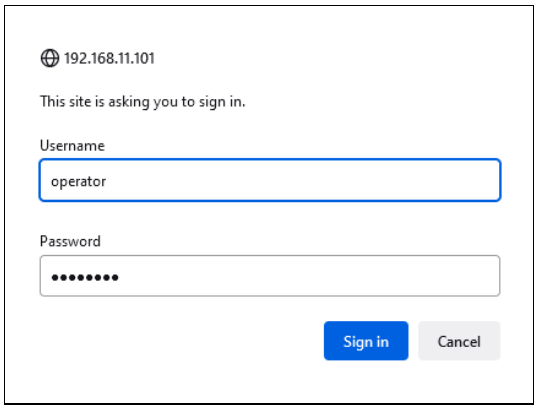
The data format returned by the device is JSON.
(Please see: https://de.wikipedia.org/wiki/JavaScript_Object_Notation)

Query



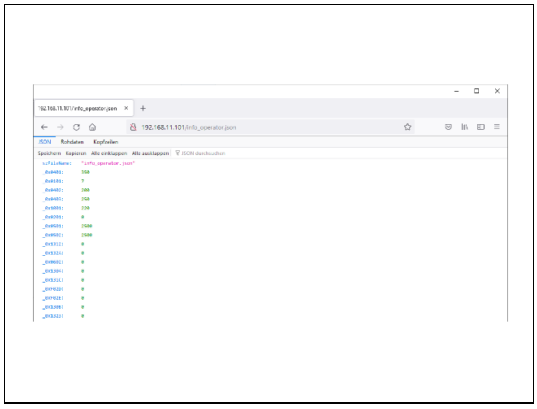
The data for the control room can be retrieved via the URL:

- http://<ip-addr>/info_operator.json
- e.g. http://192.169.1.101/info_operator.json



The username/password must be entered.

Username: “operator”
Password: “operator”



Response from the Ex p control unit

KEY/ID	Parameter	Unit
_0x0401	Operating pressure po (setpoint)	Pa
_0x0101	Operating pressure po (actual value)	Pa
_0x0402	Minimum pressure (switch-off value)	Pa
_0x0403	Pre-alarm (switching value)	Pa
_0x1001	Purge pressure p3 (setpoint)	Pa
_0x0201	Purge pressure p3 (actual value)	Pa
_0x0501	Maximum pressure, operation p4 (switching value)	Pa
_0x0502	Maximum pressure, purge p5 (switching value)	Pa
_0x1312	Pressure sensor A pa (actual value)	Pa
_0x132A	Pressure sensor B pb (actual value)	Pa
_0x0602	Purge time	Seconds

8 Commissioning

DANGER

Risk of explosion if parameters are incorrect!

Incorrect parameters and settings cancel the explosion protection.

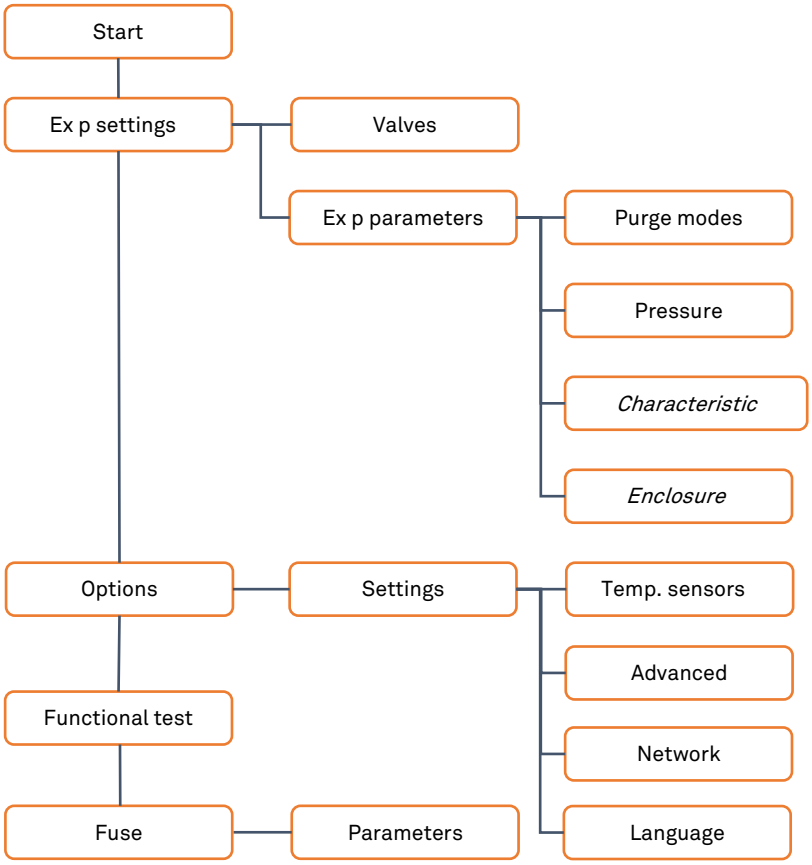
- Check the settings and parameters by using the “four eyes principle”.

8.1 General

The following sections describe the initial commissioning of the Ex p control unit. This means that it describes in detail how to set the Ex p control unit to the manufactured Ex p equipment.

8.2 Sequence for the initial commissioning

The following procedure is recommended for setting the function parameters:



8.3 Parameterization of the purge gas valve

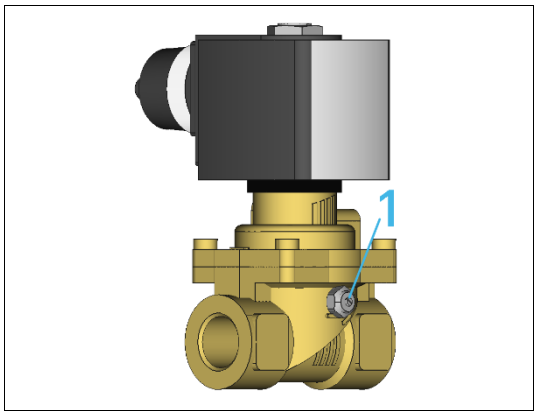
Purge gas valves in the "Proportional" or "Digital" version are available for the Ex p control unit SILAS[pz]. The difference between the two purge gas valve types is the mode of operation:

Digital purge gas valve = On/off valve. Leakage air compensation takes place via the setting of the manually adjustable leakage air needle valve.

Proportional purge gas valve = Regulating valve. During the purge phase, the internal pressure po setpoint is regulated to 87.5% of p5 and during the operating phase to po setpoint.

The used purge gas valve must be set in WEB-OS in the “Advanced / Valves” menu.

8.3.1 Setting the digital purge gas valve "Leakage air compensation"



The internal pressure during operation of the Ex p equipment is determined with the air leakage needle (1). It is important to set the air leakage needle correctly so that the SILAS^{pz} Ex p control unit switches to the "Purge" function.

Procedure

- Set up the pressurized enclosure ready for operation.
- Measure the internal pressure using a pressure gauge or use the Ex p control unit in order to record the pressure.
- Close the pressurized equipment.
- Activate the purge gas supply.
- Read the resulting internal pressure on the measuring device.
- The measured internal pressure should correspond to the desired operating pressure.

- If the internal pressure is too low, increase the purge gas volume at the leakage air needle valve. This is done by turning it counter clockwise.
- If the internal pressure is too high, the amount of purge gas at the air leakage needle must be reduced. This is done by turning the air leakage needle clockwise.

8.4 Commissioning the SILAS^{pz} control unit [Gc]

Note

Ensure that the electrical wiring is as described in the relevant operating instructions and that the purge gas supply is connected.

If the Ex p control unit is in programming mode (parameter switch activated and password entered), the pressure values are displayed in Pa. Settings are made in the unit Pa.

In order to carry out the configuration, log into the WEB-OS at user level.

8.4.1 Procedure Ex p settings - Manual purge

After the purge gas valve used has been set, the Ex p specific parameters are set in the following sections.

Follow the individual chapters for the correct procedure for the parameters to be carried out.

8.4.1.1 "Purge program / purge modes" settings

DANGER

Death or serious injury due to use of an unsuitable purge mode!

Explosion hazard

- Only activate purge programs which are suitable for the application.
- Purge programs Ex_p_3, Ex_p_6, Ex_M_1 and Ex_M_2 are special purge modes that must not be used for standard applications.

The purge mode and the sequence control can be adjusted in the "Purge parameters / Purge modes" web interface.

Note

The precondition for all purge programs is **po > p1**, so that the further process phases are initiated.

Procedure

- Connect the PC to the Ex p control unit. Activate the programming switch.
- Log into the WEB interface with the user level.
- Call up the Purge parameters / Purge modes menu.
- Select the flushing program used by clicking on the left button.
  Select purge programme Ex_p_1 by clicking on the button.
  The button changes from to .
- Confirm pop-up window with changed value.
- Purge mode should be set to " Manual" for the purge described here.

8.4.1.2 Determining the purge time

Note

The procedure described here for determining the purge time is based on the principle of manual purge time calculation.

Assumptions for determining the purge time:
- All relevant parameters are assumed values -

Ex control unit with digital purge gas valve application

When using a digital purge gas valve, the purge pressure p3 is set by means of the mechanical limitation of the purge gas nozzle. The table in section 5.6 provides guide values for the bore diameters based on the protected enclosure volume.

Deviating from this table, the purge gas nozzle can also be drilled out step by step in order to achieve the desired purge pressure p3.

The larger the bore of the purge gas nozzle, the larger the volume of the supplied purge gas and therefore the greater the achieved purge pressure p3.

Ex p control with proportional purge gas valve application

When using a proportional purge gas valve, the purge pressure p3 is achieved by adjusting the internal pressure to the value 87.5% of p5.

This means that the internal pressure during the purge process can be finely adjusted with the aid of the proportional valve, which can be advantageous for pressure-sensitive assemblies in the front of the pressurized enclosure.

Procedure

- Connect the PC to the Ex p control unit. Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the Purge parameters / Pressure parameters menu.
- Set pressure parameter p3 - purge pressure to 2000 Pa (20 mbar).
  Pop-up window with display of changed value opens. Confirm.
- Pressure parameter p5 - Set maximum pressure, purge to the maximum value permitted by the pressurized equipment during purge, e.g. set 2000 Pa (20 mbar)
  Pop-up window with display of changed value opens. Confirm.
- Deactivate the programming switch.
- The Ex p control unit switches from programming mode to control/monitoring mode.
- Press the "F5" button on the PC in order to refresh the browser window
- The start screen opens.
- Note the achieved p3 purge pressure (actual value), e.g. 12 mbar.
  The bore of the purge gas nozzle may need to be adjusted.
  Open operating instructions chapter Purge air diagram.
  Note the corresponding flow rate Q as a function of the determined p3 from the diagram.
- Calculate the purge time by using the formula below.
- - Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the Purge parameters / Pressure parameters menu.
- Set pressure parameter p3 - purge pressure to determined value
  Pop-up window with display of changed value opens. Confirm.
- Call up the purge parameters / purge modes menu
- Set the purge time to the calculated purge time
  Pop-up window with display of changed value opens. Confirm.

8.4.1.3 Calculating the purge time

The purge time is calculated by using the following formula:

$$\frac{\text{Cabinet volume [litres]} \times \text{Purge factor}}{\text{Flow rate [litres/hour]}} \times 60 = \text{Purge time [minutes]}$$

The flow rate must be determined using the achieved purge pressure p3 and the corresponding flow rate diagram (see Appendix, Section 13).

Example 1:

Cabinet volume = 140 l; flushing = 5-fold; 1 pressure monitor

Setting the switching value "P3" = 12.0 mbar,

as in chapter 8.2.2 "Determining the purge pressure".

Flow rate according to diagram = 14,000 litres/hour

$$\frac{140 \text{ litres} \times 5}{14.000 \text{ litres/hour}} \times 60 = 3 \text{ minutes}$$

Example 2:

Cabinet volume = 720 l; purge = 5-fold; 2 pressure monitors

Setting the switching value "P3" = 12.0 mbar,

as in chapter 8.2.2 "Determining the purge pressure"

Flow rate according to diagram = 24.000 litres/hour

$$\frac{720 \text{ litres} \times 5}{24.000 \text{ litres/hour}} \times 60 = 9 \text{ minutes}$$

8.4.1.4 "Ex p parameter / pressure parameter" setting

Note

The pressure parameters to be complied with are part of IEC / EN 60079-2.

Furthermore, the pressure parameters depend on the application and must be checked during the initial commissioning.

The following values can be used as a basic setting:

po = 2.5 mbar (250 Pa)

p1 = 1.0 mbar (100 Pa)

p2 = 1.5 mbar (150 Pa)

p3 = Determined by chapter 8.4.1.2

p4 = Application-dependent, e.g. pressure-sensitive components?

P5 = Application-dependent, e.g. pressure-sensitive components?

Procedure

- Connect the PC to Ex p control unit. Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the purge parameters / pressure parameters menu
- Enter and confirm the "po - operating overpressure" parameter
  e.g. 250 Pa (2,5 mbar)

  The value "po" is the internal operating overpressure of the pressurized enclosure. This value is monitored by the Ex p control unit and compensated, if necessary.
- Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p1 - minimum pressure"
  e.g. 100 Pa (1.0 mbar)

  The value "p1" is the permitted minimum pressure of the pressurized enclosure. This value is monitored by the Ex p control unit and, if necessary, a shutdown is triggered if the pressure falls below this value.
- Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p2 - pre-alarm"
  e.g. 150 Pa (1.5 mbar)

  The value "p2" is a pre-alarm. The pre-alarm can be used to emit a pre-alarm before shutdown due to p1 undershooting.
- Pop-up window with display of changed value opens. Confirm.
- Follow the same procedure for the other pressure parameters.

8.4.2 Procedure Ex p settings - Automatic purge

8.4.2.1 "Purge program / purge modes" settings

DANGER

Death or serious injury due to use of an unsuitable purge mode!

Explosion hazard

- Only activate purge programs suitable for the application.
- Purge programs Ex_p_3, Ex_p_6, Ex_M_1 and Ex_M_2 are special purge modes that must not be used for standard applications.

The purge mode and the sequence control can be adjusted in the "Purge parameters / Purge modes" web interface.

Note

The precondition for all purge programs is **po > p1**, so that the further process phases are initiated.

Procedure

- Connect the PC to the Ex p control unit. Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the Purge parameters / Purge modes menu.
- Select the purge program used by clicking on the left button.
  Ex_p_1 purge program by clicking on the button.
  The button changes from to .
- Confirm pop-up window with changed value.
- Activate purge mode to " Automatic" by clicking on the button.
  Click on the button.
  The button changes from to .
- Confirm pop-up window with changed value.
- Enter the desired flushing factor.

  ⚠ The purge factor specifies how often the protected volume should be purged.

  E.g. purge 5 times means that a protected volume of 100 litres is purged with at least 500 litres of purge gas.

  Enter the value "5" and confirm with Enter.
- Confirm the confirmation window.

8.4.2.2 "Ex p parameter / pressure parameter" setting

Note

The pressure parameters to be complied with are part of IEC / EN 60079-2.

Furthermore, the pressure parameters depend on the application and must be checked during initial commissioning.

The following values can be used as a basic setting:

po = 2.5 mbar (250 Pa)

p1 = 1.0 mbar (100 Pa)

p2 = 1.5 mbar (150 Pa)

p3 = automatic determination by Ex p control unit

p4 = Application-dependent, e.g. pressure-sensitive components?

P5 = Application-dependent, e.g. pressure-sensitive components?

Procedure

- Connect the PC to the Ex p control unit. Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the Purge parameters / Pressure parameters menu.
- Enter and confirm the "po - operating overpressure" parameter
  e.g. 250 Pa (2.5 mbar)
- The value "po" is the internal operating overpressure of the pressurized enclosure. This value is monitored by the Ex p control unit and compensated, if necessary.
  Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p1 - minimum pressure".
  e.g. 100 Pa (1.0 mbar)
- The value "p1" is the permitted minimum pressure of the pressurized enclosure. This value is monitored by the Ex p control unit and, if necessary, a shutdown is triggered if the pressure falls below this value.
  Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p2 - pre-alarm".
  e.g. 150 Pa (1.5 mbar)
- The value "p2" is a pre-alarm. The pre-alarm can be used to emit a pre-alarm before shutdown due to p1 undershooting.
  Pop-up window with display of changed value opens. Confirm.
- Follow the same procedure for the other pressure parameters.

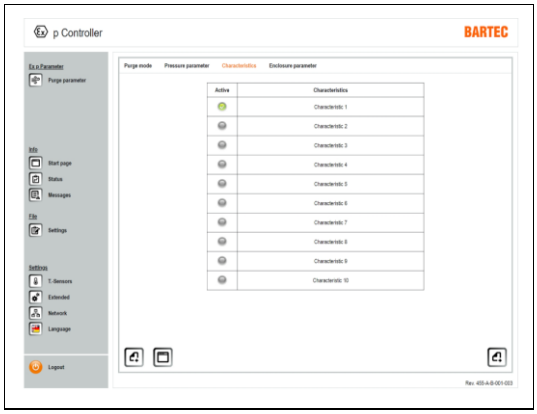
8.4.2.3 "Ex p parameter / characteristic curve" setting

WARNING

Risk of death or injury due to incorrect setting of the characteristic curve.

Explosion protection is no longer provided.

- Check the type number and associated characteristic curve of the pressure monitor.



The application-specific mounted pressure switch is defined in the "Characteristic curve" tab.

This must be set in a correct manner for the automatic purge time to be calculated correctly.

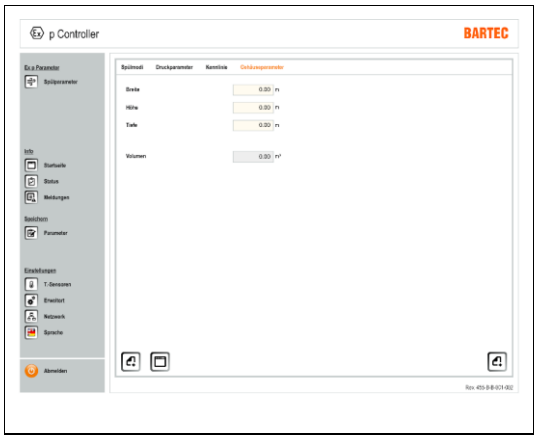
The pressure monitor used can be selected by "clicking" on the button ( ).

The selection table can be found in chapter 7.8.2.3.

8.4.2.4 "Ex p parameters / enclosure parameters" setting

Note

If the Ex p control unit is in programming mode (parameter switch activated and password entered), the units of measurement are displayed in mm.



The internal volume of the pressurized enclosure is defined in the "Enclosure parameters" tab.

8.4.3 Function test Ex p

Note

Safe operation with pressure fluctuations

- For safe operation (pressure fluctuations), the set inlet pressure of the pressure reducer must be increased by 0.5 bar.

When commissioning the pressurized enclosure, it is necessary to check the individual operating phases. In order to do this, all previous work steps must be completed. The operating pressure, leakage compensation and purge time must be set.

8.4.3.1 Checking the pre-purge phase

Procedure

- Set up the pressurized enclosure ready for operation.
- Activate the SILAS^{pz} control unit.
- Activate the purge gas supply;
  LED “Status" active
  LED "p1" active LED "p2" off
  LED "p3" active LED "Operate" flashes
- Reduce the purge gas supply by lowering the pressure on the pressure reducer. The purge time stops.
  LED “Status" active
  LED "p3" off LED "Operate" off
- Reset the purge gas supply to the initial value by increasing the pressure on the pressure reducer. Allow the purging time to elapse.
  LED “Status" active
  LED "p1" active LED "p2" off
  LED "p3" off LED "Operate" active

8.4.3.2 Checking the operating phase

Procedure

- Set up the pressurized enclosure ready for operation.
- Activate the SILAS control unit.
- Activate the purge gas supply.
- Allow the purge time to elapse; LED "K2" lights up, relay "K2" activates internals inside the pressurized enclosure.
- Reduce the purge gas supply by lowering the pressure on the pressure reducer; LED "K2" goes out, relay "K2" deactivates fixtures inside the pressurized enclosure.

8.5 Commissioning the SILAS^{pz} [Dc] control unit

Note

Ensure that the electrical wiring is as described in the associated operating instructions and that the purge gas supply is connected.

If the Ex p control unit is in programming mode (parameter switch activated and password entered), the pressure values are displayed in Pa. Settings are made in the unit Pa.

In order to carry out the configuration, log into the WEB-OS at user level.

8.5.1 Procedure Ex p settings

Follow the individual chapters for the correct procedure for the parameters to be carried out.

8.5.1.1 "Purge program / purge modes" settings

DANGER

Death or serious injury due to use of an unsuitable purge mode!

Explosion hazard

- Only activate purge programs that are suitable for the application.
- Purge programs Ex_p_3, Ex_p_6, Ex_M_1 and Ex_M_2 are special purge modes that must not be used for standard applications.

The purge mode and the sequence control can be adjusted in the "Purge parameters / Purge modes" web interface.

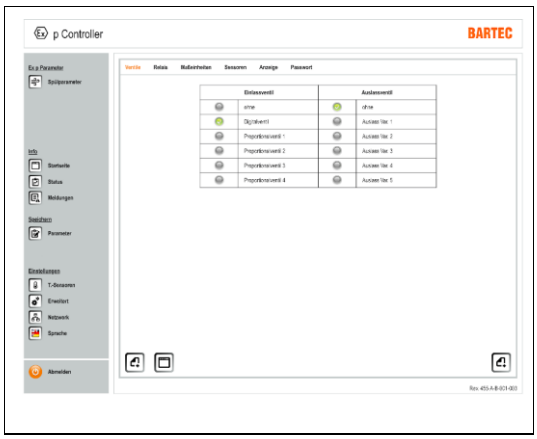
Note

The precondition for all purge programs is **po > p1**, so that the further process phases are initiated

Procedure

- Connect the PC to the Ex p control unit. Activate the programming switch.
- Log into the WEB-OS with the user level.
- Call up the Purge parameters / Purge modes menu.
- Select the purge program used by clicking on the left button.
  Select purge program Ex_pD_1 by clicking on the button.
  The button changes from to .
- Confirm pop-up window with changed value.
- Purge mode should be set to " Manual" for the purge described here.

8.5.1.2 "Purge gas valve" settings



As no purge takes place in Ex pD (dust) applications, the purge gas valve is replaced by an adjustable purge gas nozzle.

In order to ensure that the control unit does not activate a valve, the "None" setting must be adopted in the associated WEB interface menu "Advanced / Valves".

Inlet and outlet valves are set to "without".

8.5.1.3 "Ex p parameters / Pressure parameters" settings

Note

The pressure parameters to be complied with are part of IEC / EN 60079-2.

Furthermore, the pressure parameters depend on the application and must be checked during initial commissioning.

The following values can be used as a basic setting:

po = 1.5 mbar (150 Pa)

p1 = 1.0 mbar (100 Pa)

p2 = 1.2 mbar (120 Pa)

p3 = not used for dust applications

p4 = 5.0 mbar (500 Pa)

P5 = 5.0 mbar (500 Pa)

Procedure

- Connect PC to Ex p control unit. Activate programming switch
- Log into the WEB-OS with the user level
- Call up the Purge parameters / Pressure parameters menu.
- Enter and confirm parameter "po - operating overpressure"
  e.g. 150 Pa (1.5 mbar)

  The value "po" is the internal operating overpressure of the pressurized enclosure. This value is monitored by the Ex p control unit and compensated, if necessary.
- Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p1 - minimum pressure",
  e.g. 100 Pa (1.0 mbar)

  The value "p1" is the permitted minimum pressure of the pressurized enclosure. This value is monitored by the Ex p control unit and, if necessary, a shutdown is triggered if the pressure falls below this value.
- Pop-up window with display of changed value opens. Confirm.
- Enter and confirm pressure parameter "p2 - pre-alarm"
  e.g. 120 Pa (1.2 mbar)

  The value "p2" is a pre-alarm. The pre-alarm can be used to emit a pre-alarm before shutdown by falling below p1.
- Pop-up window with display of changed value opens. Confirm.

8.5.2 Follow the same procedure for the other pressure parameters Function test Ex p

Note

Safe operation with pressure fluctuations

- For safe operation (pressure fluctuations), the inlet pressure of the pressure reducer must be increased by 0.5 bar.

When commissioning the pressurized enclosure, it is necessary to check the individual operating phases. In order to do this, all previous work steps must be completed. The operating pressure, leakage compensation and purge time must be set.

8.5.2.1 Checking the operating phase

Procedure

- Set up the pressurized enclosure ready for operation.
- Activate the SILAS^{pz} control unit.
- Activate the purge gas supply.
- The Ex pD application is activated after positive pressure has been established;
  LED "Status" active LED "Operate" active
  LED "p1" active LED "p2" off LED "p3" off
- Reduce the purge gas supply by lowering the pressure on the pressure reducer;
  LED "Status" active LED "Operate" off
  LED "p1" off LED "p2" off LED "p3" off

9 Operation

9.1 Safety during the operation

DANGER

Death or serious injury due to damaged explosion protection measures!

Safe operation is no longer possible.

- Take the SILASpz control unit out of operation and secure it against being switched on again.

9.2 Operating phases of the Ex p control unit SILAS^{pz}

The operation of a pressurized enclosure protected by an Ex p control unit SILAS^{pz}, which is designed for the potentially explosive gas atmosphere, can be divided into three phases. The three phases are divided into the preparation, pre-purge and operating phases.

9.2.1 Flow chart

Operating phase	Requirement	Impact
Preparation phase Chapter 9.2.2	Mains voltage connected	Initiation of the purge phase
	Internal pressure < p4 and > p1	
	Purge time has not yet elapsed	
	Purge valve opens	
Purge phase Chapter 9.2.3	Internal pressure < p3	Purge time is running
	Internal pressure < p5	
	Purge time counts down	
Operating phase Chapter 9.2.4	Pre-purge time has elapsed	Release of the pressurized equipment
	Internal pressure > p1	
	Internal pressure < p4	

9.2.2 Preparation phase

The preparation phase begins when the supply voltage for the SILAS^{pz} control unit is switched on and the purge gas is supplied. The purge gas flows into the pressurized enclosure via the purge gas valve.

- SILAS^{pz} active due to supply voltage
- The internal pressure of the pressurized enclosure is increased by the incoming purge gas.
- The minimum pressure "p1" of the enclosure is exceeded. The "p1" LED lights up.
- The purge gas valve is opened via the SILAS^{pz} control unit.
- Transfer to the “purge phase".

9.2.3 Purge phase

The pressurized enclosure is purged with purge gas in order to remove any explosive gas/air mixture that may be present or to dilute it to a harmless concentration before the possible ignition sources in the pressurized enclosure are switched on.

This process prepares the pressurized enclosure for the operating phase. The amount of purge gas required depends on the free volume and the protected application within the pressurized enclosure. The pre-purge process is constantly monitored by the sensor of the Ex p control unit SILAS[pz].

- Opening the purge gas valve increases the flow of purge gas.
- The plate which is integrated in the pressure switch is raised.
- Switching values of minimum pressure "p1", purge pressure "p3" are exceeded. This is indicated by the corresponding LEDs on the Ex p control unit. The "Operate" LED flashes during the purge process.
- The purge time is counted down.
- After the purge time has elapsed, the purge gas valve is closed.
- Transfer to the operating phase

9.2.4 Operating phase

The operating phase begins with the closing of the purge gas valve.

The operating pressure must be maintained during the entire operation of the pressurized enclosure in order to prevent the ingress of flammable substances. The release of the pressurized enclosure is signalled via relay "K1" of the Ex p control unit SILAS[pz].

If the enclosure pressure falls below the set minimum values during the operating phase, all electrical installations in the pressurized enclosure that are not themselves explosion-proof are switched off. A new purge is initiated as soon as the purge pressure "p3" is reached again.

- The purge valve closes and the leakage losses are compensated via the integrated air leakage valve.
- The "Operate" LED changes from flashing to permanently lit. The "p3" LED goes out.
- Relay "K1" switches the mains voltage on or releases it.
- All other relays switch depending on the configuration.

9.3 Operating phases of the SILAS [Dc] control unit

The operation of pressurized equipment protected by an Ex p control unit SILAS[pz], which is designed for use in potentially explosive dust atmospheres, can be divided into two phases: The preparation phase and the operating phase. The two phases are explained below.

9.3.1 Flow chart

Operating phase	Requirement	Impact
Preparation phase Chapter 9.3.2	Mains voltage connected	Initiation of the purge phase
	Internal pressure < p4 and > p1	
Operating phase Chapter 9.3.3	Internal pressure > p1	Release of the pressurized equipment
	Internal pressure < p4	

9.3.2 Preparation phase

During the preparation phase, all internal dust deposits must be removed before the pressurized enclosure is activated. After cleaning the pressurized enclosure, the door is closed, the Ex p control unit SILAS[pz] is put into operation and the purge gas supply is activated.

By activating the purge gas supply, purge gas is fed into the pressurized enclosure via the adjustable air leakage needle, thus creating an overpressure compared to the surrounding atmosphere.

- The incoming purge gas increases the internal pressure of the pressurized enclosure.
- The minimum pressure "p1" of the enclosure is exceeded.
- The "p1" LED lights up.
- The next phase "Operating phase" is initiated.

9.3.3 Operating phase

The operating phase begins with the incoming purge gas. This builds up an overpressure in the pressurized enclosure compared to the atmosphere. The internal pressure of the pressurized enclosure is measured at the SILAS[pz] control unit and compared with the target limit values. Once the internal overpressure exists and the minimum switching value has been exceeded, the release of the pressurized enclosure is signalled via relay "K1" of the Ex p control unit SILAS[pz].

If the enclosure pressure falls below the set minimum values during the operating phase, all electrical installations in the pressurized enclosure that are not themselves explosion-proof are switched off. Purge is restarted as soon as the internal pressure "p1" is reached again.

- Existence of the internal overpressure.
- The "Operate" and "p1" LEDs light up.
- Relay "K1" switches the mains voltage on or releases it.
- All other relays switch depending on the configuration.

10 Maintenance and care

WARNING

Dust deposits due to environmental influences.

Dust deposits can accumulate in the pressure switch when used in dust-explosion applications.

- In the event of heavy dust deposits, clean the pressure monitor every six months.

Note

Maintenance and care

- Observe the currently valid regulations and national regulations for the maintenance, servicing and testing of the equipment!
- Operating and maintenance work may only be carried out by trained specialist personnel. The statutory regulations and other binding guidelines on occupational safety, accident prevention and environmental protection must be observed.
- When opening covers or removing parts, unless this can be done manually, live parts may be exposed. Connecting parts may also be live.

10.1 Maintenance work

10.1.1 Maintenance intervals

WARNING

Maintenance intervals

If used correctly and in compliance with the installation instructions and ambient conditions, the maintenance interval in accordance with EN 60079-17 must be observed

- Maintenance interval max. 3 years
- Maintenance by qualified personnel

Maintenance interval	Activity to be carried out
Monthly	Visual inspection according to chapter 10.1.2
Semi-annually	Cleaning according to chapter 10.1.3
Annually	Regular maintenance according to chapter 10.1.4

10.1.2 Visual inspection

Carry out a monthly visual inspection.

Procedure

- Check the enclosure, cable entries and cables for any damage.
- Check screw connections for tightness.
- Check the fault memory for any contents.
- Check the seals and sash locks.

10.1.3 Cleaning

Do not use any solvents to clean the control unit, as these can impair its properties if they come into contact with seals.

10.1.4 Regular maintenance

Depending on the purity of the purge air used, the inlet and outlet of the control unit must be checked regularly for any contamination (e.g. oil, dust, etc.) or corrosion.

In the event of anomalies, the operator should consider the possibility of a timely and proper cleaning at BARTEC GmbH as opposed to a spontaneous failure of the control unit.

Furthermore, the function of the entire system should be checked. The correct sequence of the purge phase and operating phase should be checked.

The following table serves as a minimum maintenance requirement for a pressurized enclosure.

Pos.	Inspection point	Maintenance
1	Visual inspection for any damage to the enclosure	
2	Check that the installed devices are securely fastened	
3	Pay attention to devices with hot surfaces (attach warning label, if necessary)	
4	Establish equipotential bonding of the pressurized enclosure	
5	General condition of the attachments of the pressurized enclosure (appliance feet, rain cover, cable glands)	
6	Pre-purge phase checked	
7	Switching values of the Ex p control unit SILAS^{pz} checked	
8	Function test of the SILASpz control unit carried out	
9	Possible bypass operation checked for function	

11 Malfunction and troubleshooting

ATTENTION

A change in operating behavior may be an indication of existing damage to the Ex p control unit!

The Ex p control unit may be damaged.

- Do not put the Ex p control unit back into operation until the cause of the fault has been rectified.

It is assumed that all external electrical and mechanical devices have been connected correctly. Therefore, the correct installation and connection of the electrical devices should be checked first.

11.1 Fault table

Fault	Possible cause	Remedy
Sporadic failure	Cable break	Check connections.
	Pressure drop / leakage	Check tightness and leakage compensation.
	EMC influences	Check wiring according to EMC specifications.
Control unit without function (All LEDs off)	Mains voltage not present	Check supply voltage.
	Device defective	Return to manufacturer.
The protected appliances are switched on without pre-purge	Bypass activated	Deactivate bypass.
	Incorrect purge programme activated	Check purge programme.
During pre-purge, the purge gas valve switches off briefly	Too much purge gas is introduced into the pressurized enclosure	Reduce the size of the purge gas nozzle.
Digital purge gas valve does not switch to the small nozzle after the pre-purge phase	Temperature sensor is connected, internal temperature is too high	Check purge gas valve for any foreign particles in the mechanical part.
		Wait until the internal temperature has dropped due to the increased flow rate, or check the set temperature switching value.
	Main switch or jumper not connected to terminals Hs_In / Hs_Out	Switch on the main switch or connect the jumper to terminals Hs_In / Hs_Out.
	Purge gas valve does not close	Check purge gas valve for switched off supply voltage.
Control unit switches off the electrical devices with a time delay after the purge time	Leakage air needle of the digital valve is too small	Increase the air flow rate of the leakage air needle.
	Switching value "p3" is too high	Check switching value "p3".
Relay K4 or K5 does not switch	Switching parameters have been incorrectly selected	Check switching parameters.

Fault	Possible cause	Remedy
"Operate" LED does not flash during the purge time	Purge gas is not present	Check purge gas valve for the presence of supply voltage.
	Purge gas valve does not open or only partially opens	Check purge gas valve for any foreign particles in the mechanical part.
		Increase inlet pressure to set value.
	Purge gas does not flow through the Ex p enclosure in sufficient quantity	Check purge gas nozzle for correct value.
		Check setpoint values "p3", and "p1" of the control unit.
		Increase the cross-section of the purge gas supply line.
		Purge gas supply line too small. Increase the cross-section of the supply line.
	Set pressure of the pressure reducer is not reached	Remove cap or take suitable measures in order to eliminate reduction.
	Pressure monitor of the control unit is impermissibly closed or fitted with a reducer	Seal the enclosure by using suitable measures.
	The enclosure is leaking during the pre-purge phase due to increased internal pressure	Check purge gas valve for the presence of supply voltage.
Digital purge gas valve switches on briefly during the operating phase	Value "po" too high	Reduce value "po".
	Pressurized enclosure leaking, switching value "p1" undershot	Seal the pressurized enclosure.
	Pressurized enclosure leaking, switching value "p1" undershot	Adjust the leak compensation.
If the pressure drops, the electrical appliances do not switch off	Bypass is activated	Bypass is activated
	Incorrect purge programme selected	Correct purge programme.

11.1.1 Error messages

The control units issue plain text messages, which are divided into 3 categories.

- Positive messages are notifications which do not affect system readiness.
- Warning messages are notifications which affect parts of the system.
- Alarm messages are notifications that lead to the protected equipment being switched off.

11.1.1.1 Positive messages

Status	Code	Plain text
	00000001	Purge process
		The control unit has started the purge process.
	00000002	Ex p Ready
		The control unit has successfully completed the purge process. The main switch or HS_IN / HS_OUT jumper is not closed.
	00000003	Ex p Active
		The control unit has successfully completed the purge process. The main switch or HS_IN / HS_OUT jumper is closed and release has been granted.
	00000004	p3 reached
		The setpoint “p3” purge flow has been reached and the purge time is counting down.

11.1.1.2 Warning messages

Status	Code	Plain text
	00000005	Bypass active
		The bypass is activated on the control unit.
	00000006	Door contact / main switch open
		The main switch or bridge HS_IN / HS_OUT is not closed.
	00000007	p2 undershot
		The setpoint p2 “Pre-alarm” is undershot.
	00000008	p4 exceeded
		Setpoint p4 “Maximum pressure – operation” exceeded
	00000009	p5 exceeded
		Setpoint p5 “Maximum pressure – purge” exceeded
	0000000A	Temperature sensor 1 exceeded
		Setpoint temperature at sensor 1 exceeded
	0000000B	Temperature sensor 2 exceeded
		Setpoint temperature at sensor 2 exceeded
	0000000C	Temperature sensor 3 exceeded
		Setpoint temperature at sensor 3 exceeded

11.1.1.3 Alarm messages

Status	Code	Plain text
	0000000D	Ex p inactive
		The protected equipment is deactivated.
	0000000E	Device fault 1
		HW test error (processors)
	0000000F	Device fault 2
		HW test error (barriers)
	00000010	Device fault 3
		HW test error (internal temperature monitoring)
	00000011	Device fault 4
		HW test error (serious fault)
	00000012	Sensor fault 1
		HW test error (pressure sensor / sensor board status)
	00000013	Sensor fault 2
		HW test error (opt. current sensors)
	00000014	Sensor fault 3
		HW test error (ext. temperature sensors)
	00000015	p1 undershot
		Setpoint p1 “Min. pressure” is undershot.
	00000016	p3 undershot
		Setpoint p3 "Purge pressure" is undershot.
	00000017	p4 exceeded
		Setpoint p4 “Maximum pressure – operation” exceeded.
	00000018	p5 exceeded
		Setpoint p5 “Maximum pressure – purge” exceeded.
	00000019	Temperature sensor 1 exceeded
		Setpoint temperature at sensor 1 exceeded.
	0000001A	Temperature sensor 2 exceeded
		Setpoint temperature at sensor 2 exceeded.
	0000001B	Temperature sensor 3 exceeded
		Setpoint temperature at sensor 3 exceeded.

12 Technical data

12.1 Ex pz control unit SILAS

12.1.1 Explosion protection

Type	A7-37S2-2111/.520
Certifications	ATEX, IECEx, EAC, CCC
Areas of use	Zone 2, Zone 22
ATEX	
Certification	BVS 19 ATEX E 016 X
Marking	Ex II 3G Ex ec mc ic [ic pzc] IIC T5 / T4 Gc
	Ex II 3D Ex tc [ic pzc] IIIC T95°C / T130 °C Db
IECEx	
Certification	IECEx BVS 19.0038X
Marking	Ex ec mc ic [ic pzc] IIC T5 / T4 Gc
	Ex tc [ic pzc] IIIC T95°C / T130 °C Db
Eurasian Economic Union (EEU)	
Certification	EAЭC RU C-DE.AЖ58.B.01809/21
Marking	2Ex ic e mc [ic pz] IIC T5 / T4 Gc x
	Ex tc [ic pz] IIC T4 Gc X

12.1.2 Electrical data

Type	A7-37S2-2111/.520
Rated operating voltage DC	24 Vdc to 44 Vdc, +/- 10 % for type A7-37S2-2111/1521
Rated operating voltage AC	100 Vac to 230 Vac, +/- 10% for type A7-37S2-2111/2521
Current consumption	0.5 A to 1.5 A
Tolerance range	+/- 10 %
Overvoltage category	II
Max. power consumption	17 Watt
Relay K1	2 potential-related NO contacts,
- Release relay -	230 Vac @ 5 A (AC1) or 24 Vdc @ 5 A (DC1)
	Max. inrush current 15 A for 20 ms
Relay K2	4 potential-free NO contacts,
- Release or signal relay -	230 Vac @ 3 A (AC1) or 24 Vdc @ 3 A (DC1)
	Max. inrush current 15 A for 20 ms
Relay K3 / K4	Potential-free CO contact
- Signal relay -	230 Vac @ 1 A (AC1) or 24 Vdc @ 1 A (DC1)
	Max. inrush current 15 A for 20 ms

Type	A7-37S2-2111/.520
Connection terminal "Ex e"	0.08 ... 2.5 mm² (28 ...12 AWG)
With wire end ferrule	0.25 ... 1.5 mm²
Connection terminal "Ex i"	0.20 ... 2.0 mm² (20 ...14 AWG)
With wire end ferrule	0.25 ... 0.75 mm²

12.1.3 Ex p specific data

Type	A7-37S2-2111/.520
Pressure measuring range	0 to 25 mbar
Tolerance range	0 ... 25 mbar = ±0.4 mbar
Purge valve	Digital or proportional
Purge time	0 to 120 minutes (adjustable)

12.1.4 Mechanical data

Type	A7-37S2-2111/.520
Protection class	IP 64 acc. to EN IEC 60079-0
	IP 66 acc. to EN 60529
Dimensions	250 (B) x 300 (H) x 130 (T) mm
Enclosure material	Stainless steel, V4A
Weight	10.5 kg
Cable glands	6x M20 nickel-plated brass (clamping range: 4 - 12 mm)
	1x M20, clamping range 7 - 13 mm

12.1.5 Ambient conditions

Type	A7-37S2-2111/.520
Storage and transportation	-25 °C to +60 °C
Operating temperature @ T4	-25 °C to +60 °C
Operating temperature @ T5	-25 °C to +50 °C
Relative humidity	< 95 % (no condensation)
To be used at an altitude of	< 2000 m

12.2 Pressure monitor

Type	17-51P3-1604
Dimensions	55 x 70 x 57 mm (W x H x D)
Material	POM
Opening pressure	3 mbar
Mounting hole	37 mm
Weight	Approx. 0.2 kg
Transport and storage temperature	-20 °C to + 80 °C
Operating temperature	-20 °C to + 80 °C

12.3 Purge gas valve

12.3.1 Digital purge gas valve

Type	05-0056-0073
Nominal operating voltage	DC 24 V
Pressure	Max. 16 bar
Weight	Approx. 1.2 kg
Nominal diameter	13 mm
Connection	G 3/8“

12.3.2 Proportional purge gas valve

Type	05-0056-0081
Nominal operating voltage	DC 24 V
Pressure	Max. 3.5 bar
Weight	Ca. 1,2 kg
Nominal diameter	6 mm
Connection	G 3/8“

12.4 Purge gas

Residual dust	< 40 µm
Residual water	Dew point +3 °C
Residual oil content	1 mg/m³
Temperature	Maximum + 40 °C

13 Ordering information

13.1 Ex pz control unit SILAS^{pz}

Designation	Order number
Control unit SILAS^{pz}, DC	A7-37S2-2111/1520
Control unit SILAS^{pz}, AC	A7-37S2-2111/2520

13.2 Pressure monitor

Designation	Order number
Pressure monitor module, in Ex p enclosure, 18 mm orifice	17-51P3-1604

13.3 Purge gas valve

Designation	Order number
Digital valve with air leakage needle valve; G3/8″, ATEX / IECEx, 2x purge gas nozzle undrilled, DC 24 V, NC	05-0056-0073
Proportional valve with air leakage needle valve; G3/8″, ATEX / IECEx, 2x purge gas nozzle undrilled, DC 24 V, NC	05-0056-0081

13.4 Purge gas valve safety device

Designation	Order number
Valve fuse 1.0 A (digital purge gas valve application)	05-0080-1016
Valve fuse 1.6 A (proportional purge gas valve application)	05-0080-1017

13.5 Purge gas nozzle zone 22

Designation	Order number
Purge gas nozzle 1/4", with attachments	05-0056-0062

13.6 Pressure reducer

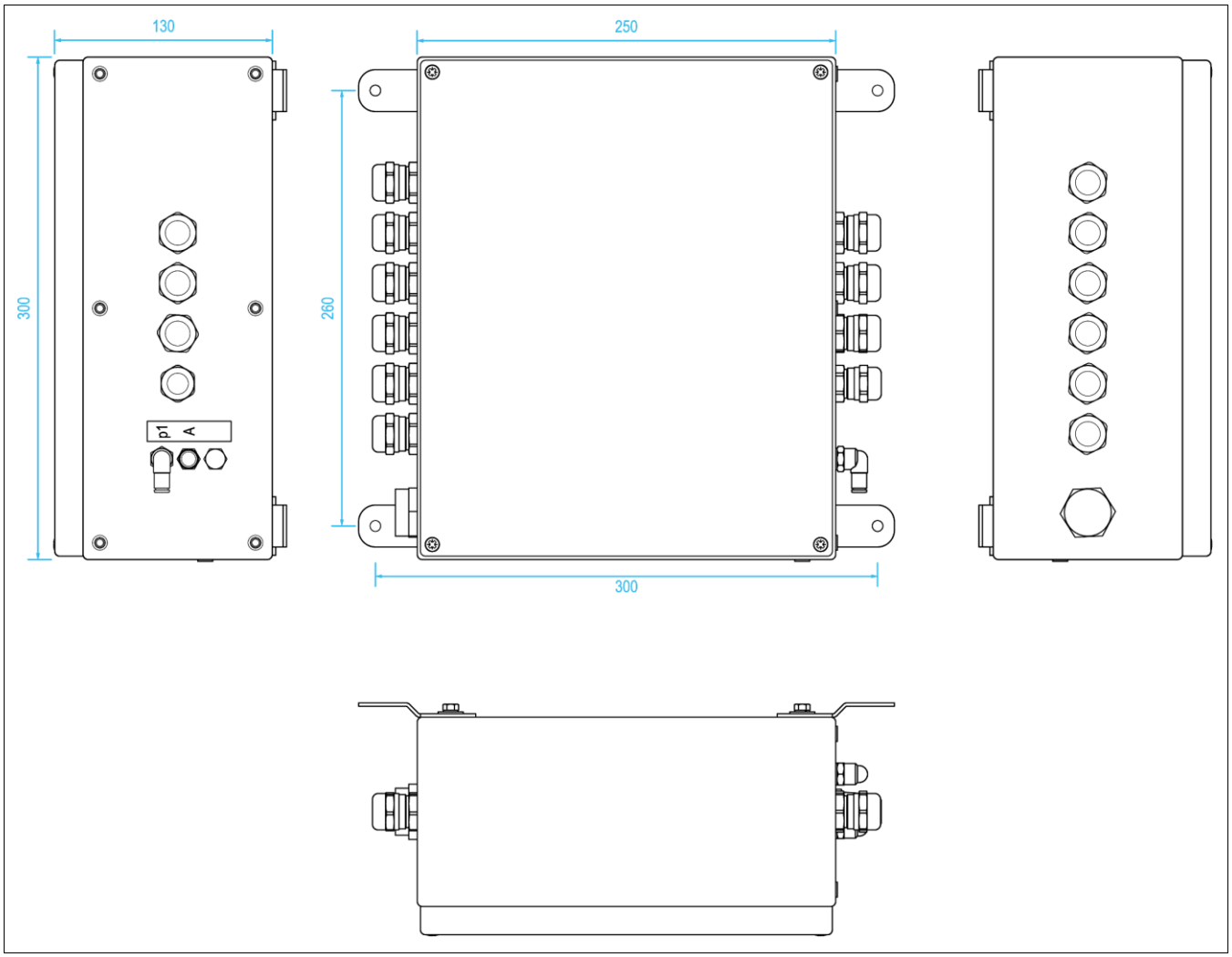
Designation	Order number
Pressure reducer 1/4″, 0.5-6 bar, max. 110 m³/h, attachments	05-0056-0083
Pressure reducer 1/2", 0.5-6 bar, max. 450 m³/h, attachments	05-0056-0084

13.7 Installation set

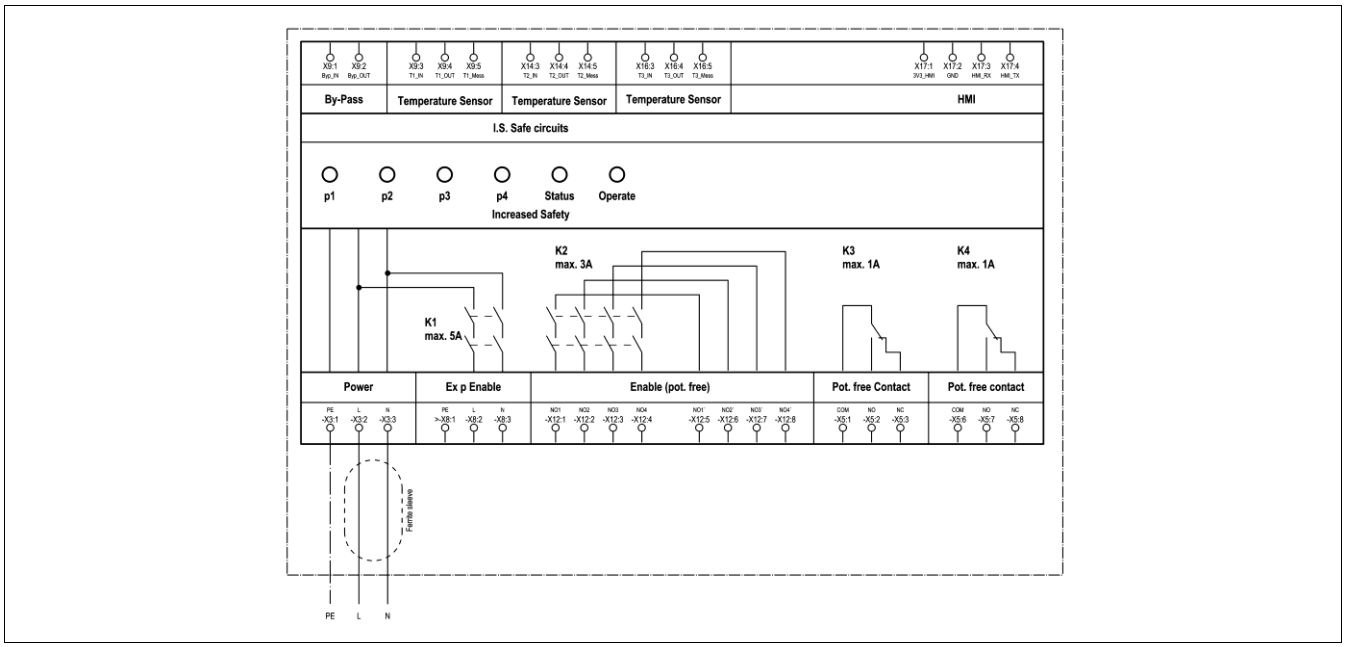
Designation	Order number
Installation set for mounting the SILAS control unit inside the pressurized enclosure, IP 66	05-0091-0275

14 Appendix

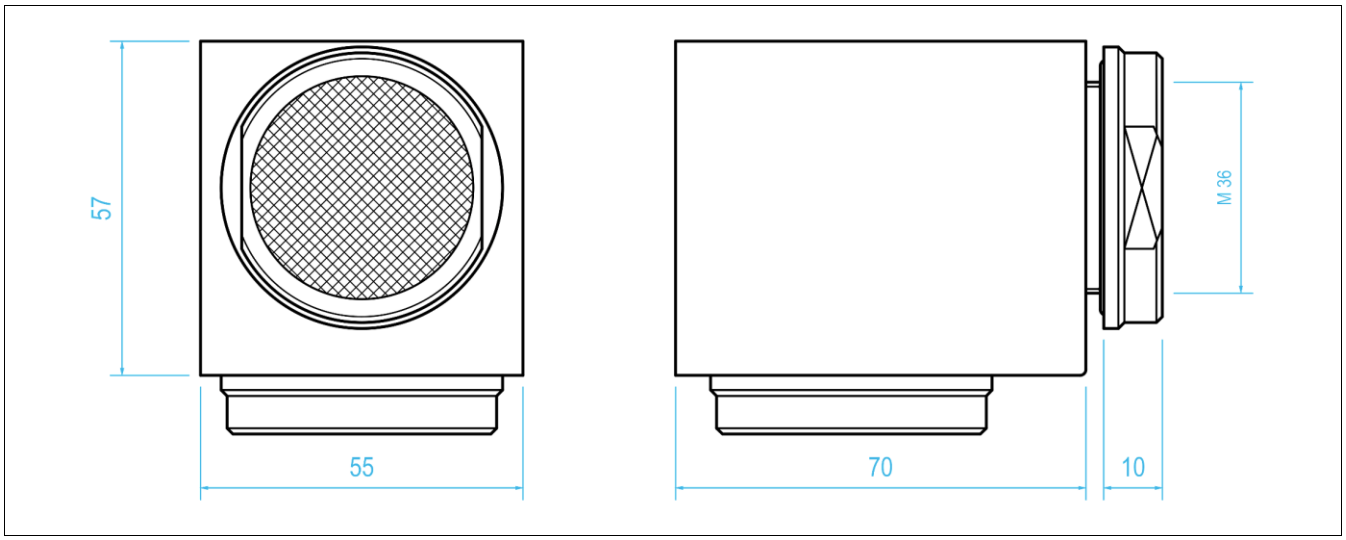
14.1 Dimensions of the Ex pz control unit SILAS^{pz}



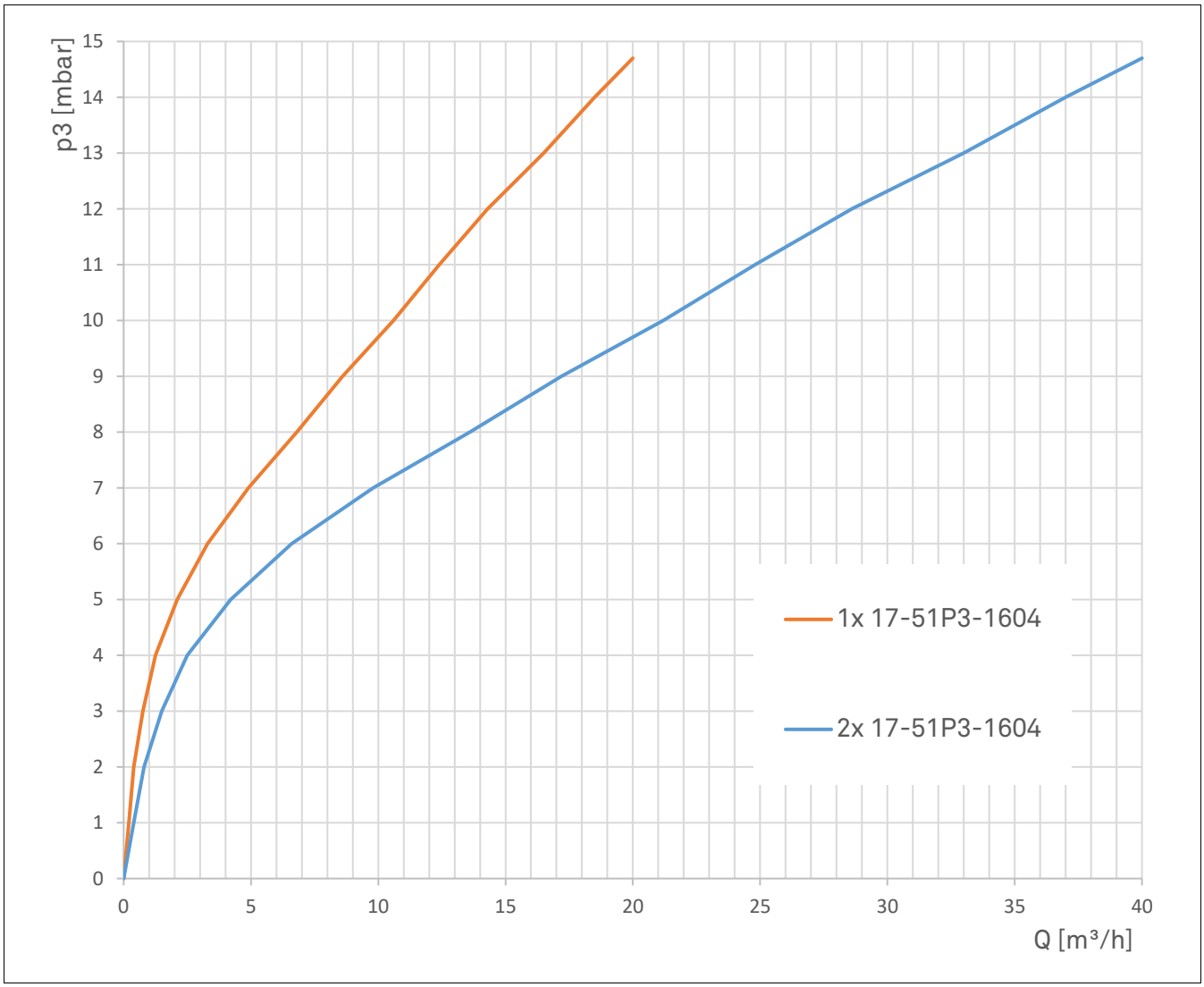
14.1.1 Block diagram



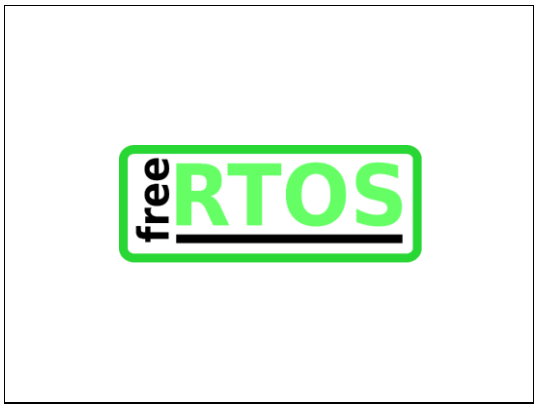
14.2 Dimensions of the pressure monitor



14.3 Purge gas diagram



14.4 Software packages used



The service area of the hardware/software of the SILAS control unit uses the freeware freeRTOS.

15 Declaration of Conformity

EU Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de conformité

№ A1-37S2-7C0001-B

BARTEC

Wir	We	Nous
	BARTEC GmbH Max-Eyth-Straße 16 97980 Bad Mergentheim Germany	
erklären in alleiniger Verantwortung, dass das Produkt **Ex p Kontrolleinheit**	declare under our sole responsibility that the product **Ex p control unit**	attestons sous notre seule responsabilité que le produit **Unité de contrôle Ex p**
	Typ A7-37S2-*1*1/** SILAS^{pz}** **Type A7-37S2-*1*1/**** SILAS^{pz}**	
auf das sich diese Erklärung bezieht den Anforderungen der folgenden **Richtlinien (RL)** entspricht **ATEX-Richtlinie 2014/34/EU** **EMV-Richtlinie 2014/30/EU** **RoHS-Richtlinie 2011/65/EU** **WEEE-Richtlinie 2012/19/EU** und mit folgenden Normen oder normativen Dokumenten übereinstimmt	to which this declaration relates is in accordance with the provision of the following **directives (D)** **ATEX-Directive 2014/34/EU** **EMC-Directive 2014/30/EU** **RoHS-Directive 2011/65/EU** **WEEE-Directive 2012/19/EU** and is in conformity with the following standards or other normative documents	se référant à cette attestation correspond aux dispositions des **directives (D)** suivantes **Directive ATEX 2014/34/UE** **Directive CEM 2014/30/UE** **Directive RoHS 2011/65/UE** **Directive WEEE 2012/19/UE** et est conforme aux normes ou documents normatifs ci-dessous

EN IEC 60079-0:2018/AC:2020	**EN 61010-1:2010/A1:2019/AC:2019**
EN 60079-2:2014	**EN 60529:1991/A2:2013/AC:2019**
EN IEC 60079-7:2015/A1:2018	**EN 61000-6-4:2007 +A1:2011**
EN 60079-11:2012	**EN 61000-3-2:2014**
EN 60079-18:2015/A1:2017	**EN 61000-3-3:2013**
EN 60079-31:2014	**EN 61326-1:2013**

Verfahren der internen Fertigungskontrolle	Procedure of internal control of production	Procédure de contrôle interne de fabrication
	BVS 19 ATEX E 016 X Rev. - **0158, DEKRA Testing and Certification GmbH, 44809 Bochum**	

CE

Bad Mergentheim, 08.04.2024

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Ex p

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