BARTEC

Manual Ex p Control Unit

APEX^{mpc}

SILAS^{mpc}

BARTEC

Operating instructions – Motor Purge Controller

Ex p control unit APEX^{mpc}
Type: 07-37A2-2211/*M5*
– Safety manual –
ATEX / IECEx Zone 1 / 21

Ex p control unit SILAS^{mpc}
Type: A7-37S2-2111/*M5*
ATEX / IECEx Zone 2 / 22

Document: 01-37A2-7D0003
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1 General information

1.1 Manufacturer

BARTEC GmbH
Max-Eyth-Strasse 16
97980 Bad Mergentheim
Germany

Phone : +49 7931 597 0
Fax : +49 7931 597 119
Internet: bartec.com
Email: info@bartec.com

1.2 Purpose of these operating instructions

ATTENTION
Please read the enclosed operating instructions carefully before starting up the Ex p control unit.

These operating instructions contain the required information for the intended use of the Ex p control unit of the Motor Purge Controller (mpc) version.

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 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.
- Make the operating instructions 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 0044	CE marking with certifying body in accordance with the currently valid directive. This applies to Ex p control units of the APEX^{mpc}, Typ 07-37A2-2211/*M5* version.
CE	CE marking according to the currently valid directive. This applies to Ex p control units of the SILAS^{mpc}, Type A7-37S2-2111/*M5* version.
Ex	Device certified in accordance with the marking for potentially explosive atmospheres.
SIL	Safety function – This symbol indicates special instructions for safe functions in accordance with IEC 61508. This applies to Ex p control units of the APEX^{mpc}, Type 07-37A2-2211/*M5* version.
	Marking according to WEEE directive 2012/19/EU

2 Safety

2.1 Handling the product

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

Safe and proper installation of the Ex p control unit to the pressurised enclosure is a prerequisite for faultless and correct operation.

2.2 Intended use

2.2.1 Exclusive intended use

The Ex p control unit APEX in the mpc version is used exclusively as a control and monitoring device for pressurised equipment and is intended for the use in explosion group II, category 2GD and temperature class T4 or for the use in dust with surface temperatures of T130°C.

Furthermore, the safety function of the Ex p control unit APEX fulfils the requirements for SIL 2 in accordance with IEC 61508 and performance level “d” pursuant to EN ISO 13849-1. The permissible operating data of the used device must be observed.

The Ex p control unit SILAS in the mpc version is used exclusively as a control and monitoring device for pressurised equipment and is intended for the use in explosion group II, category 3GD and temperature class T4 or for the use in dust with surface temperatures T130°C.

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. 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 Ex p control unit.
- Improper installation, commissioning, operation and maintenance of the Ex p control unit.
- Failure to observe the instructions in the manual regarding transport, storage, assembly, commissioning, operation and maintenance.
- Unauthorised structural modifications to the Ex p 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 Ex p control unit APEX or SILAS 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 Ex p control unit APEX^{mpc} or SILAS^{mpc} who:

- are familiar with the basic regulations on safety and accident prevention and have been instructed in the use of the Ex p control unit APEX and SILAS;
- 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 Personnel qualification

Target group	Expertise
Design and Engineering	- Specialised training - Knowledge and experience to recognise and avoid any hazards which can arise from electricity - Understanding of the overall system - Configuration / programming - Specifically instructed for areas with potentially explosive atmosphere
Qualified electrician and installation technician	- Specialised training - Knowledge and experience to recognise and avoid any hazards which can arise from electricity - Understanding of the overall system - Specifically instructed for areas with potentially explosive atmosphere
Operator	- Instructions in operation by the operator - Specifically instructed for areas with potentially explosive atmosphere
Warehouse and transport operators	- Specialised training - Knowledge and experience to recognise and avoid any hazards which can arise from electricity - Understanding of the overall system - Configuration / programming - Specifically instructed for areas with potentially explosive atmosphere

2.6 Safety instructions

2.6.1 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!
- Do not wipe dry or clean devices in the areas with potentially explosive atmosphere!
- Do not open any devices in areas with potentially explosive atmosphere.
- Avoid any exposure to moisture.

2.6.2 Safety instructions for the operation

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 inspection

- 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

- Any repairs must be carried out in accordance with EN / IEC 60079-19.
- For SIL-qualified devices, only a corresponding electronic insert with SIL qualification may be used.
- All application-specific settings must be re-entered. You must therefore carry out a recommissioning after a repair has been performed. If you saved the parameterisation data when commissioning the Ex p control unit for the first time, you can transfer it back to the replacement Ex p control unit. Detailed information on replacing spare parts can be found in these operating instructions. After recommissioning or transferring the parameterisation data, you must verify the parameters. Only thereafter the device is ready for operation again.

Commissioning

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

2.7 Avoiding any material damage

2.7.1 Short circuit due to incorrect connection

Incorrect connection of the power supply will destroy the electronics and invalidate the warranty.

2.7.2 EMC-compliant connection

In order to ensure the safe operation of the Ex p control unit, it is important that the wiring is EMC-compliant. This includes observing the Section “Electrical connections” with regard to EMC-compliant wiring and inductive loads.

2.7.3 Storage at excessively high temperatures

The Ex p control unit must be stored at the intended storage temperature. Otherwise, the electronics or seals may be damaged. Ensure adequate air conditioning at high storage temperatures.

2.7.4 Aggressive cleaning agents

When selecting the correct cleaning agent, it is essential to ensure that it is suitable for the application, as otherwise damage to seals and connections may occur. Flammable products are generally not authorised.

2.7.5 Health hazard due to improper disposal

According to the European WEEE Directive, electrical and electronic devices must not be disposed of with household waste. Their components must be recycled or disposed of separately, as toxic and hazardous components can cause lasting damage to health and the environment if they are disposed of improperly.

As a consumer, you are obliged under the German Electrical and Electronic Equipment Act (ElektroG) to return electrical and electronic equipment free of charge to the manufacturer, the point of sale or to public collection centres set up for this purpose at the end of its service life. Details are regulated by the respective state law. The symbol on the product, the operating instructions and/or the packaging refers to these regulations. By separating, recycling and disposing of old appliances in this way, you are making an important contribution to protecting our environment.

2.8 SIL qualification / safety according to IEC 61508

Note
The SIL qualification is only valid for the type 07-37A2-***1/**** (APEX) version.

SIL **Important notes and information on safety-related handling of the product.**

2.8.1 SIL qualification

During the development of the Ex p control unit APEX, particular attention is paid to the avoidance of any systematic faults and the detection and control of random faults. Listed below are the most important properties and requirements from the point of view of functional safety in accordance with IEC 61508:

- Internal monitoring of safety-relevant circuit components
- In the event of any fault, transition of the safety-relevant outputs to a defined safe state
- Determination of the probability of failure of the defined safety function
- Safe parameterisation with non-safe operating environment
- Repeat testing

The SIL qualification of components is documented within this manual. All safety-relevant characteristic data required by the user and planner for project planning and operation of the safety instrumented system is summarised in this Section. Further SIL-relevant information is integrated in this manual.

2.8.2 Safety function

The safety function of the Ex p control unit APEX is the purging with a defined quantity of purging gas, the safe monitoring of the internal overpressure of the protected equipment and the release of operation. The safe state means that in the event of a pressure drop or malfunction, the Ex p control unit APEX switches to the safe state = deactivation of the protected equipment.

The “safe state” is triggered by:

- Pressure falls below the minimum pressures within the Ex p equipment
- Illogical pressure values within the Ex p equipment
- Failure of the supply voltage

If the APEX Ex p control unit does not deactivate the protected equipment on request or in the event of a fault or does not switch to the safe state, a dangerous failure has occurred.

2.8.3 Safety parameters

SIL	**The following safety parameters are without optional sensors.** The optional sensors must be taken into account when determining the overall failure rate! - The safety parameters can be found in the documentation for the used optional sensors.

Safety characteristics according to IEC/EN 61508 / DIN EN ISO 13849:

SIL	=	2
Performance Level	=	d
PFHsys	=	(PFH_S+_PFH_L+PFH_FE+PFH_C) = 1.70E-08
HFT	=	1
SFFsys	=	92.85 %
MTTFd	=	76 Yr
DC	=	88.78 %

Device type B (complex equipment)

Interval of repeat tests = 1 year

Category 3

2.8.4 Response time

The response time of the Ex p control unit APEX to safety-relevant functions, without specific user delay times, is less than 2 seconds.

With the APEX Ex p control unit, it is possible to set a delay time in the event of any pressure fluctuations below the minimum pressure.

This results in a delay time of

$T_{Reaction}$	=	$T_{Control} + T_{Delay}$
$T_{Reaction}$	=	Time until the Ex p APEX control unit reacts to a safety-relevant function
$T_{Control}$	=	Internal time required by the Ex p control unit in order to recognise the safety-relevant triggering. < 2 seconds
T_{Delay}	=	Adjustable delay time for safety-related tripping which is added to the reaction time of the $TS_{tControl}$

2.8.5 Residual risk

Residual risks can arise from:

- Errors in the project planning
- Errors in operation
- Errors in the wiring

3 Product description

3.1 General

The type of protection Ex p, called “pressurised 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 Ex p control units APEX^{mpc} and SILAS^{mpc} described in these operating instructions use the “pressurised enclosure with leakage loss compensation” technique. In detail, this means maintaining an overpressure in an enclosure by supplying purging gas to compensate for the leakage losses occurring in the enclosure.

In order to prevent the explosive atmosphere (gas) which has penetrated during downtimes from becoming a hazard, the enclosure must be purged with purging 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 Ex p control unit and its system components must be designed to be explosion-proof.

3.2 System components of the Ex p control unit APEX^{mpc} / SILAS^{mpc}

3.2.1 Ex p control unit APEX^{mpc}, Type 07-37A2-2211/*M5*

The Ex p control unit APEX^{mpc} with its system components is an automatically operating control unit for monitoring, controlling and regulating pressurised motors or large enclosures in the areas with potentially explosive atmosphere of Zone 1 / 21.

Each system assembly consists of an Ex p control unit APEX^{mpc} and the associated pressure monitor mpv.

3.2.2 Ex p control unit SILAS^{mpc}, Type A7-37S2-2111/*M5*

The Ex p control unit SILAS^{mpc} with its system components is an automatically operating control unit for monitoring, controlling and regulating pressurised motors or large enclosures in the areas with potentially explosive atmosphere of Zone 2 / 22.

Each system assembly consists of an Ex p control unit SILAS^{mpc} and the associated pressure monitor mpv.

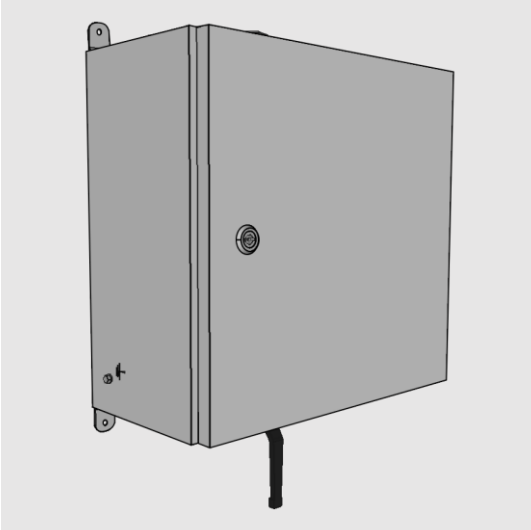
3.2.3 Pressure monitor, Type 17-51P3-3*03

The mpv pressure monitor has two functions within the Ex p control unit. Firstly, it serves as an overpressure valve which opens if the internal pressure is too high and reduces the overpressure. Secondly, an orifice plate is integrated into the pressure monitor, via which the differential pressure is measured by using the sensor function unit.

In conjunction with the mpc, this must be mounted separately on the pressurised motor. Furthermore, measuring hoses must be connected between the pressure monitor and the mpc.

3.3 Optional accessories for the Ex p control unit APEX^{mpc} / SILAS^{mpc}

3.3.1 Manual air leakage equaliser, Type 05-0056-0069



The manual air leakage boost is used to increase the air leakage volume to ensure that the basic volume of required air leakage is carried out via the air leakage boost and the peak volumes via the APEX^{mpc} or SILAS^{mpc}.

3.3.2 p-Operator Panel, Type 17-51P5-1111

The p-Operator Panel is a visualisation unit for the Ex p control unit APEX or SILAS. It can be connected as an option and is used in order to display the system status and for parameterising the Ex p control units.

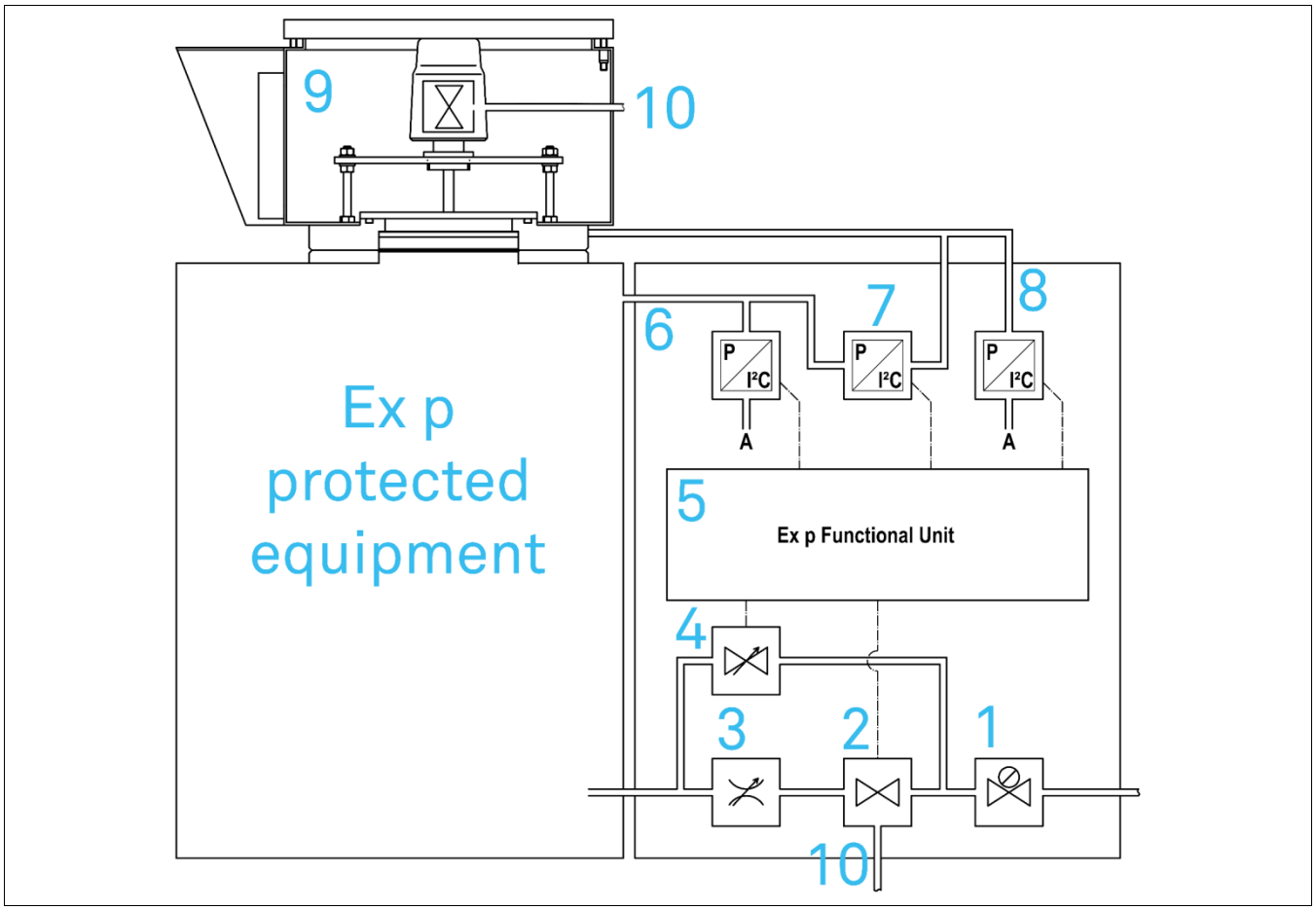
By using mounting brackets, it can be used either as a surface-mounted unit or as a built-in unit in the basic version.

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

The use of the p-Operator Panel is described in a separate operating manual.

4 System structure

4.1 General

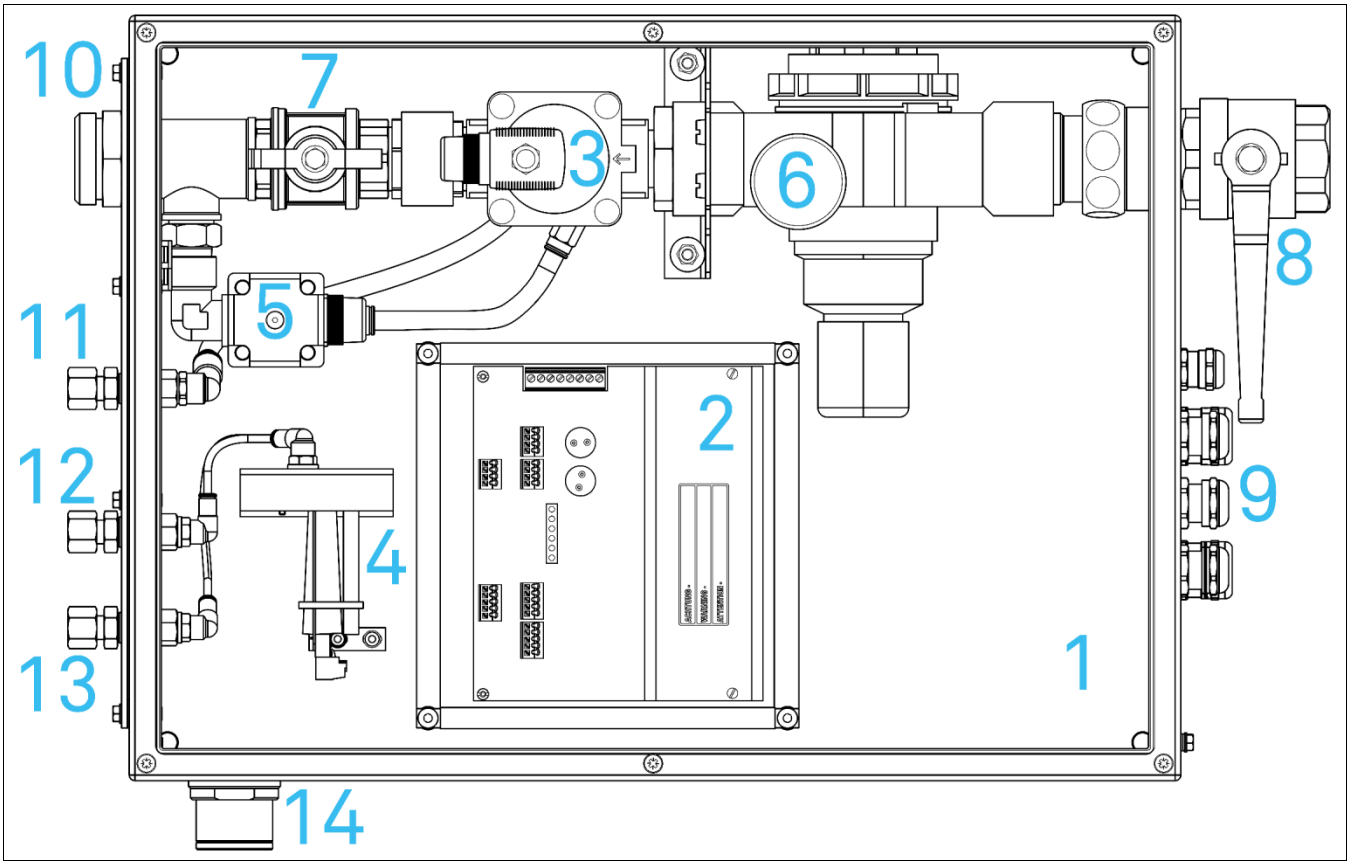


Pos.	Designation	Remarks
1	Pressure reducing station	Max. set pressure 3.5 bar
2	Digital purge gas valve	Opening during the purge phase
3	Purge flow regulation	Limitation of purge flow during the purge phase
4	Proportional leakage compensation valve	Compensation of leakage losses
5	Ex p functional unit	
6	I – Internal Pressure	Pressure detection in the Ex p operating medium
7	Internal differential pressure measurement	internal
8	L – Outlet Pressure	Pressure detection at the mpv pressure monitor
9	Pressure monitor mpv	
10	A - Actuation mpv	Actuation mpv

4.2 Ex p control unit mpc, Standard

The system structure of the Ex p control units APEX^{mpc} and SILAS^{mpc} is shown below.

The protective enclosure is designed in accordance with the Ex e type of protection and can be mounted on the outside of the pressurised enclosure / motor.



Pos.	Designation	Remarks
1	Ex e protective enclosure	
2	Ex p functional unit	
3	Digital purging gas valve	Purge gas supply during the purging operation
4	Ex p pressure measuring card	Recording of Ex p pressures
5	Proportional leakage compensation valve	Pressure regulation during the operating phase
6	Pressure reduction station	Pressure reduction of supplied purging air

Pos.	Designation	Remarks
7	Purge flow regulation	Limitation of the purging flow
8	Purge gas supply	Supplying the Ex p system with purge air
9	Cable inlets	Introduction of electrical cables
10	Purge gas supply Ex p	Purge gas supply to the Ex p equipment
11	A – Actuation MPV	Actuation mpv
12	I – Internal Pressure	Pressure detection in the Ex p equipment
13	L – Outlet Pressure	Pressure detection on the pressure monitor mpv
14	Atmosphere compensation	

4.2.1 Ex e protective enclosure

The Ex p control unit mpc is mounted in an Ex e protective enclosure. Any subsequent modifications are only permitted by the manufacturer.

4.2.2 Ex p functional unit

The Ex p functional unit houses the redundant safety processors for the Ex p control unit. These processors process the measured system pressures as well as the intrinsically safe inputs parameterisation switch, bypass and main switch.

In addition, the releases K1 (energised) and K2 (potential-free) are controlled in a safety-oriented manner.

The service processor houses the control of the system valves, the signalling relays K3 and K4, temperature sensors and the WEB operating system.

The operator is provided with 6 LEDs for signalling the system status.

4.2.3 Ex digital valve

The digital valve is responsible for switching to the purging mode. After the Ex p system has been activated, purging air is fed into the Ex p protected equipment by means of the proportional valve and thereby increasing the internal pressure to p1. The detected pressure increase is the start signal for the safety processors to open the digital valve and generate a high flow rate in the equipment.

The digital valve also opens the pressure monitor mpv.

4.2.4 Ex p pressure measuring card

The Ex p pressure measuring card records the system pressures. All measured system pressures are recorded redundantly and processed by the safety processors.

4.2.5 Ex proportional valve

The proportional valve is used in order to maintain the pressure of the protected Ex p equipment during the operating phase. This means that as soon as the Ex p equipment has been purged, it closes and the proportional valve supplies as much air as is required in order to maintain the internal pressure of the Ex p equipment at po (internal pressure during operation).

Setting pressure reducing station	Maximum air leakage compensation
2.0 bar	435 l/min (26 m³/h)
2.5 bar	530 l/min (32 m³/h)
3.0 bar	630 l/min (38 m³/h)
3.5 bar	730 l/min (44 m³/h)

4.2.6 Pressure reducing station

Note
The maximum setting of the pressure reducing station is 3.5 bar. The proportional valve may be damaged at higher pressures.

The pressure reducing station reduces the pressure of the supplied purging gas. The normal operating pressure of the supplied purging air is approx. 2.5 to 3 bar.

4.2.7 Purging flow regulation

The maximum amount of supplied purging gas can be set by using the purging flow regulation. During the initial commissioning, this is opened slowly and opened until the desired internal pressure is obtained during the purging process.

4.2.8 “Purging gas supply” connection

The purging gas supply connection is used in order to provide the Ex p system with purging air. The customer connects the purging gas supply here by using a G 1 ½" internal thread.

The supply should be selected large enough in order to provide the required purging gas flow.

4.2.9 Cable entries

The power supply for the Ex p control unit and all release and signalling lines can be fed into the Ex e protective enclosure via the cable entries.

4.2.10 “Purging gas supply Ex p” connection

The “Ex p purging gas supply” connection is connected to the protected Ex p operating equipment at the point where the purging air shall be introduced. For this purpose, a threaded connection G1 ½" external thread is available.

4.2.11 “A - Actuation mpv” connection

The “A-Actuation mpv” pipe connection is the connection for pneumatically opening the mpv during the purging process..

For this purpose, a pipe connection for a pipe with an outer diameter of 10 mm is available for this purpose.

4.2.12 “I - Internal Pressure” connection

The “I-Internal Pressure” pipe connection is the connection for feeding the internal pressure of the protected Ex p equipment to the Ex p pressure measurement card.

For this purpose, a pipe connection for a pipe with an external diameter of 10 mm is available.

4.2.13 “L - Outlet Pressure” connection

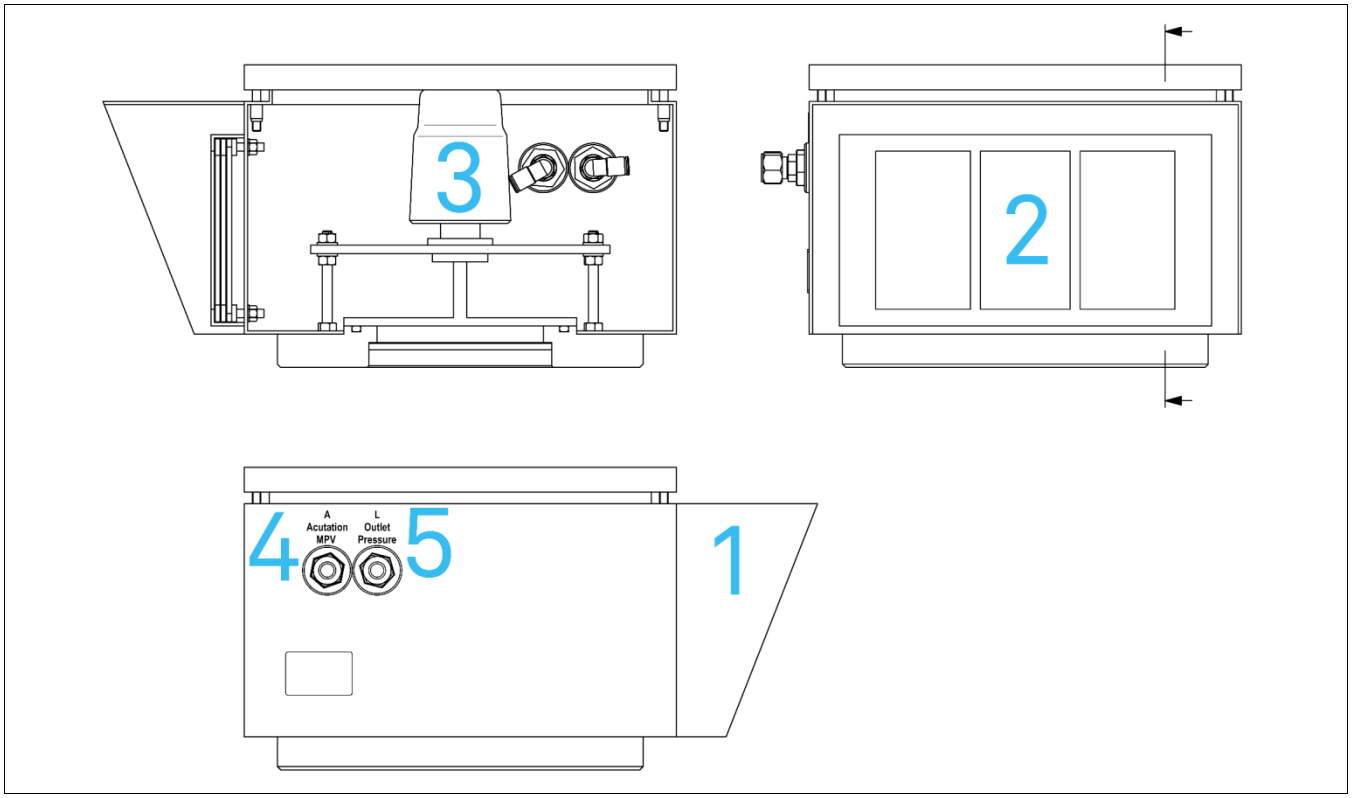
The “L-Outlet Pressure” pipe connection is the connection to lead the pressure from the pressure monitor mpv of the protected Ex p equipment to the Ex p pressure measuring card.

For this purpose, a pipe connection for a pipe with an external diameter of 10 mm is available.

4.3 Pressure monitor mpv

The system structure of the mpv pressure monitor for the mpc Ex p control unit is shown below.

The protective enclosure is mounted outside the pressurised enclosure / motor.



Pos.	Designation	Remarks
1	Pressure monitor mpv	
2	Integrated flying spark arrester	
3	Pneumatic opening valve	Opening of the outlet for the purge phase
4	Connection A - Actuation mpv	Activation of the outlet
5	Connection L – Outlet pressure mpv	Measuring point for the pressure detection

4.3.1 Pressure monitor mpv

The mpv pressure monitor associated with the system is used in order to record the purging pressure and outlet of the purging gas during the purging phase.

During the operating phase, it is used in order to measure the redundant value for the internal pressure of the pressurised equipment.

4.3.2 Integrated flying spark arrester

The integrated flying spark arrester prevents glowing particles from the Ex p equipment from entering the potentially hazardous environment.

4.3.3 Pneumatic opening valve

The mpv pressure switch is pneumatically controlled via the purging valve in the mpc to ensure that the mpv opens the disc during the purging operation.

4.3.4 Connection “A – Actuation mpv”

The “A - Actuation mpv” connection has to be connected to the same connection on the Ex p control unit mpc. For this purpose, a 10 mm pipe connection is available.

This connection is used in order to control the mpv for the opening during the purging phase.

4.3.5 Connection “L – Outlet pressure mpv”

The “L - Pressure measurement mpv" connection has to be connected with the mpc connection of the same name. For this purpose, a 10 mm pipe connection is available.

This connection is used in order to transfer the measured pressure at the mpv to the mpc for evaluation.

5 Transport and storage

5.1 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

5.2 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.

5.3 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.
- Set the Ex p control unit down slowly.

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

5.4 Storage

Store the Ex p control unit in a horizontal position and at a temperature between -20 °C and +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.

5.5 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.

6 Installation

DANGER

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

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

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

Note

Familiarise yourself with the general safety instructions before starting work (see Section 2 “Safety”).

- Observe the sections “Installation” and “Electrical connections”.

Note

Any deviations regarding the installation may occur with customised setups.

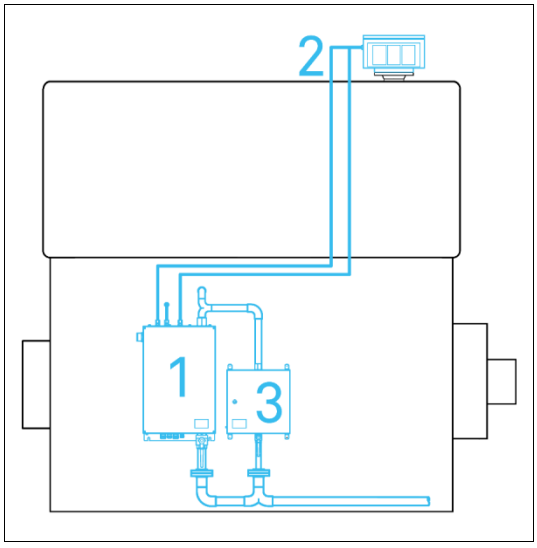
6.1 Typical arrangement

ATTENTION

The following illustrations show a schematic representation and do not show the correct positioning on the pressurised enclosure.

Check the arrangement in accordance with IEC / EN 60079-2.

- For heavy gases, for example, it may be advantageous to arrange the pressure switch components at the bottom and the purge gas supply at the top.

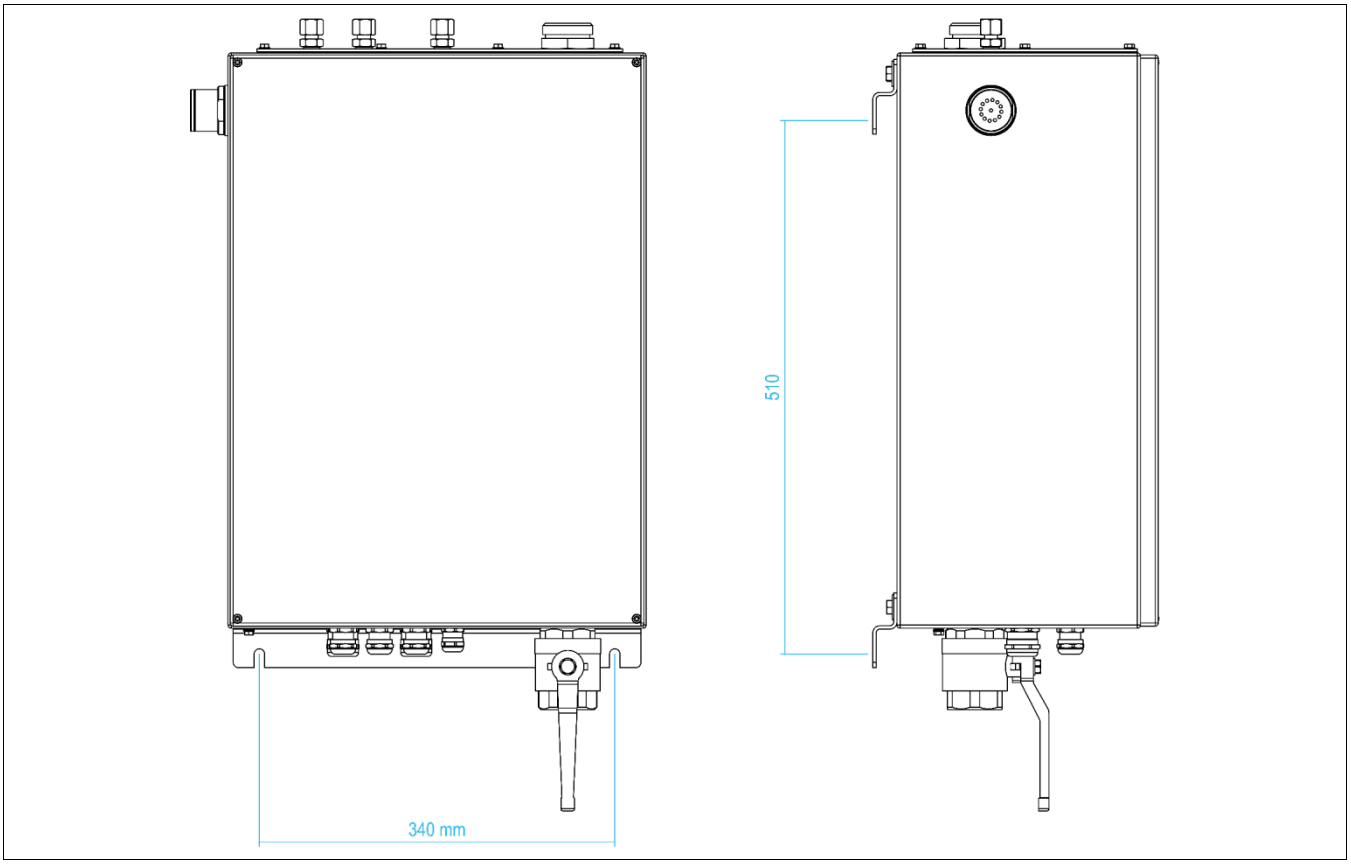


Pos.	Designation
1	Ex p control unit APEX / SILAS Version: Motor Purge Controller (mpc)
2	Pressure monitor Motor Purge Valve (mpv)
3	Optional Manual air leakage compensation

6.2 Mounting the MPC

Two mounting rails are mounted on the rear of the Ex e protective enclosure of the Ex p control unit mpc.

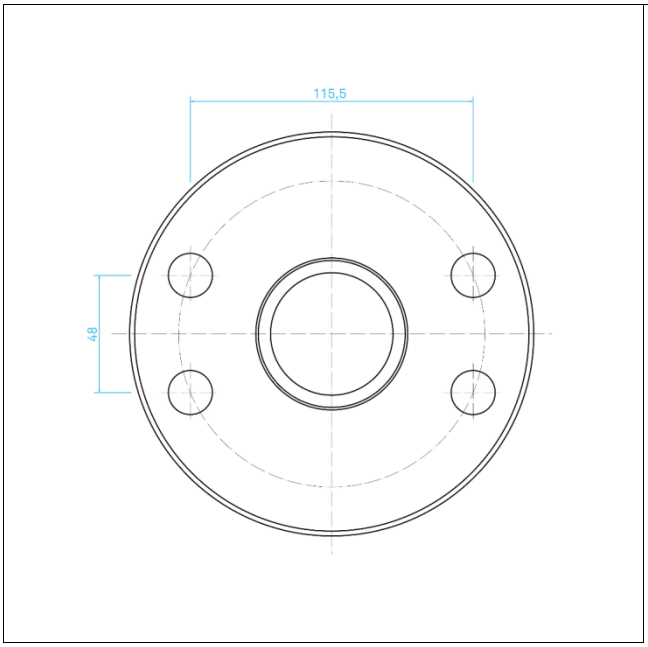
These rails can be used in order to suspend and screw the Ex p control unit to the fastening screws which are provided on the Ex p equipment.



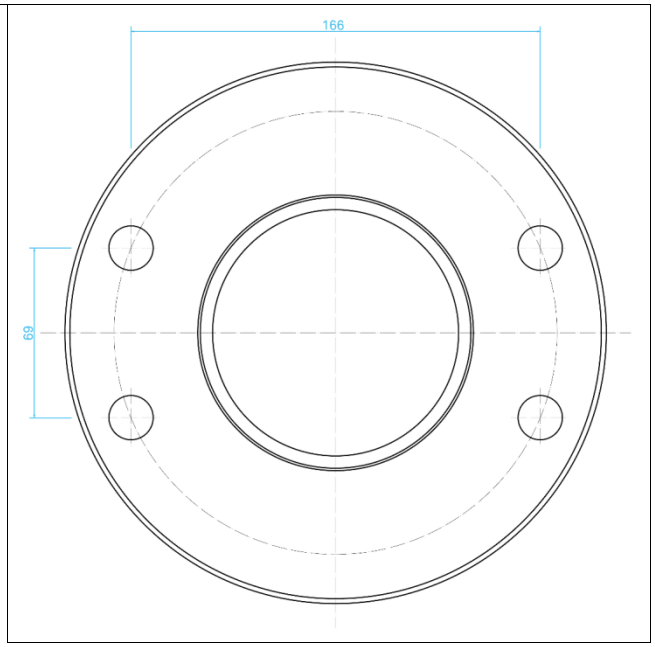
6.3 Mounting the pressure monitor

A flange connection is integrated on the bottom side of the MPV enclosure, which serves as a mounting for the MPV.

The purge air is fed through this flange during purge and is guided via an integrated orifice, which is required in order to record the differential pressure.



mpv 2



mpv 3

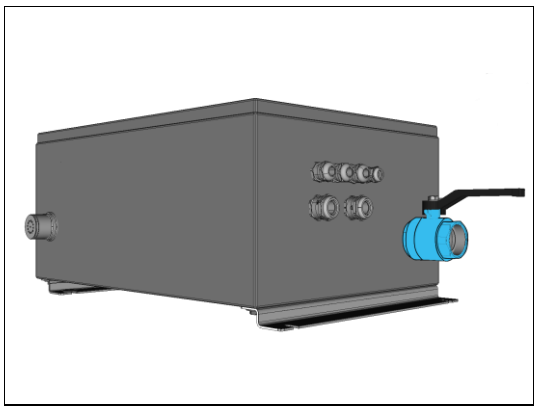
6.4 Pneumatic connections

Note

We recommend only seamless soft annealed stainless steel pipes made of material 1.4571 in accordance with DIN 2391, Part 1 or DIN 2462, tolerance class D4 / T3.

The following pipework work must be carried out in order to ensure that the Ex p control unit mpc functions properly.

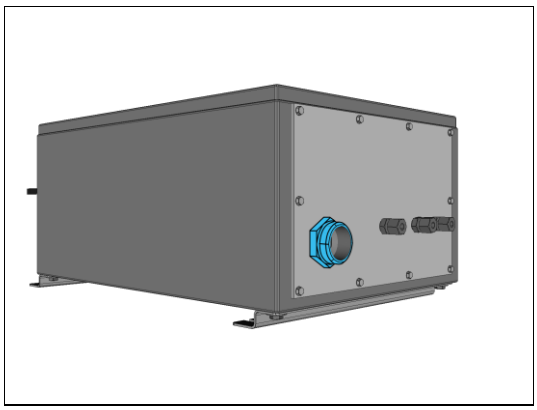
6.4.1 Purging gas supply on the mpc



The purging gas supply on the Ex p control unit mpc is designed with a G 1 ½" internal thread connection.

The internal diameter for the purging gas supply must be designed in such a way that the required purging gas flow is not reduced.

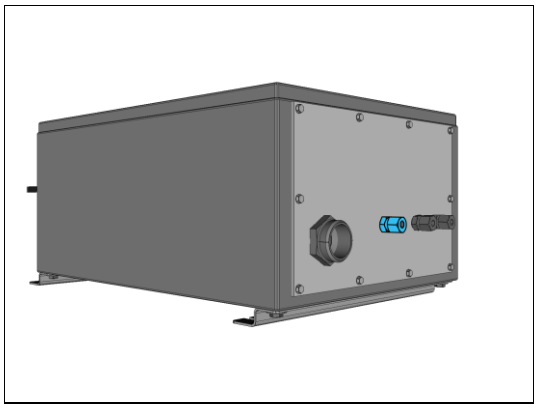
6.4.2 Purging gas supply from the mpc to the Ex p equipment



The purging gas supply from the Ex p control unit mpc to the protected Ex p equipment must be fitted with a G 1 ½" external thread.

The internal diameter for the purging gas supply must be designed in such a way that the required purging gas flow is not reduced.

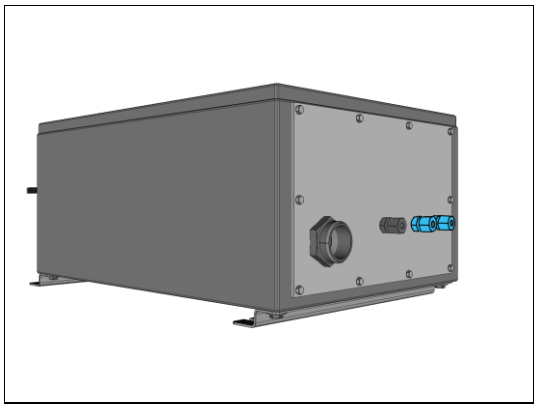
6.4.3 Connection activation of the mpv on the mpc



A 10 mm pipe connection is available for activating the mpv.

This must be piped to the corresponding connection on the mpv.

6.4.4 Pressure measurement connections on the mpc

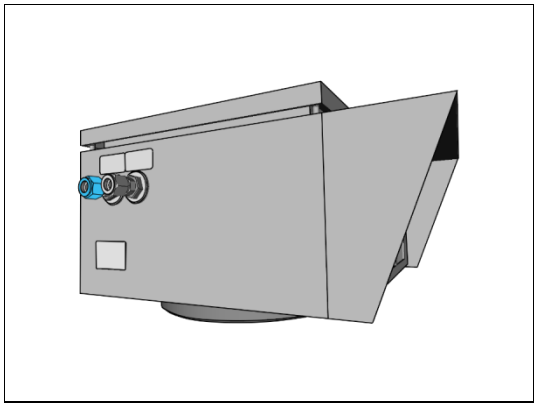


The pressure measurement connections “I-Internal Pressure” and “L-Outlet Pressure” are each designed with a 10 mm pipe connection.

“I-Internal Pressure”: This must be piped to the reference measuring point on the pressurised equipment.

“L-Outlet Pressure”: This must be piped to the corresponding connection on the mpv.

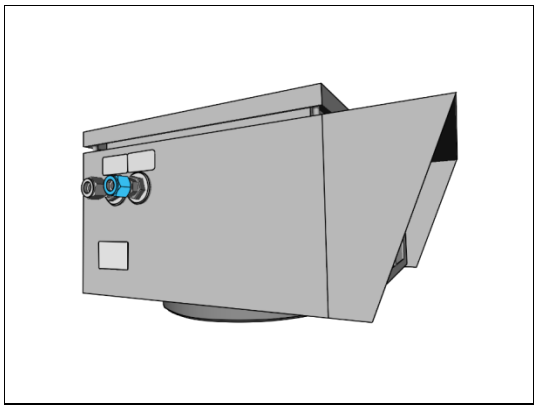
6.4.5 Activation of the mpv on the mpv



The pneumatic connection “A-Actuation mpv” is designed with a 10 mm pipe connection..

This must be piped to the corresponding connection on the Ex p control unit.

6.4.6 Pressure measurement connection on the mpv from the mpc

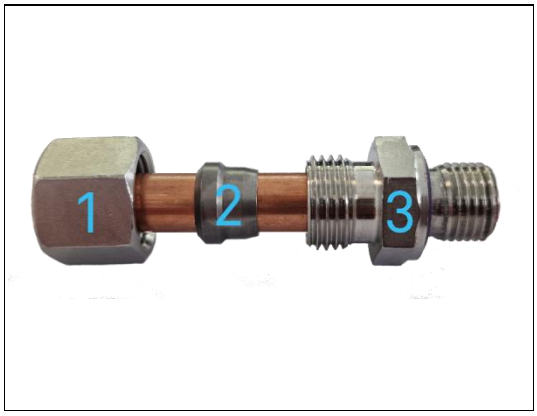


The pneumatic connection “L-Outlet Pressure” is designed with a 10 mm pipe connection.

This must be piped to the corresponding connection on the Ex p control unit.

6.4.7 Mounting pipes to the cutting ring fitting

The following procedure is recommended in order to ensure a clean and tight connection of pipes to the cutting ring fittings.



No.	Designation
1	Union nut
2	Cutting ring
3	Mounting nozzle

Procedure

a) Saw off the pipes at right angles in a fixture, permissible angular deviation from the pipe axis max. 0.5°.

⚠ **Note: Do not use a pipe cutter!**

b) Lightly deburr the inside and outside of the pipes.

Chamfer of max. 0.2 x 45° is permissible. We recommend using reinforcing sleeves for thin-walled pipes!

c) Grease the inside of the union nut, cutting ring and mounting nozzle with sf81 lubricant.

If possible, screw the union nut loosely onto the mounting nozzle once in order that the grease can be better distributed in the thread.

d) Slide the union nut and cutting ring over the pipe end.

⚠ **Note: Cutting edge always in the direction of the connection taper.**

e) Push the pipe, cutting ring and union nut unit into the installation socket. Screw the union nut onto the mounting nozzle by hand until you feel it make contact. Press the pipe against the stop at the base of the mounting nozzle.

f) Tighten with a spanner approx. 1 - 1 ½ turns. The pipe can be turned radially up to approx. ½ turn, after which it should not turn.

g) **Check:** Loosen the union nut.

Check the incision of the cutting edge on the pipe. The throw-on covers part of the face of the cutting ring evenly around the entire circumference. It must be possible to turn the cutting ring radially, but not to move it forwards. Due to the tough pipe material 1.4571, the cutting edge does not produce a comparable churning as with ST 35 pipes.

h) Final assembly: Once the pre-assembled pipe has been approved, insert it into the assembly socket. Tighten the union nut approx. ¼ - ½ turns above the force increase. The mounting nozzle must be held in place with a spanner.

7 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.

7.1 Wiring instructions

DANGER

Death or serious injury due to opening the cover of the Ex p 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 authorised 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 Ex p control unit!

An explosion can be triggered.

- Connect all core cables to terminals (even those which are not required).
- Check 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 Ex p control unit (intact, clean and seated).

7.2 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.

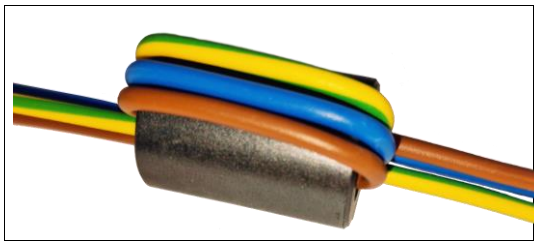
BARTEC Ex p control units are considered to be electromagnetically compatible and have been developed in compliance with the applicable EMC standards and limit values.

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.
  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.

7.2.1 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 be destroyed.

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

Version	DC	AC
Rated current	>= 3.15 A	>= 2 A
Nominal voltage	>= 63 V D	>= 277 V AC
Response time	Sluggish	Sluggish
Breaking current	>= 1.5 kA	>= 1.5 kA
Melting integral	12... 34 A²s	9,7... 14,7 A²s

7.2.2 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 to suppress any inductive loads.

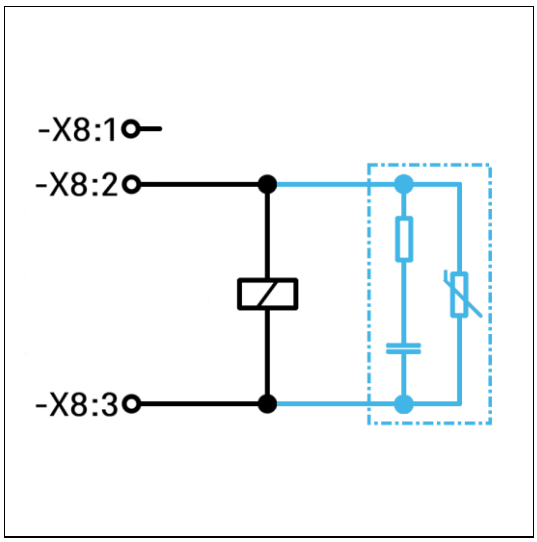
Use protective circuits for inductive loads in order to limit the voltage peaks which occur when switching off.

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



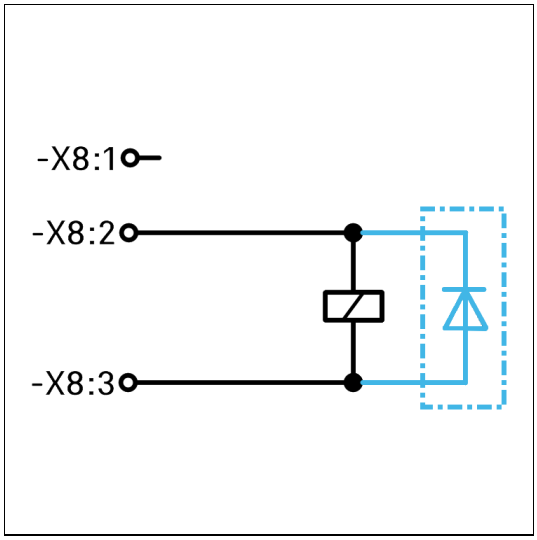
This circuit variant is used for inductive loads AC-fed relays / contactors.

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, z e.g. BARTEC 07-7311-61GF/5400
Freewheeling diode

7.3 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 be 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).

ACHTUNG

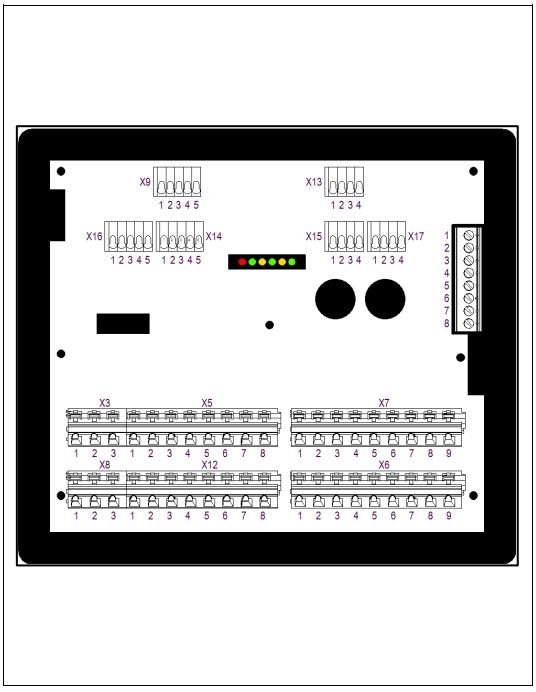
EMC-compliant wiring!

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

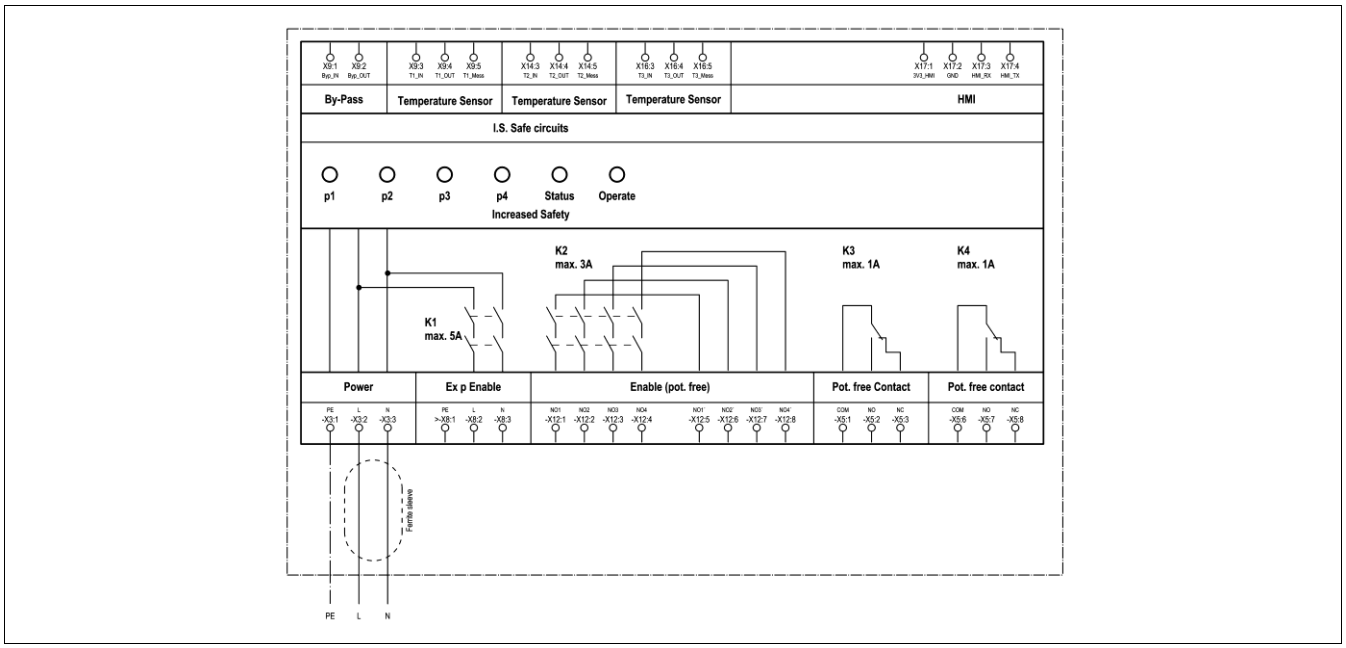
7.3.1 Terminal block overview

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).

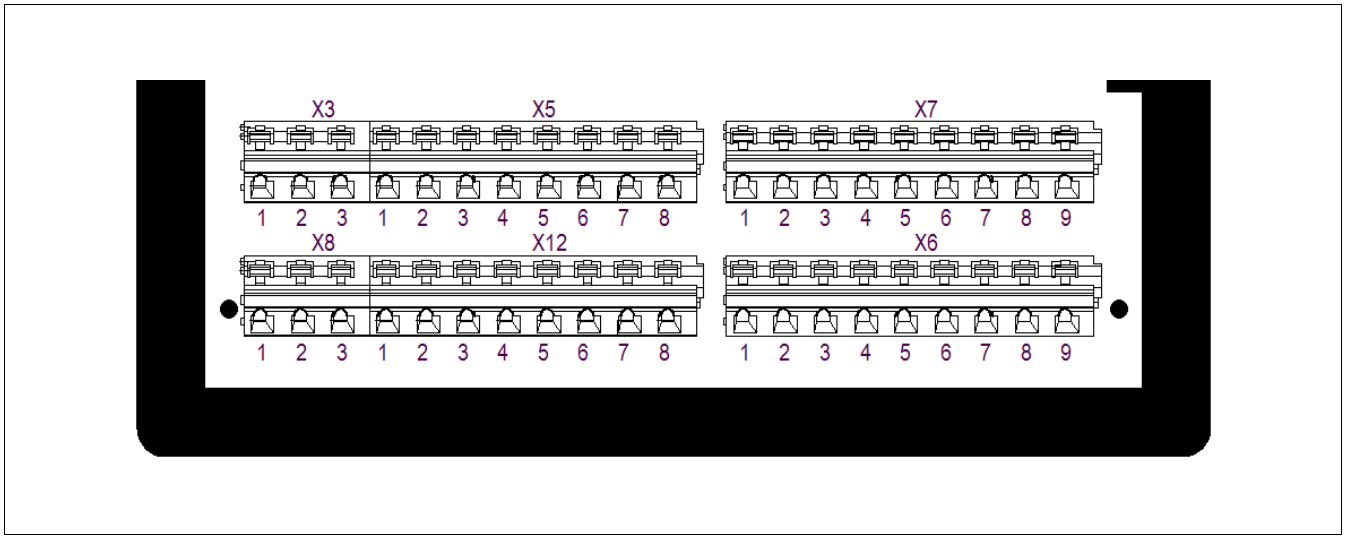


Terminal	Connection
X3	Power supply
X5	2x signalling relay, 1x CO each
X8	Enable, energised
X12	Signalling relay, 4x NO
X7	Purging gas valve, empty contacts
X8	Valve, LAN
X9	Bypass, temperature sensor 1
X13	Optional sensor 1
X14	Main switch, temperature sensor 3
X15	Optional sensor 2
X16	Parameter release, temperature sensor 2
X17	p-Operator Panel
	Pressure measuring card

7.3.2 Wiring diagram



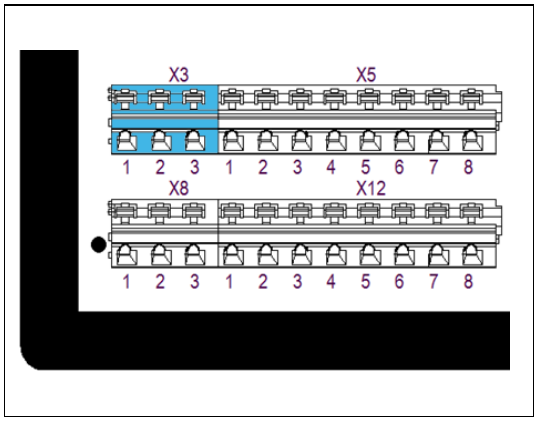
7.3.3 Ex e connection terminals



7.3.3.1 Terminal row “X3”

The supply voltage is connected to terminal row X3.

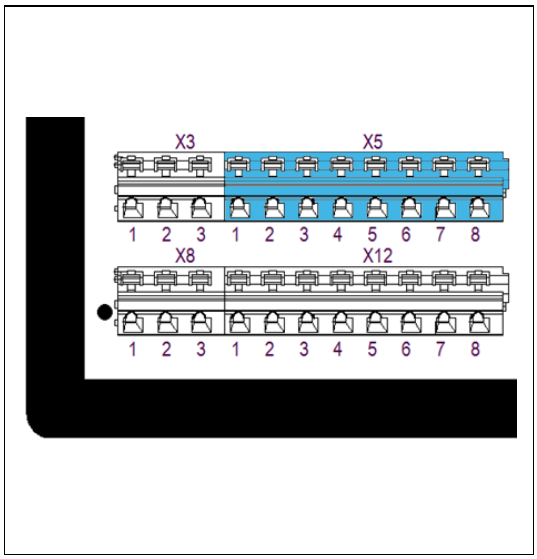
⚠ **Ferrite sleeve assembly!** → Please see Section “EMC-compliant connection”



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

7.3.3.2 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 ()
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)

7.3.3.3 Terminal row “X8”

ATTENTION

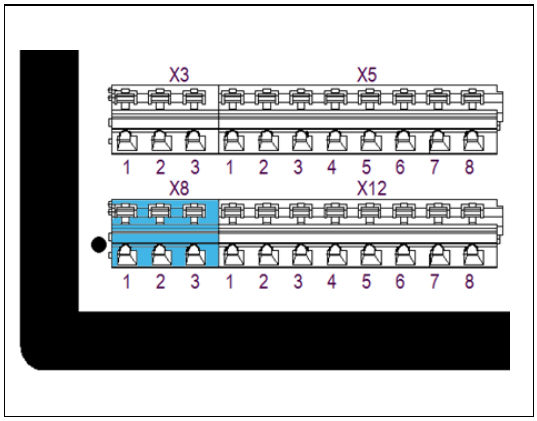
Material damage due to overcurrent on the control electronics!

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 Section 6.1.4.”.
- Maximum inrush current 15 A for 20 ms

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

⚠ **There must be no voltage in the pressurised enclosure when the Ex p control unit is deactivated.**

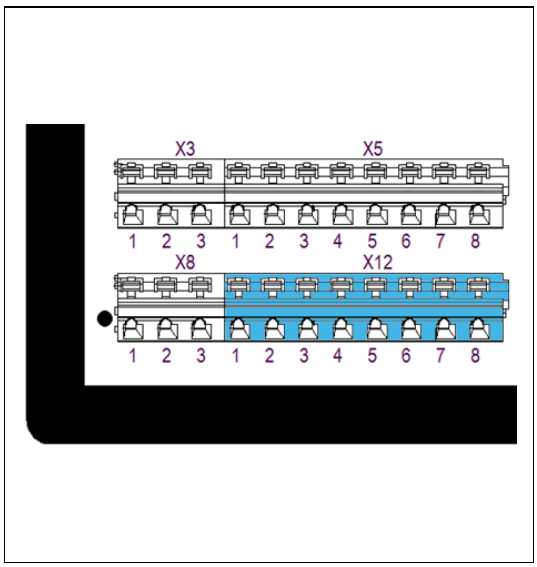


Terminal	Connection
1	PE
2	Phase (+conductor) power supply
3	Neutral (GND) power supply

7.3.3.4 Terminal row “X12”

SIL	Potential-free signal K2 can be categorised as a pure enable according to SIL when used.

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	Contact
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)

7.3.3.5 Terminal row “X7”

ATTENTION

Material damage due to incorrect back-up fuse!

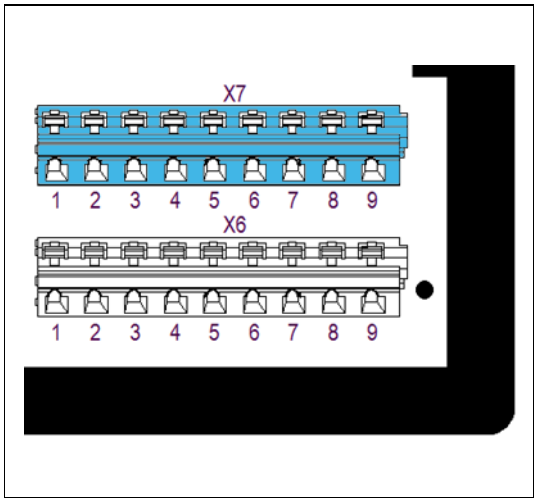
Valve or Ex p control unit may become damaged.

- 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.

Note

The valve and associated valve safety device are connected as standard in the Ex p control unit mpc.

Terminal row X7 is used in order to connect the purging 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

7.3.3.6 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 outlet valve with a 1.0 A back-up fuse and the proportional outlet valve with a 1.6 A back-up fuse.

DANGER

Death or serious injury due to connected programming cable!

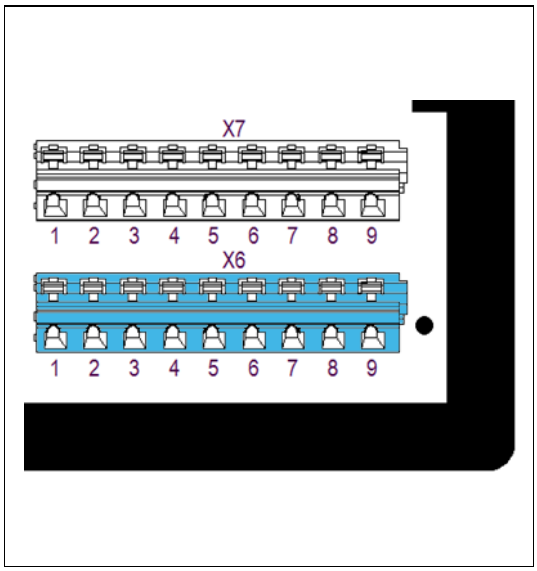
Risk of explosion.

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

Note

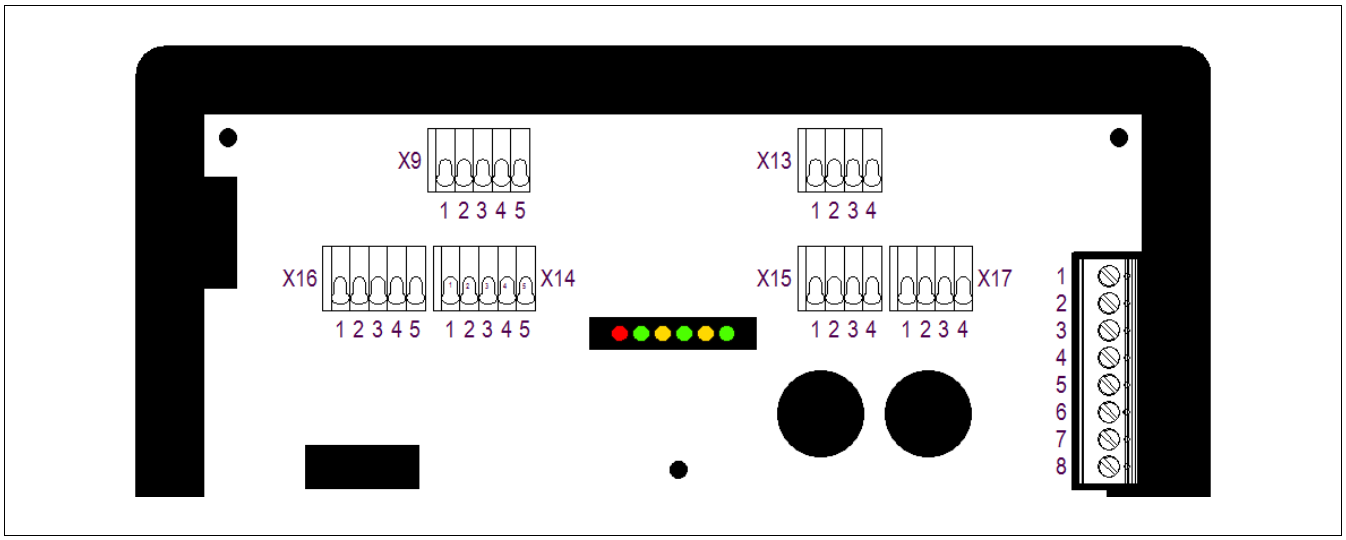
The valve and associated valve fuse are connected as standard in the Ex p control unit mpc.

Terminal row X6 is used in order to connect the outlet valve with the associated valve fuse. In addition, terminal points 6 - 9 are intended to accommodate the wires of the LAN connection cable.



Terminal	Connection
1	Back-up fuse
2	Back-up fuse
3	Valve +
4	Valve -
5	Valve PE
6	GN - Transmit, negative
7	GNWH - Transmit, positive
8	OG- Receive, negative
9	OGWH - Receive, positive

7.3.4 Ex i connection terminals



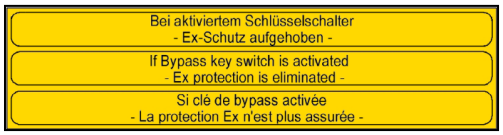
7.3.4.1 Terminal row “X9”

DANGER

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

Risk of explosion.

- 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.



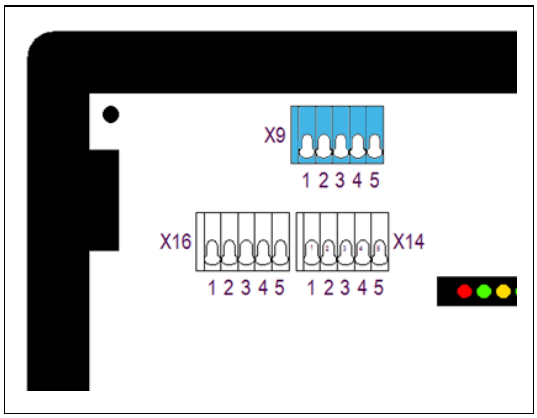
A bypass key switch is connected to the Ex p control unit.

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

The position of the bypass key switch is interrogated by the control electronics in an intrinsically safe manner.

In order to ensure that the bypass switch is recognised and the function can 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	Bypass IN
2	Bypass OUT
3	Temperature sensor 1 IN
4	Temperature sensor 1 OUT
5	Temperature sensor 1 MESS

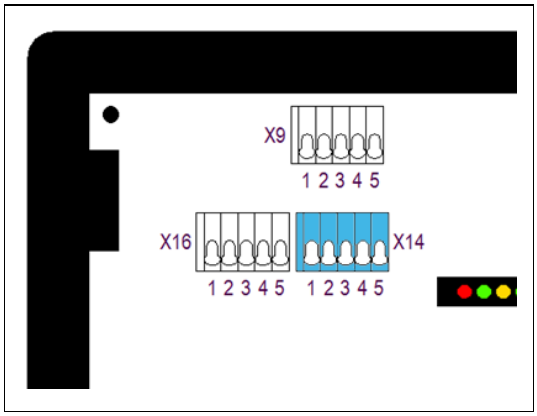
7.3.4.2 Terminal row “X14”

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

7.3.4.3 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.

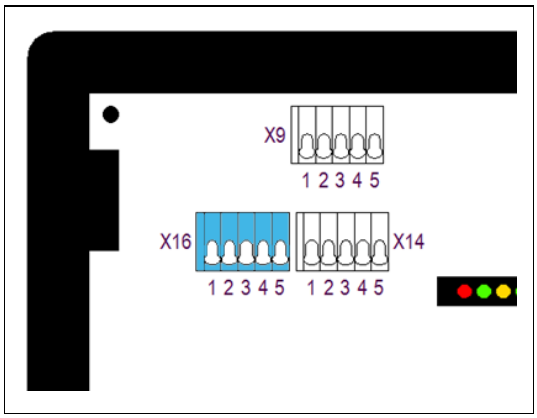
Note

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

7.3.4.4 Terminal row “X13”

SIL	**Caution when connecting external sensors to the Ex p control unit!** When connecting external sensors to the Ex p control unit, attention must be paid to functional safety! - The external sensors must fulfil the requirements of SIL 2.

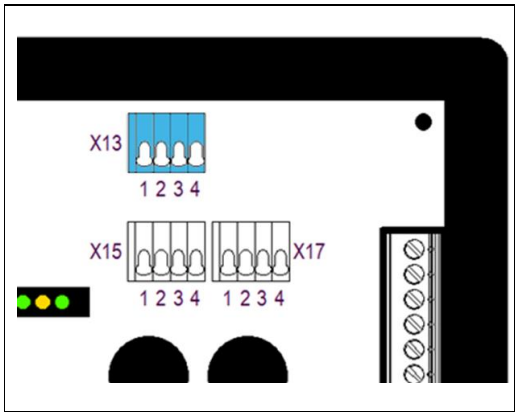
Two standard functions can be carried out at the optional current input.

a) Additional pressure sensor for monitoring other areas on the Ex p equipment

b) Purging can be triggered without deactivation by means of a current signal.

Parameterisation is carried out via the WEB-OS.

A pressure or gas sensor with 4...20 mA output can be connected to the sensor input OS 2 [Ex ia]. The signal is processed depending on the setting of the functions.



Terminal	Connection
1	GNDiso
2	OS2_OUT
3	OS2_IN
4	24V_OS2

7.3.4.5 Terminal row “X15”

SIL	**Caution when connecting external sensors to the Ex p control unit!** When connecting external sensors to the Ex p control unit, attention must be paid to functional safety! - The external sensors must fulfil the requirements of SIL 2.

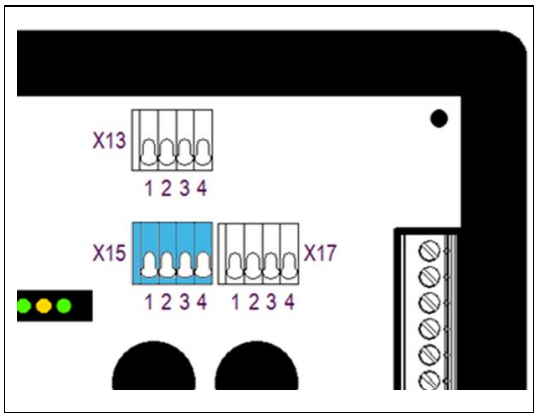
Two standard functions can be carried out at the optional current input.

a) Additional pressure sensor for monitoring other areas on the Ex p equipment

b) Purging can be triggered without deactivation by means of a current signal.

The parameterisation is carried out via the WEB-OS.

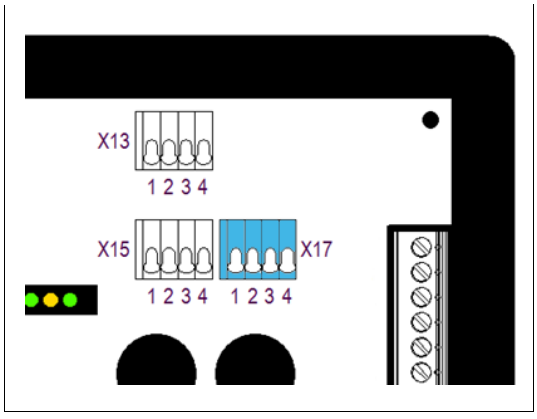
A pressure or gas sensor with a 4...20 mA output can be connected to the OS 1 sensor input. The signal is processed depending on the function settings.



Terminal	Connection
1	GND
2	OS1_OUT
3	OS1_IN
4	24V_OS1

7.3.4.6 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

8 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 purging gas supply and supply voltage have been connected. System statuses can be queried via the WEB operating system.

8.1 Configuration of the LAN interface on the Ex p control unit

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

Standard IP address (delivery status): 192.168.11.101

8.1.1 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:

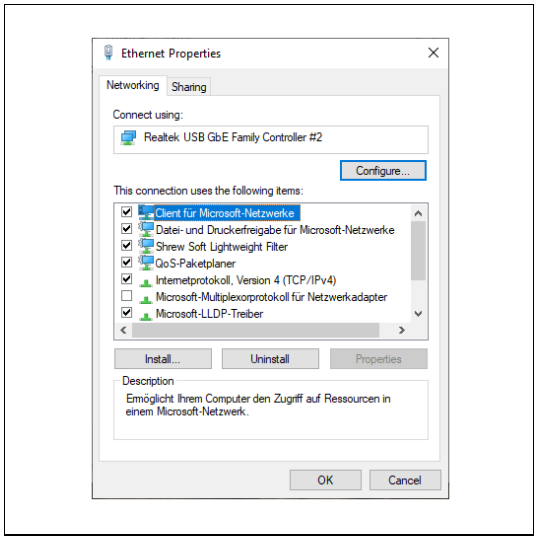
LAN interface configuration:

- Extended / Speed: 100 Mbps Full Duplex

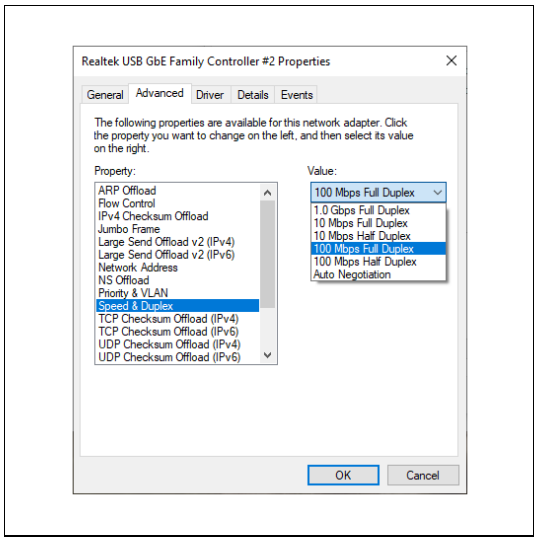
Properties Internet Protocol Ver. 4 (TCP/IPv4):

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

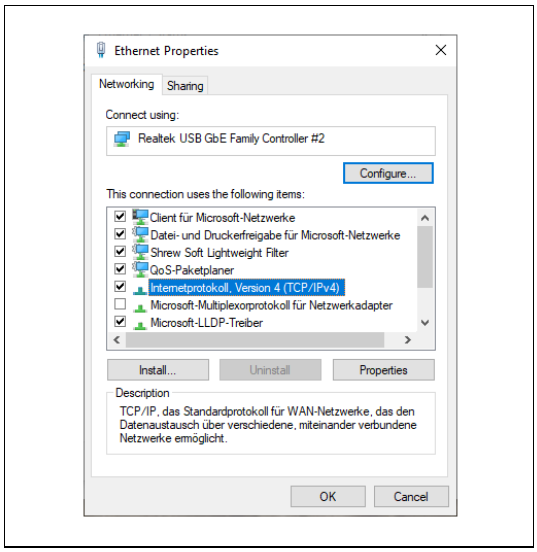
Procedure



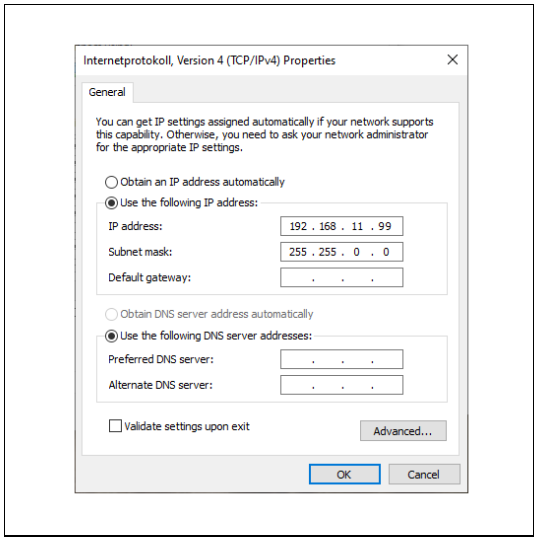
- Open the network settings of the LAN interface on the PC/laptop.
- Select the “Properties” button in order to call up the properties of the LAN connection.



- 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):

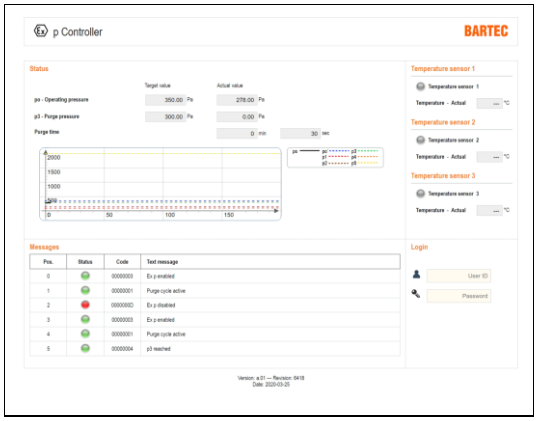
- Change “Obtain IP address automatically” to “Use the following IP address” by clicking on it.
- Enter the IP address 192.168.11.99 under “IP address”.
- Enter the subnet mask 255.255.0.0.
- Confirm the entries with OK.

8.2 Operating the WEB operating system

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

8.3 Logging into the WEB operating system

Two levels are available for logging into the WEB interface



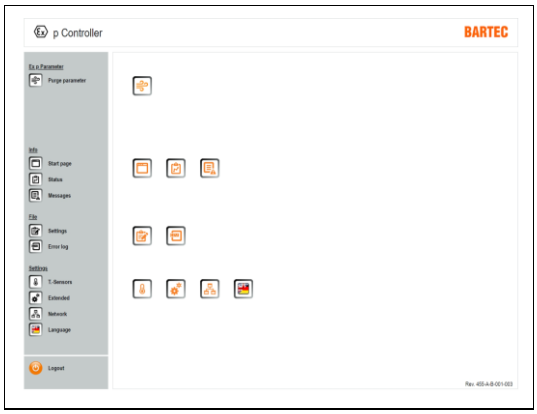
Level 1	=	**Guest access**
User ID	=	guest
Password	=	guest

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.

8.4 Navigating in the WEB operating system



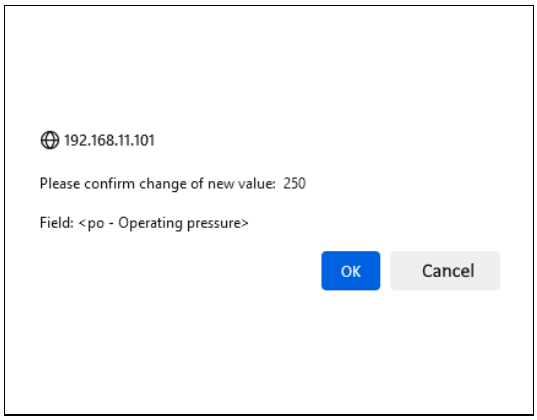
By clicking on the grey navigation bar on the left, you can jump directly to the specific submenus.

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.

8.5 Entering parameters

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

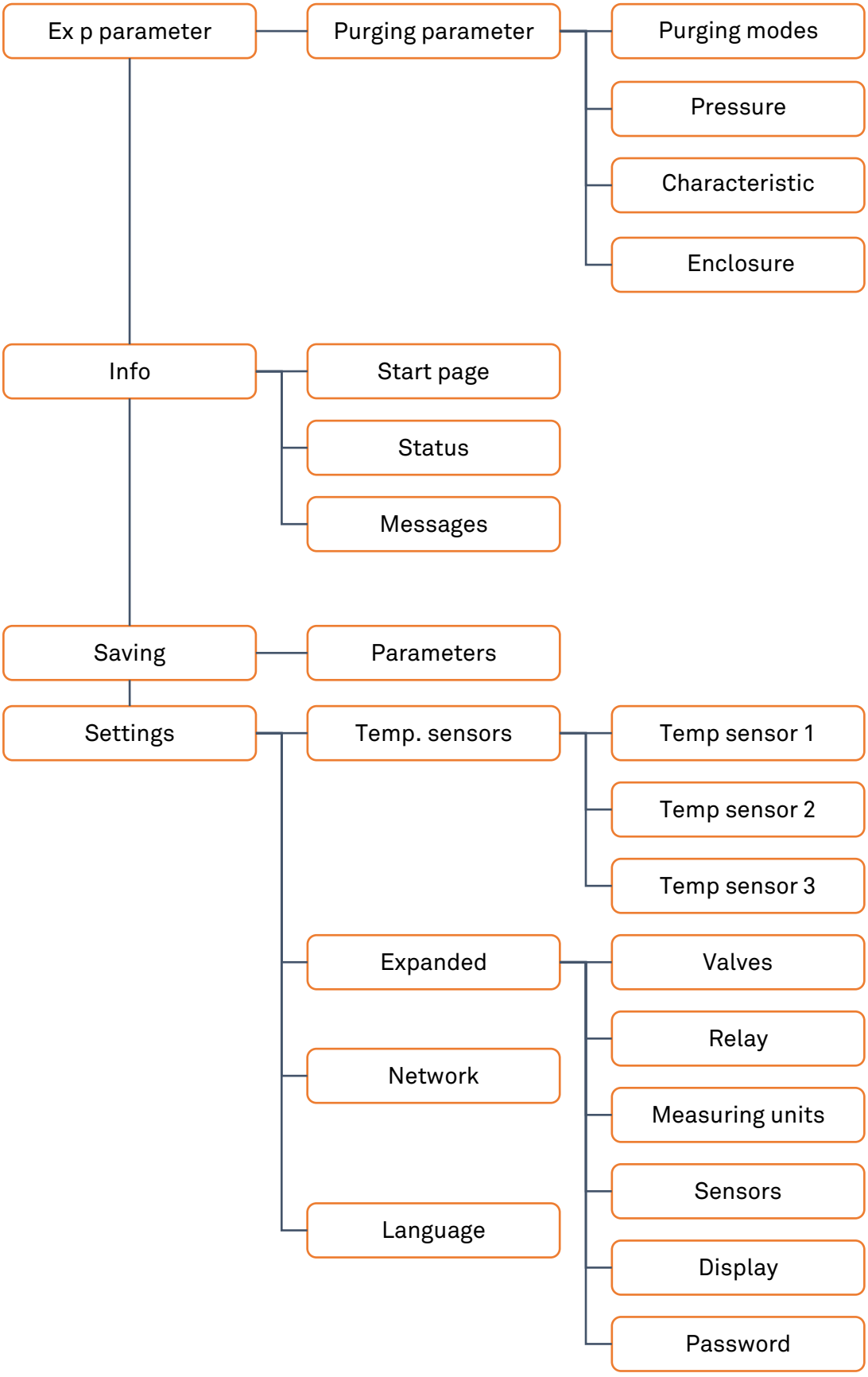


Procedure

- 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.

8.6 Menu structure of the WEB operating system

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



8.7 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	Purging pressure Lights up during the purging 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 / purge process Flashing during purging and illuminated when released after purging
Status	Green	Supply / bypass Illuminated when supply voltage is applied and flashing when bypass is activated

8.8 WEB operating system operating menu

8.8.1 Purge parameter / Purging parameters

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

8.8.1.1 Purging modes

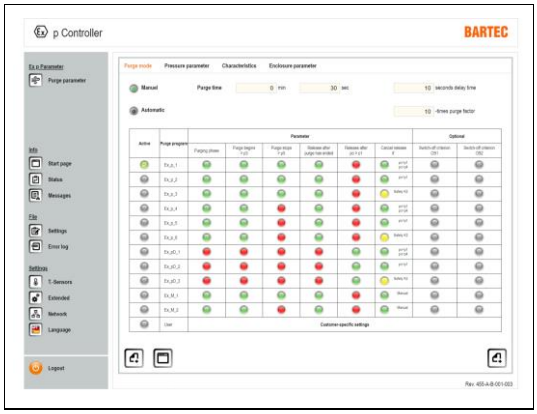
DANGER

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

Risk of explosion.

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

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



Purge time = Fixed purge time of the Ex p equipment

Delay time = Defines the delay time for switching off the Ex p operating equipment in the event of pressure variation.

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

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

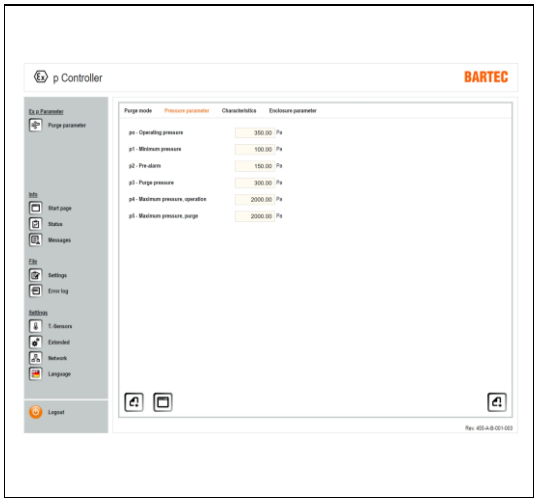
The **manual purging** is based on the fact that the values for purging time and pressures are permanently stored in the device during initial commissioning. The purging time is calculated and programmed by the commissioning technician based on the determined flow rate and enclosure volume.

Purging programmes at gas application:

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

8.8.1.2 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	**Purging pressure**. Purging time starts when the set value is exceeded.
p4	**Maximum pressure, operation**. The release switches off depending on the mode used.
p5	**Maximum pressure, purging**. The release switches off depending on the mode used.

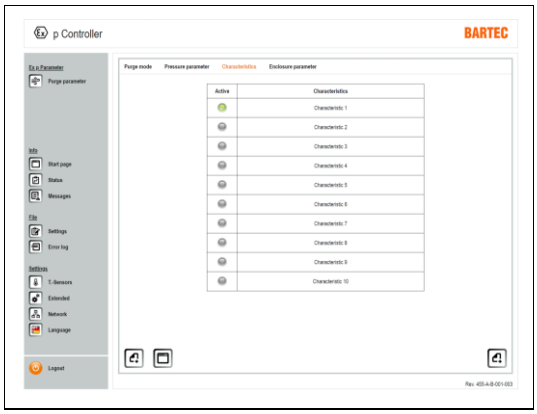
8.8.1.3 Characteristic curve

DANGER

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

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

- Check type and set characteristic.



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

Value	mpv	
Characteristic curve 8	mpv 2	Type: 17-51P3-3803; mpv 2
Characteristic curve 9	mpv 3	Type: 17-51P3-3903; mpv 3

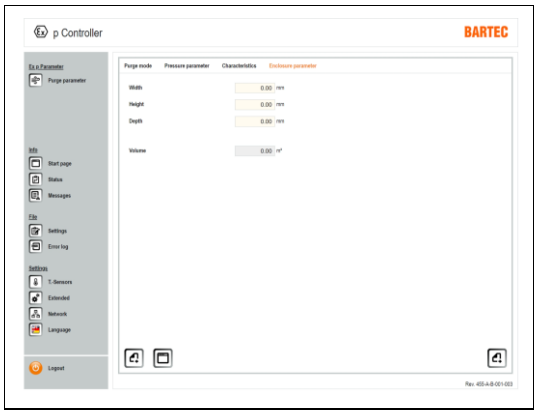
8.8.1.4 Enclosure parameters

DANGER

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

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

- Check the size and volume of the enclosure.

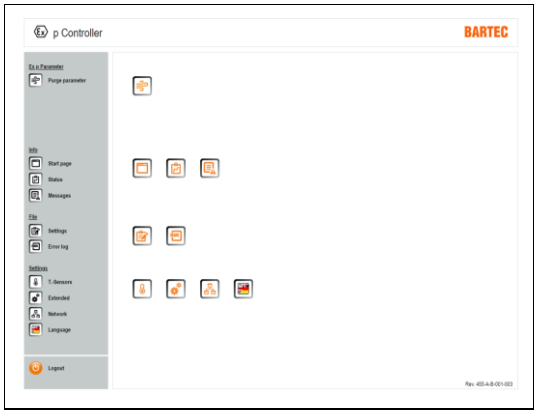


For automatic purging time determination, the size of the protected volume must be set in the Ex p control unit.

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

8.8.2 Info

8.8.2.1 Start page

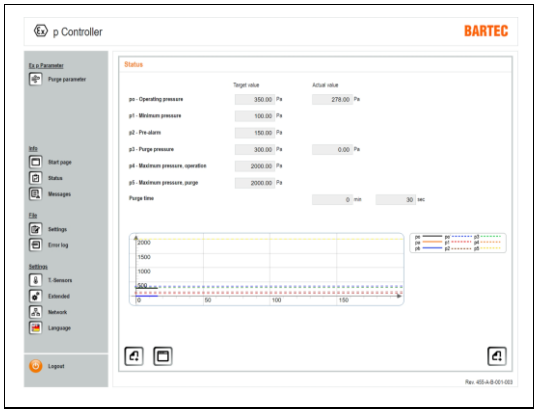


By clicking on the grey navigation bar on the left, you can jump directly to the specific submenus.

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.

8.8.2.2 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.

8.8.2.3 Messages

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

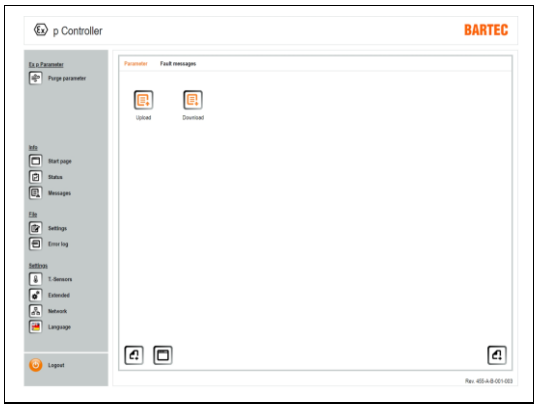
Green messages = Positive

Yellow messages = Warning

Red messages = Error messages

8.8.3 File

8.8.3.1 Parameters

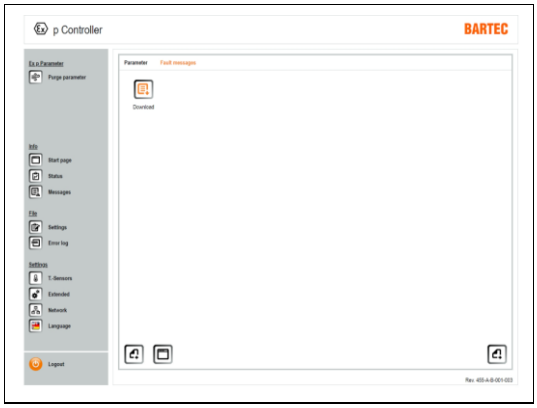


In the “Save / Parameters” menu, parameters can be saved from the Ex p control unit to a local computer or transferred from the local computer to the Ex p control unit.

Upload = Transfer local parameter set to the Ex p control unit.

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

8.8.3.2 Error log



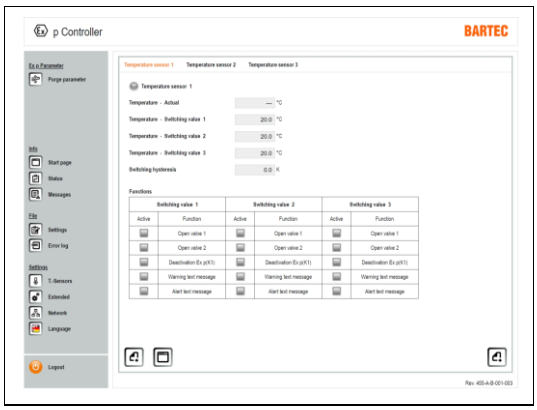
The fault messages stored in the APEX^{mpc} can be read out and saved locally in the "Save / Fault memory" menu.

Save = Save fault messages from Ex p control unit to local computer.

ⓘ The fault memory is not available for the SILAS^{mpc} variant.

8.8.4 Settings / Extended

8.8.4.1 Temperature sensors



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

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

This function can be used, for example, in order to monitor frequency inverters.

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

Switching value	Function
Open valve 1	Cooling via purging air
Open valve 2	Cooling via valve 2, e.g. Vortex
Deactivation Ex p (K1)	If the temperature is exceeded, the release is cancelled.
Warning message in plain text	Exceeding the temperature is output as a warning in plain text in the “Messages” area
Alarm message in plain text	Exceeding the temperature is output as an alarm in plain text in the “Messages” area

“Temperature sensors” setting

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!

Procedure

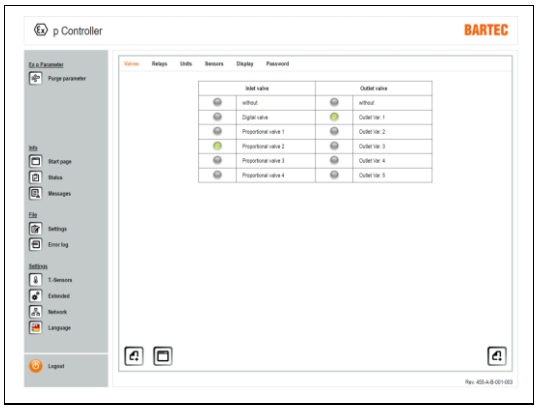
- Connect the computer to the Ex p control unit / control unit
- Activate the programming switch
- Log into the WEB interface with the user level
- Call up the “Advanced / Sensors” menu
- Activate the corresponding button for the required temperature sensor, e.g. temperature sensor 1 by clicking on PT100 or 1000
- “Manual” button changes to
- Confirm pop-up window with 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
- Store switching value 2
  e.g. 35 °C
- Confirm pop-up window with the changed value
- Store switching value 3
  e.g. 60 °C
- Confirm pop-up window with the changed value
- 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 purging air” function
- Confirm pop-up window with the changed value
- Select function for switching value 2
  e.g. warning message in plain text “Warning message is output as a plain text message” function
- Confirm pop-up window with changed value
- Select function for switching value 3
  e.g. deactivation Ex p (K1) and alarm message in plain text
- Function “cancellation of the release of the Ex p equipment and output of an alarm message as plain text”
- Confirm pop-up window with changed value.

8.8.4.2 Valves

Note

The valve settings are preconfigured by BARTEC and must not be changed.

- Any changes may result in malfunctions.



The purging 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 purging gas valve is labelled with the following symbol:

Purging gas valve		Outlet valve (without any function)	
	Valve		Valve
activated	Proportional valve 2	activated	Outlet var. 1

8.8.4.3 Relay

Note

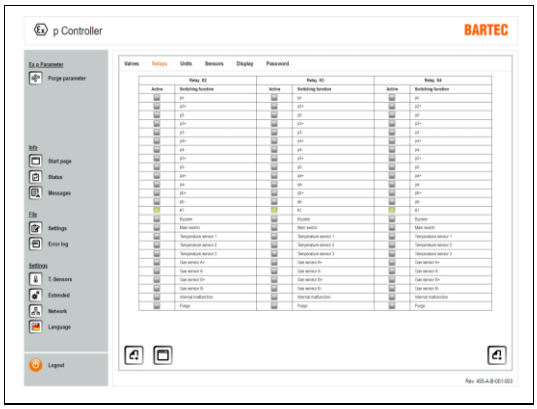
ATTENTION: Switch relay k2 simultaneously with K1!

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.

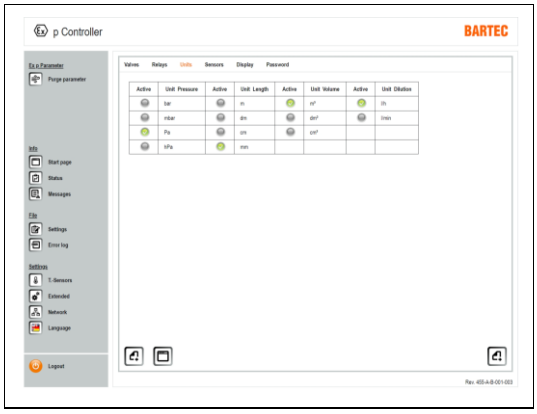
The default setting is switching with K1..

The activated switching function is labelled with the following symbol:

Procedure

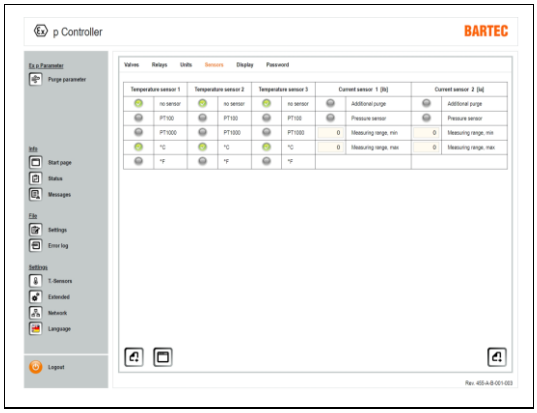
- Connect the computer to the Ex p control unit
- Activate the programming switch
- Log into the WEB interface with the user level
- Call up the “Advanced / Relay” menu
- Activate the specific message(s) in the “of the respective relay” column by clicking on the corresponding button.
  e.g. click on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

8.8.4.4 Units of measurement



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

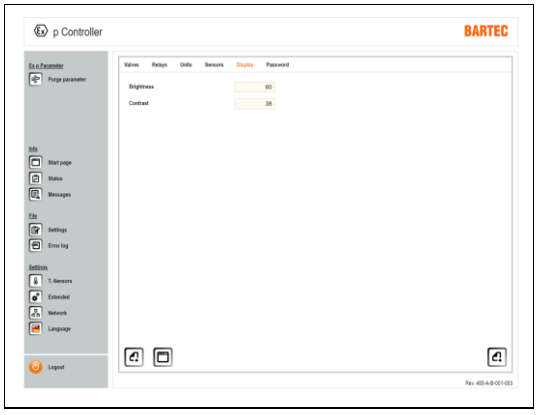
8.8.4.5 Sensors



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

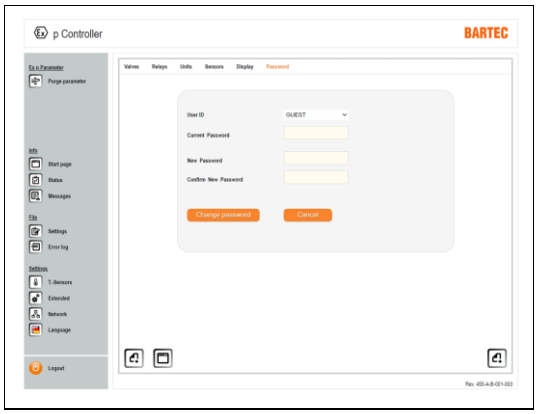
ⓘ The OS1 and OS2 current sensors are not available for the SILAS^{mpc} variant.

8.8.4.6 Display



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

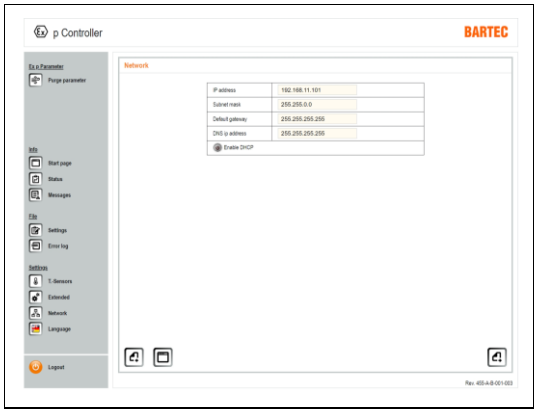
8.8.4.7 Password



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.

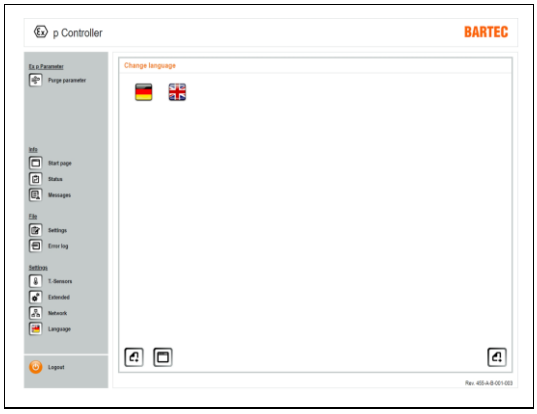
8.8.4.8 Network



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.

8.8.4.9 Language



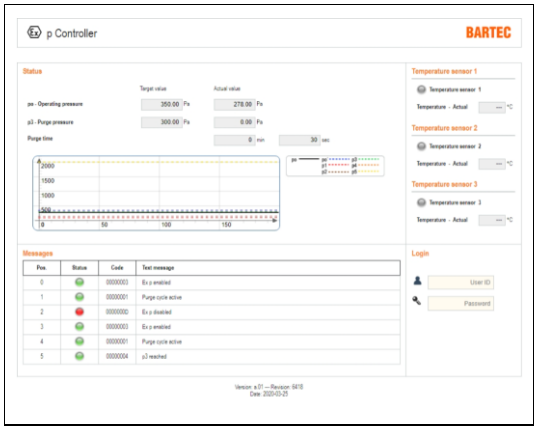
The system language can be selected between German and English in the “Language” menu.

8.9 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.

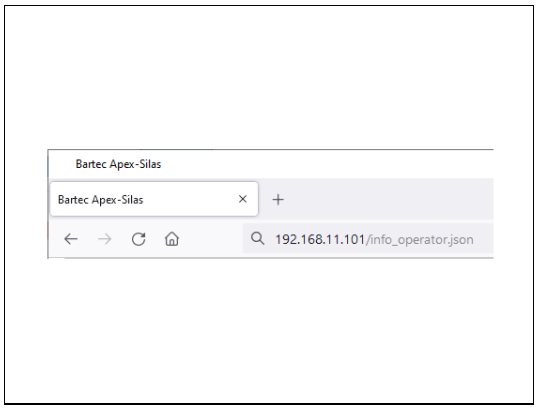
The setpoints for po and p3 and the corresponding measured values are displayed in the top left-hand area. In addition, plain text messages, pressure diagram and the values for optionally connected temperature sensors are displayed.

8.10 Reading out data containers

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

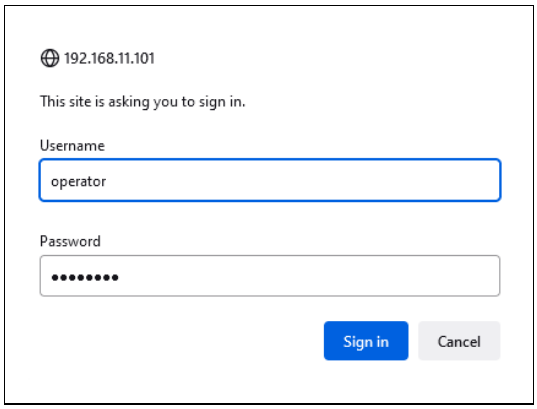
The data format returned by the device is JSON.
(Please see: https://de.wikipedia.org/wiki/JavaScript_Object_Notation)

Query



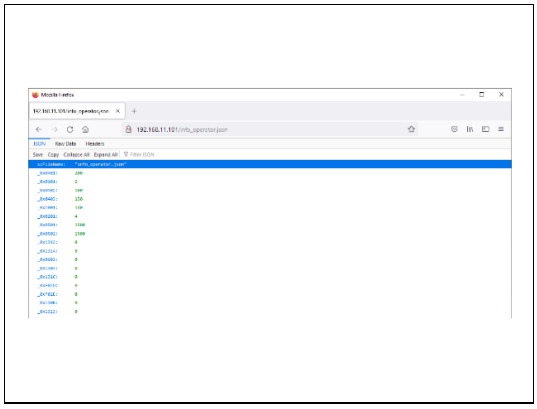
The data for the control centre can be requested via the URL:

- 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	Purging pressure p3 (setpoint)	Pa
_0x0201	Purging 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	Purging time	Seconds

9 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”.

Note

It must be ensured that the electrical wiring is as described in the relevant operating instructions and that the purging 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.

9.1 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.

9.2 Commissioning the Ex p control unit

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

Carry out the following sections in sequence to set the Ex p control unit.

In the “Purge programme / Purging modes” menu, set the purging time to approx. 10 minutes for the first time in order that the following chapters and pressure parameters for purging pressure p3 can be determined successfully.

9.2.1.1 Setting “Ex p parameters / Pressure parameters”

Note

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

Furthermore, the pressure parameters are application-dependent and must be set and 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 = Application-dependent

p4 = Application-dependent and to be determined by the distributor

P5 = Application-dependent and to be determined by the person placing the product on the market

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 “Purging 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 pressurised enclosure. This value is monitored by the Ex p control unit and equalised, if necessary.
- The 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 pressurised enclosure. This value is monitored by the Ex p control unit and, if necessary, a switch-off is triggered if the pressure falls below this value.
- The 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 switching off by falling below p1.
- The pop-up window with display of changed value opens. Confirm.
- Follow the same procedure for the other pressure parameters p4 and p5.

9.2.1.2 Determining the purging pressure p3 and corresponding purging time

Note

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

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

In the following, the pressure in the protected equipment is determined using the purging flow regulation and the corresponding purging time is determined using the measured purging pressure p3.

Procedure

- Close the purging flow control
- Activate the Ex p control unit
- Connect the PC to the Ex p control unit
- Call up the IP address 192.168.11.100 on the browser
- Activate the purging gas supply
- Slowly open the purging flow regulator in order that po reaches a value of approx. 75% to 80% of the maximum permissible pressure
- Record the measured purging pressure p3
- Calculate the purging time in accordance with the following steps:

Calculating the purging time

> **Note**
>
> **Subtract 0.5 mbar from the measured p3 value.**
>
> In order to ensure that fluctuating purging gas supplies do not cause problems for the operator during the purging cycle, we recommend calculating and setting the p3 value as follows:
> 0.5 mbar from the actual measured value.

The purging time is calculated by using the following formula:

$$\frac{\text{Volume [litres]} \quad x \quad \text{Purging factor}}{\text{Flow rate [litres/hour]}} \times 60 = \quad \text{Purging time [minutes]}$$

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

Example:

Volume = 5.600 l; purging = 10-fold, mpv 3

Measured p3 value: 2.0 mbar (200 Pa)

p3 value used for the calculation: 1.5 mbar (150 Pa)

Flow rate according to diagram mpv 3 = 280.000 l/h

$$\frac{\text{5600 litres} \quad x \quad 10}{\text{280.000 litres/hour}} \times 60 = \quad \text{12 minutes}$$

Further procedure for completing the parameter settings

- Log into the WEB-OS with the user level
- Call up the “Purging parameters / Pressure parameters” menu
- Set pressure parameter p3 – purging pressure to 150 Pa (1.5 mbar)
  The pop-up window with display of changed value opens. Confirm.
- Call up the purging parameters / purging modes menu
- Set the purging time to 12 minutes
  The 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 to refresh the browser window.
- The start screen opens.
- Perform function test
  → Check the purging time.
  → Check the switch-off in the event of a pressure drop.

9.2.2 Function test of the 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 pressurised 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 purging time must be set.

Checking the pre-purge phase

Procedure

- Set up the pressurised equipment ready for operation.
- Activate the Ex p control unit.
- Activate the purging gas supply;
  LED “Status” active
  LED “p1” active LED “2” off LED “p3” active LED “Operate” flashes
- Interrupt the purging gas supply by closing the purging gas supply; purging time stops;
  LED “Status” active LED “p3” off LED “Operate” off
- Re-establish the purging gas supply by opening the purging gas supply; allow the purging time to elapse;
  LED “Status” active LED “p1” active LED “p2” off LED “p3” off LED “Operate” active

Checking the operating phase

Procedure

- Set up the pressurised equipment ready for operation.
- Activate the Exp control unit.
- Activate the purging gas supply.
- Allow the purging time to elapse;
  LED “K2” lights up, relay “K2”
  activates fixtures inside the pressurised enclosure.
- Interrupt the purging gas inflow by closing the purging gas supply;
  LED “K2” goes out, relay “K2” deactivates the pressurised equipment.

10 Operation

10.1 Safety during the operation

DANGER

Death or serious injury due to damaged explosion protection measures!

Risk of explosion.

- Take the Ex p control unit out of operation and secure it against being switched on again until it has been repaired.

10.2 Operating phases of the Ex p control unit

The operation of pressurised enclosure equipment can be divided into three phases. The three phases are divided into the preparation, pre-purge and operating phases.

10.2.1 Flow diagram

Operating phase	Requirement	Impact
Preparation phase Section 10.2.2	Mains voltage connected	Initiation of the purging phase
	Internal pressure increases to > p1 setpoint	
	Purging time has not yet elapsed	
	Purging valve opens	
Purging phase Section 10.2.3	Purging pressure p3 > p3 setpoint	Purging time is running
	Internal pressure po < p5 setpoint	
	Purging time counts down	
Operating phase Section 10.2.4	Pre-purge time has elapsed	Release of the pressurised equipment
	Internal pressure po > p1 setpoint	
	Internal pressure po < p4 setpoint	

10.2.2 Preparation phase

The preparation phase begins when the supply voltage for the Ex p control unit is switched on and the purging gas is supplied.

Upon activation of the Ex p control unit and non-activated purging gas supply or opened Ex p equipment, the following initial status is displayed:

- LED “Status” lights up.
- LED “p2” lights up.

Sequence of the preparation phase:

The internal pressure of the pressurised equipment is increased by the incoming purging gas.

- The minimum pressure “p1” of the enclosure is exceeded.
  LED “p1” lights up.
  LED “p2” goes off.
- The purging gas valve is opened via the Ex p control unit.
- The next phase “Purging phase” is initiated.

10.2.3 Purging phase

The pressurised enclosure is purged with the purging gas in order to remove any explosive gas/air mixture which is present in it or to dilute it to a non-hazardous concentration before the possible ignition sources in the pressurised enclosure are switched on.

This process prepares the pressurised enclosure for the operating phase. The amount of purging required depends on the free volume of the pressurised enclosure. The pre-purging process is constantly monitored by the sensors in the Ex p control unit and the pressure switch.

In order to prevent the internal pressure of the pressurised enclosure from becoming too high due to an impermissibly high flow resistance at the pressure switch, the internal pressure is monitored to the value of “p5” during the pre-purge time.

Sequence of the purging phase:

- Increase in the flow rate with purging gas.
- The disc integrated in the pressure switch is raised.
- Switching value of “p3” is exceeded.
  LED “p3” lights up.
- The pre-purge time is counted down.
  LED “Operate” flashes.
- After the purging time has elapsed, the purging gas valve is closed.
- The next phase “Operating phase” is initiated.
  LED “p3” goes off.

10.2.4 Operating phase

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

The operating pressure must be maintained during the entire operation of the pressurised enclosure in order to prevent the ingress of flammable substances. The release of the pressurised enclosure is released via the Ex p control unit.

If the enclosure pressure falls below the set minimum values during the operating phase, the authorisation for the operation is withdrawn.

Sequence of the operating phase:

- The flush valve closes and the leakage losses are equalised.
  LED “p1” lights up
  LED “Operate” lights up
  LED “Status” lights up
- Relay K1 switches on the mains voltage.
- Relays K2, K3 and K4 switch depending on the configuration.

11 Maintenance and care

WARNING

Maintenance intervals

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

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

Note

Maintenance and care

- Observe the currently valid provisions and the national regulations regarding the maintenance, servicing and testing of the operating equipment!
- Any operating and maintenance work may only be performed by trained specialist personnel. The legal regulations and other binding guidelines for occupational safety, accident prevention and environmental protection must be observed.
- When opening any covers or removing parts, live parts may be exposed, unless this is possible by hand. Connecting parts may also be under voltage.

Maintenance interval	Activity to be carried out
Monthly	Visual inspection according to Section 11.1
Semi-annually	Cleaning according to Section 11.2
Annually	Regular maintenance according to Section 11.4

11.1 Visual inspection

Carry out a monthly visual inspection:

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

11.2 Cleaning

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

11.3 Regular maintenance

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

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

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

11.4 Repairs

Any repairs to the control unit and accessories may only be carried out by BARTEC GmbH.

11.5 Malfunction and troubleshooting

ATTENTION

A change in the operating behaviour may be a sign of existing damage.

- Do not put the Ex p equipment 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.

11.6 Fault table

Fault	Possible cause	Remedy
Sporadic failure	Cable break	Check connections
	The pressure measuring card is loose	Check pressure measuring card
	Pressure drop / Leakage	Check tightness and leakage compensation
	EMC influences	Check wiring according to EMC specifications
Control unit without function (All LEDs are off)	Mains voltage not present	Check supply voltage
	The device is defective	Return to manufacturer
	Device defective - Inductive loads?	Replace functional unit and protect inductive loads according to specifications
The protected appliances are switched on without pre-purging	Bypass is activated	Deactivate bypass
	Incorrect purging programme has been activated	Check the purging programme
The purging gas valve switches off briefly during the pre-purging process	Excessive purging gas is introduced into the pressurised enclosure → Setpoint p5 is exceeded	Reduce the size of the purging gas nozzle
The control unit does not switch on the electrical appliances after the pre-purging phase	The main switch is not closed	Activate the main switch
	Jumper HS_IN // HS_OUT is not present	Insert jumper
Relay K4 or K5 does not switch	Switching parameters have been incorrectly selected	Check the switching parameters
The electrical appliances do not switch off in the event of a pressure drop	Bypass is activated	Bypass is activated
	Incorrect purging programme has been selected	Correct the purging programme

Overpressure is not maintained internally	The leakage air compensation is too low	Adjust the pre-pressure
		Check air leakage increase
The Ex p control unit does not purge	No purging air	Activate the purging air
		Proportional valve, check leakage air
	Switching value p1 and / or p3 is not exceeded	Check the inlet pressure setting
		Check the purging flow regulation setting
The Ex p system cancels the purging process	The purging air flow is not stable	Check the purging gas supply

11.7 Error messages

The control units issue plain text messages, which are divided into the following 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 which may lead to the protected equipment being switched off.

11.7.1 Positive messages

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

11.7.2 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 – purging” 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	

11.7.3 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 “Purging pressure” has not been reached.	
	00000017	p4 exceeded
	Setpoint p4 “Maximum pressure – operation” exceeded.	
	00000018	p5 exceeded
	Setpoint p5 “Maximum pressure – purging” 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 px control unit APEX^{mpc}

Certifications	ATEX, IECEx, EAC, CCC
Areas of use	Zone 1, Zone 21
ATEX	
Certification	BVS 19 ATEX E 015 X
Marking	Ⓔx II 2(1)G Ex eb mb ib [ib pxb] [ia Ga] IIC T4 Gb Ⓔx II 2(1)D Ex tb [ib pxb] [ia Da] IIIC T130 °C Db
IECEx	
Certification	IECEx BVS 19.0038 X
Marking	Ex eb mb ib [ib pxb] [ia Ga] IIC T4 Gb Ex tb [ib pxb] [ia Da] IIIC T130 °C Db
Eurasian Economic Union (EEU)	
Certification	EAЭC RU C-DE.AЖ58.B.01809/21
Marking	1Ex e mb ib [ib px] [ia Ga] IIC T4 Gb X Ex tb [ib px] [ia Da] IIIC T130 °C Db X

12.2 Ex pz control unit SILAS^{mpc}

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

12.3 Ex p specific data

Pressure measuring range	0 to 25 mbar
Tolerance range	± 0.5 mbar over the entire measuring range
Purging time	10 seconds to 120 minutes (adjustable)
Purging gas valve	2/2-way digital valve, NW 25
Purging gas volume	0... 180 m³/h with mpv 2
	0... 450 m³ with mpv 3
Leak compensation valve	2/2-way proportional valve
Leakage compensation	Max. 44 m³/h @ 3.5 bar

12.4 Electrical data

Nominal voltage, DC	DC 24 V... DC 44 V
Nominal voltage, AC	AC 100 V... AC 230 V
Current consumption	0.5... 1.5 A
Tolerance range	+/- 10 %
Overvoltage category	II
Max. power consumption	17 Watt
Release relay K1 (SIL)	2 potential related NO contacts,
	230 Vac @ 5 A (AC1) or
	24 Vdc @ 5 A (DC1)
Release relay K2 (SIL)	Potential-free, 4 x NO,
	230 Vac @ 3 A, 24 Vdc @ 3 A
Signal relay K3 and K4	Potential-free, 1x changeover contact,
	230 Vac @ 1 A, 24 Vdc @ 1 A
Terminal “Ex e”	0.08 ... 2.5 mm² (28 ...12 AWG)
with wire end ferrule	0.25 ... 1,5 mm²
Terminal “Ex i”	0.20 ... 2.0 mm² (20 ...14 AWG)
with wire end ferrule	0.25 ... 0.75 mm²

12.5 Ambient conditions

Transport and storage temperature	-20 °C to +60 °C
Operating temperature	-25 °C to + 50 °C
Relative humidity	< 95 % (no condensation)
To be used at an altitude of	< 2000 m

12.6 Purging gas

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

12.7 Mechanical data

Protection class	IP 64 pursuant to EN IEC 60079-0 IP 66 pursuant to EN 60529
Dimensions	550 x 400 x 250 mm (W x H x D)
Enclosure material	Stainless steel, V4A
Weight	40 kg
Cable glands	1x M16 nickel-plated brass, clamping range 3.0 - 9.0 mm 2x M20, nickel-plated brass, clamping range 6.5 - 14.0 mm 2x M25, nickel-plated brass, clamping range 10.0 - 18.0 mm
Purging gas supply	G 1 ½“ internal thread
Purging gas supply Ex p	G 1 ½“ External thread
Pressure measurement connection and connection mpv activation	3x cutting ring fitting for pipe 10 mm to DIN 2391 part 1 or DIN 2462 tolerance class D4 / T3

12.8 Pressure monitor mpv

Dimensions	260 x 160 x 345 mm (W x H x D)
Material of the enclosure	Stainless steel V4A
Material of the flange	POM
Outer diameter of the flange	165 mm @ mpv 2 220 mm @ mpv 3
Overpressure protection	50 mbar @ mpv 2 40 mbar @ mpv 3
Opening	Valve controlled
Weight	25 kg
Transport and storage temperature	-30 °C to + 60 °C
Operating temperature	-30 °C to + 60 °C
Pressure measurement connection and connection mpv activation	2x cutting ring fitting for 10 mm pipe to DIN 2391 Part 1 or DIN 2462 Tolerance class D4 / T3.

13 Ordering information

13.1 Ex p control unit

Designation	Order number
Zone 1	
APEXmpc, DC version, Ta -25°C... +50 °C	07-37A2-2211/1M50
APEXmpc, AC version, Ta -25°C... +50 °C	07-37A2-2211/2M50
APEXmpc, DC version, Ta -50°C... +50 °C, heating AC 230 V	07-37A2-2211/1M51
APEXmpc, AC version, Ta -50°C... +50 °C, heating AC 230 V	07-37A2-2211/2M51
Zone 2	
SILASmpc, DC version, Ta -25°C... +50 °C	A7-37S2-2111/1M50
SILASmpc, AC version, Ta -25°C... +50 °C	A7-37S2-2111/2M50
SILASmpc, DC version, Ta -50°C... +50 °C, heating AC 230 V	A7-37S2-2111/1M51
SILASmpc, AC version, Ta -50°C... +50 °C, heating AC 230 V	A7-37S2-2111/2M51

13.2 Pressure monitor

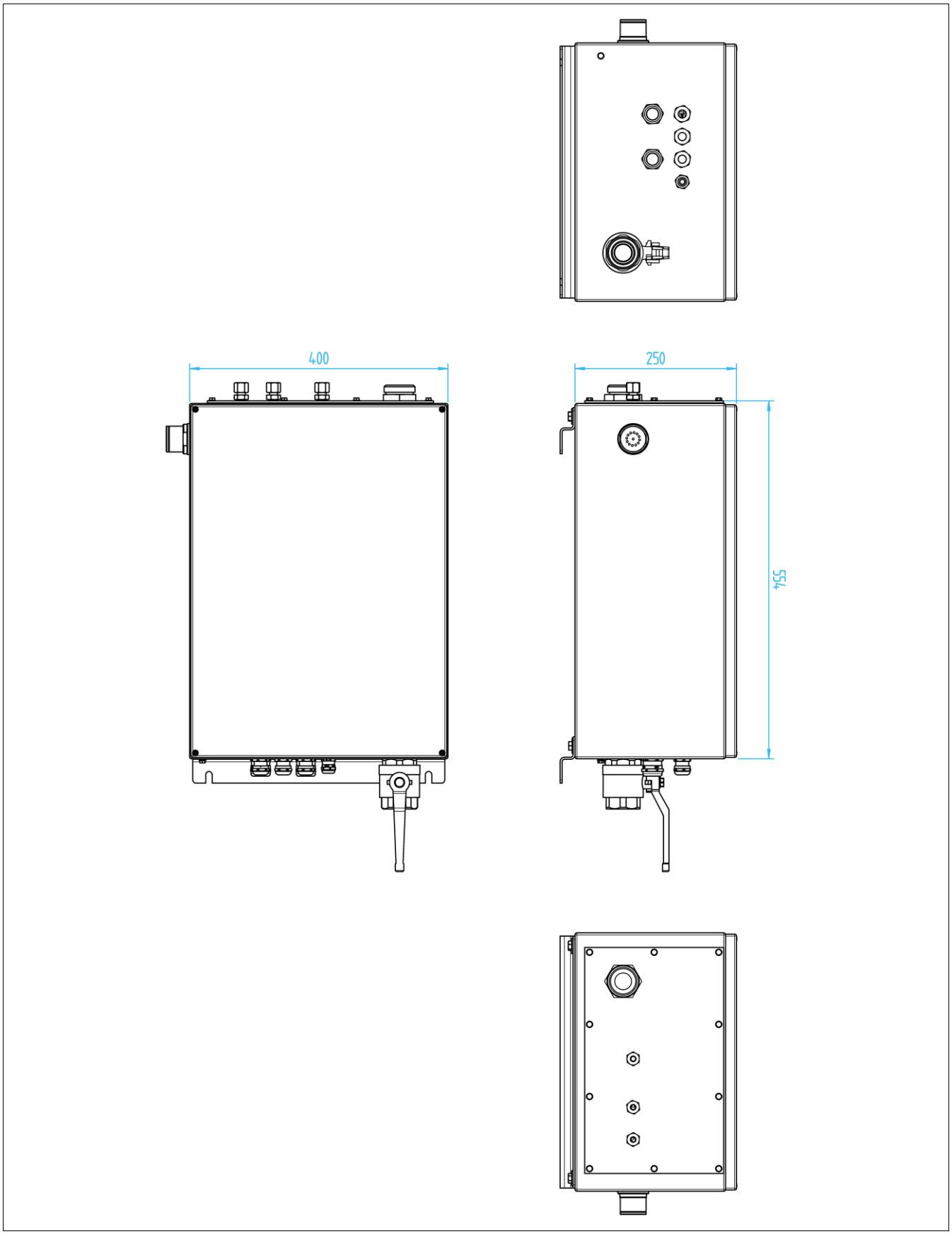
Designation	Order number
mpv 2, stainless steel 316L	17-51P3-3803/0000
mpv 3, stainless steel 316L	17-51P3-3903/0000

13.3 Spare parts

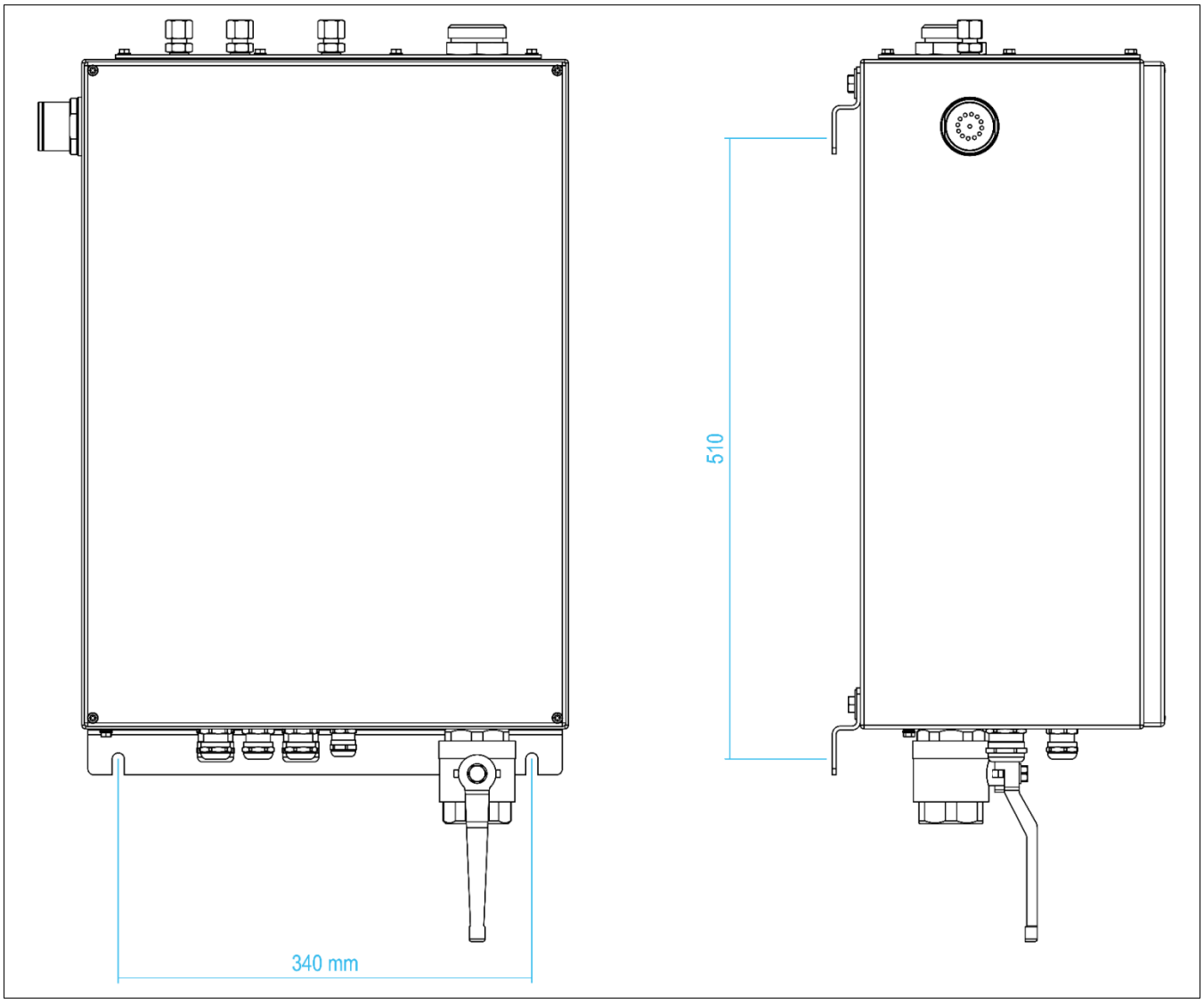
Designation	Order number
Purging gas distribution consisting of: Pressure reducer, purging gas valve and connection fittings	1206400
Leakage compensation valve consisting of Proportional valve with connection fittings	1206412
Replacement coil for purging gas valve	1206411
Ex p control unit, AC version	429504
Ex p control unit, DC version	429503
Ex p pressure measuring card, 0...25 mbar	419862
Valve safety device for the purging gas valve	409779
Valve safety device for the proportional valve	409785

14 Appendix

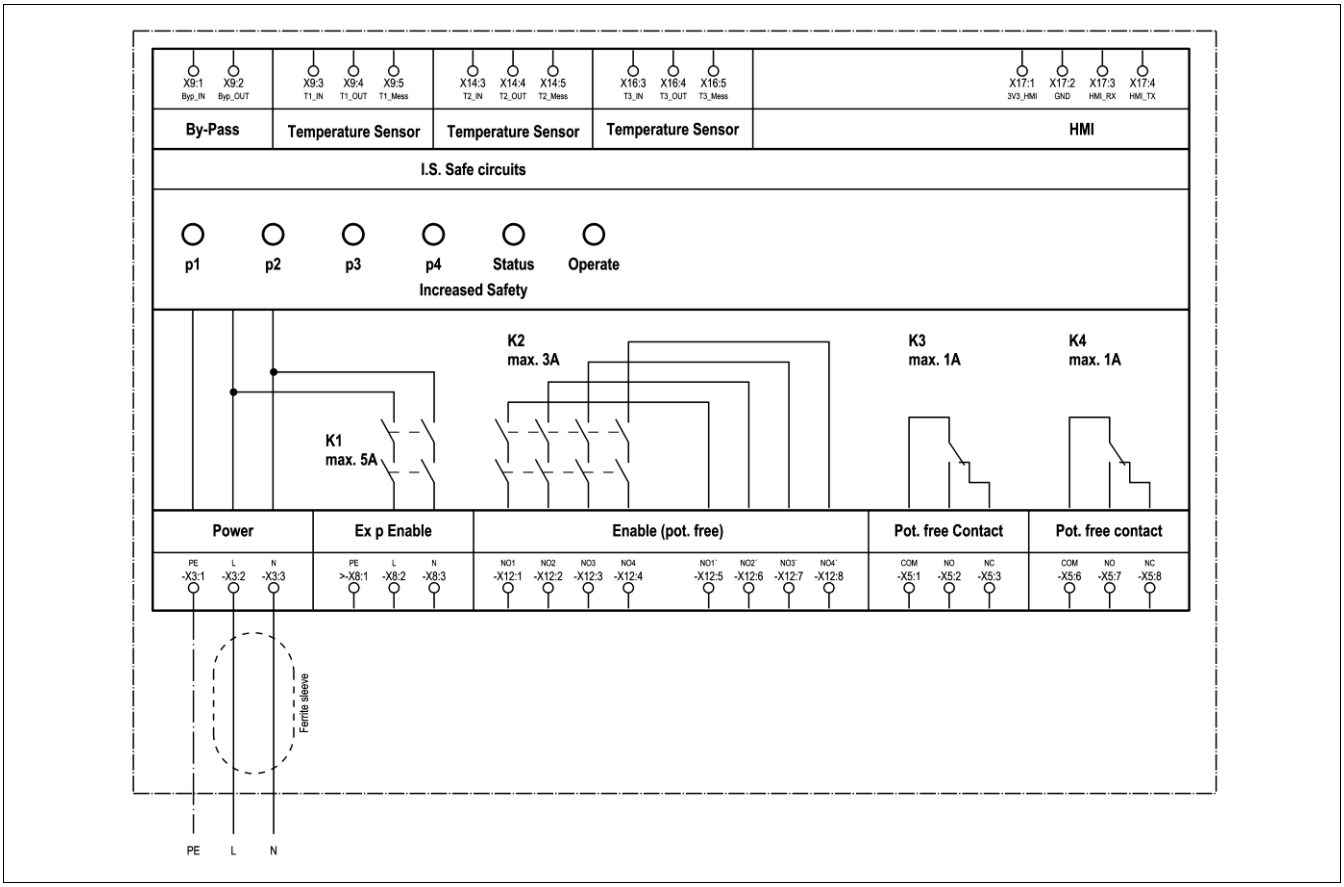
14.1 Dimensions of the Ex p control unit



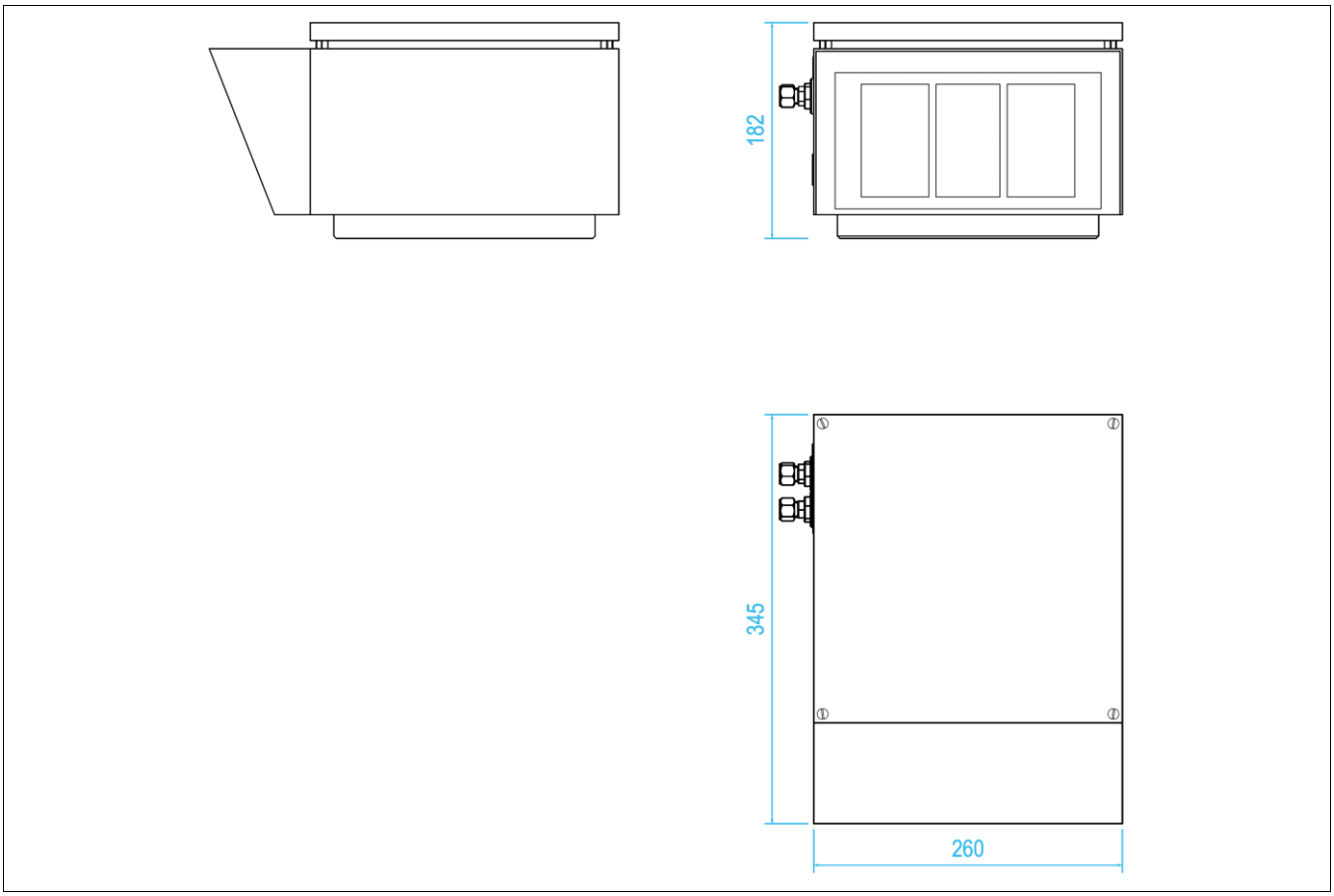
14.1.1 Dimensions of the fastening



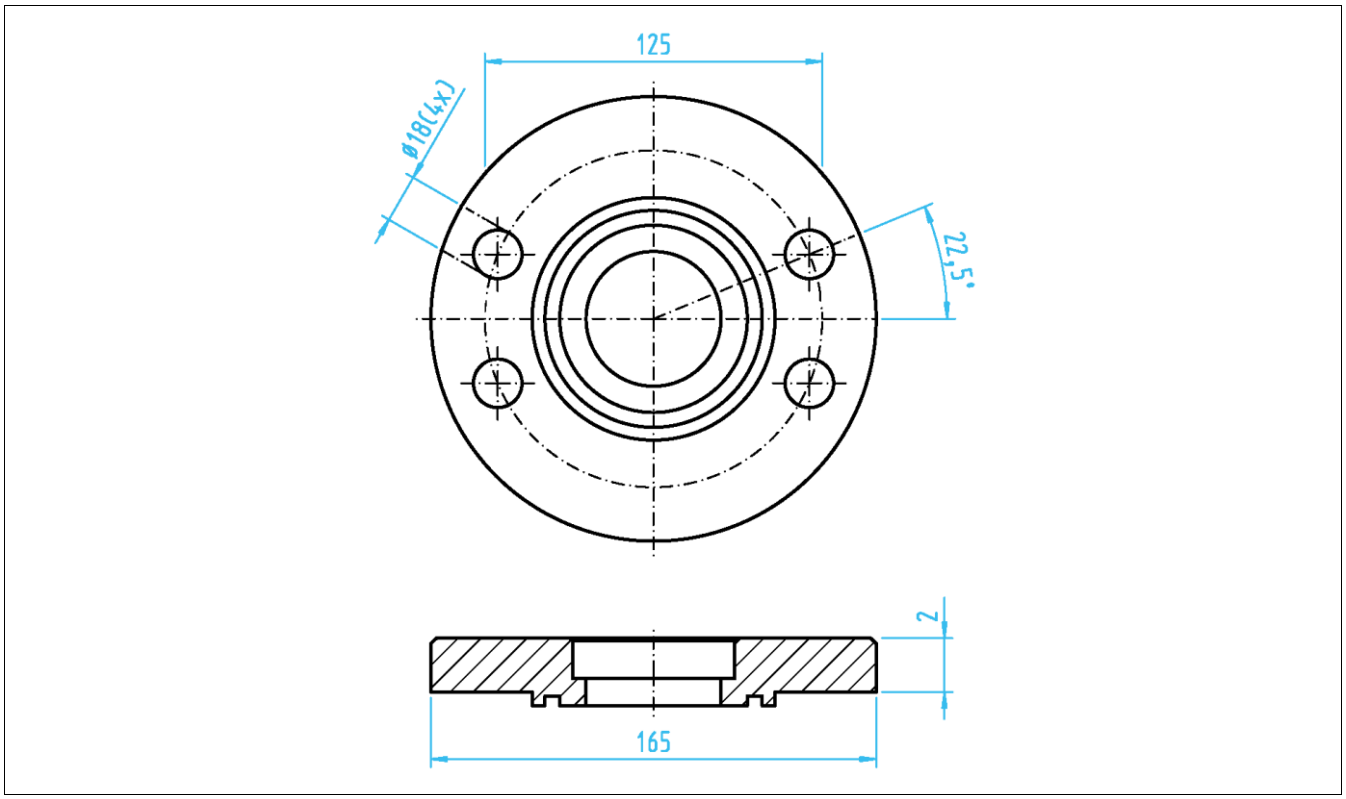
14.2 Block diagram



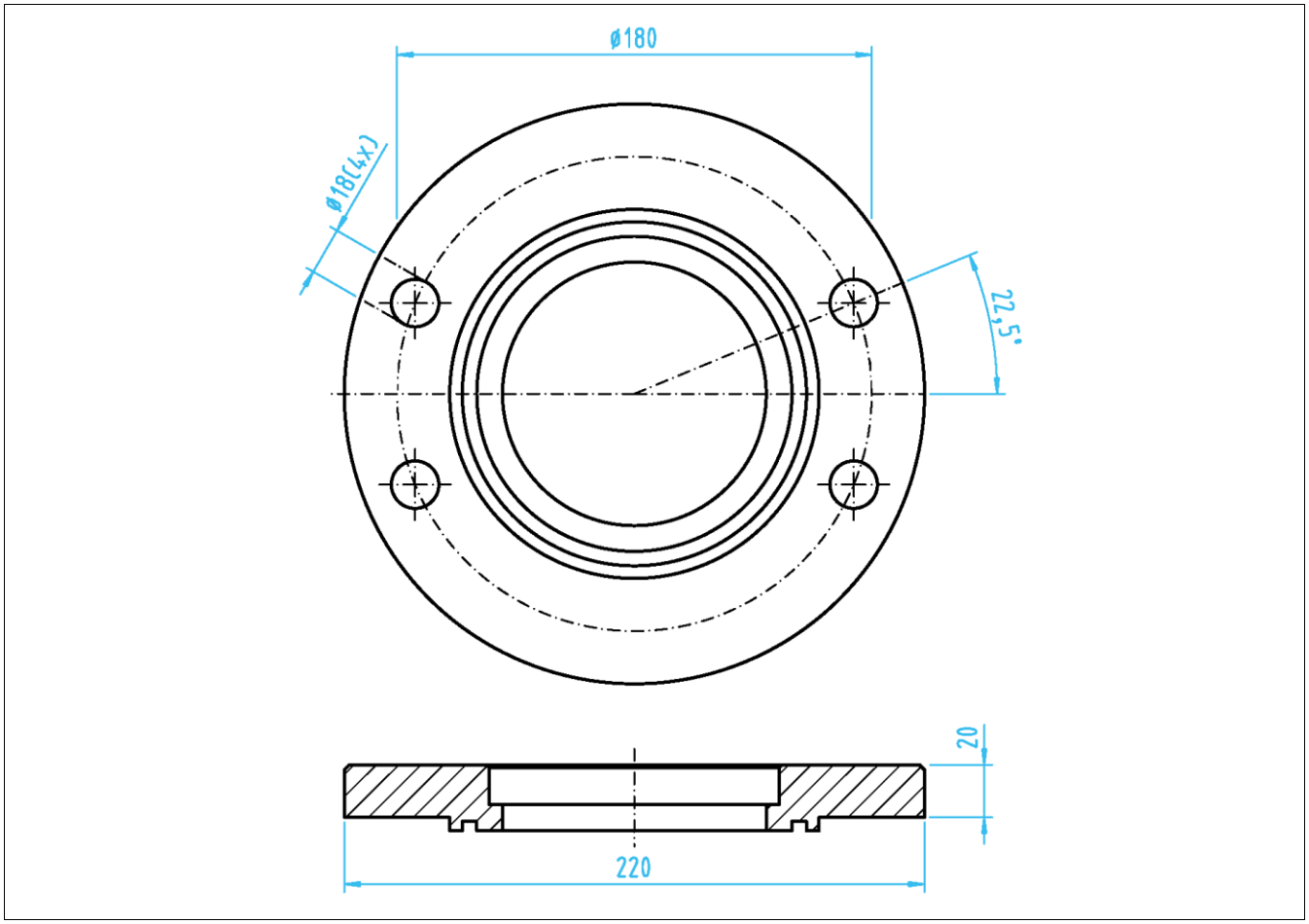
14.3 Dimensions of the pressure monitor



14.3.1 Dimensions of the flange



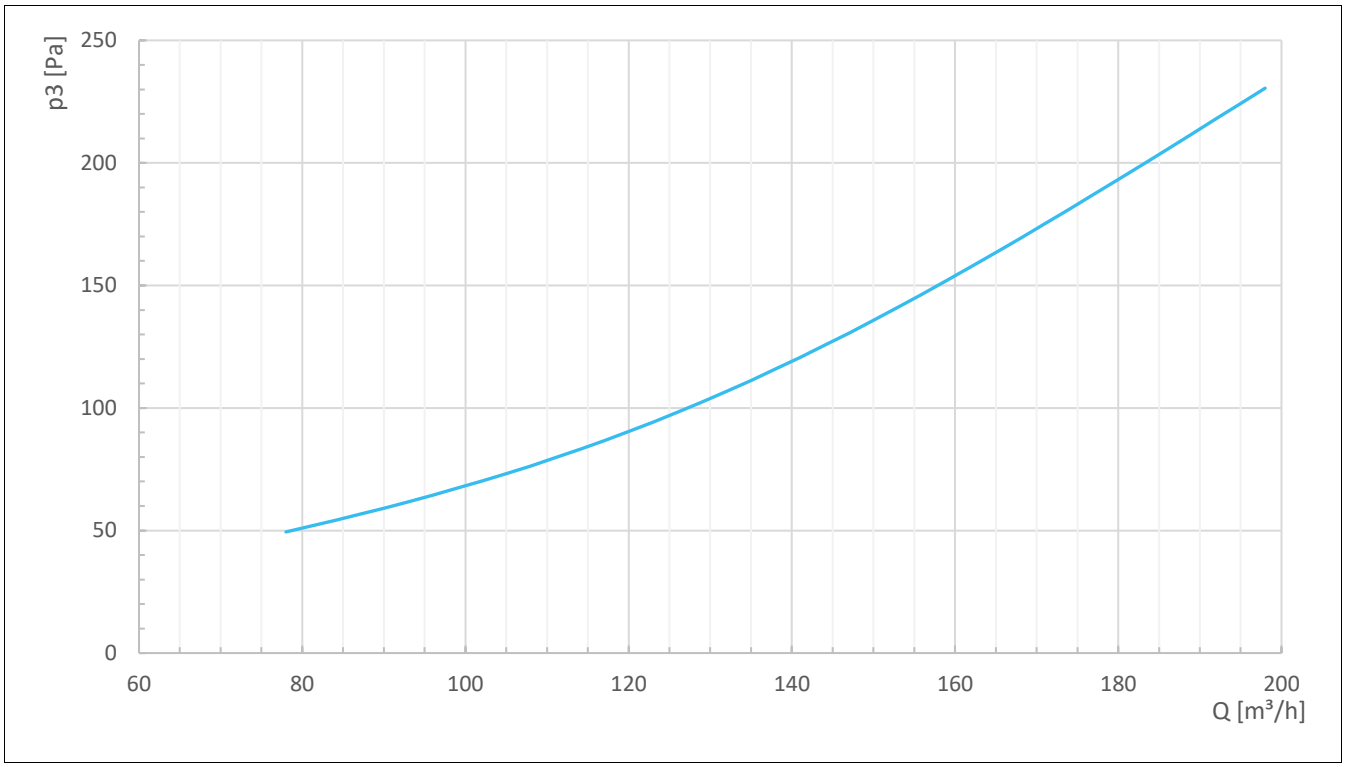
mpv 2



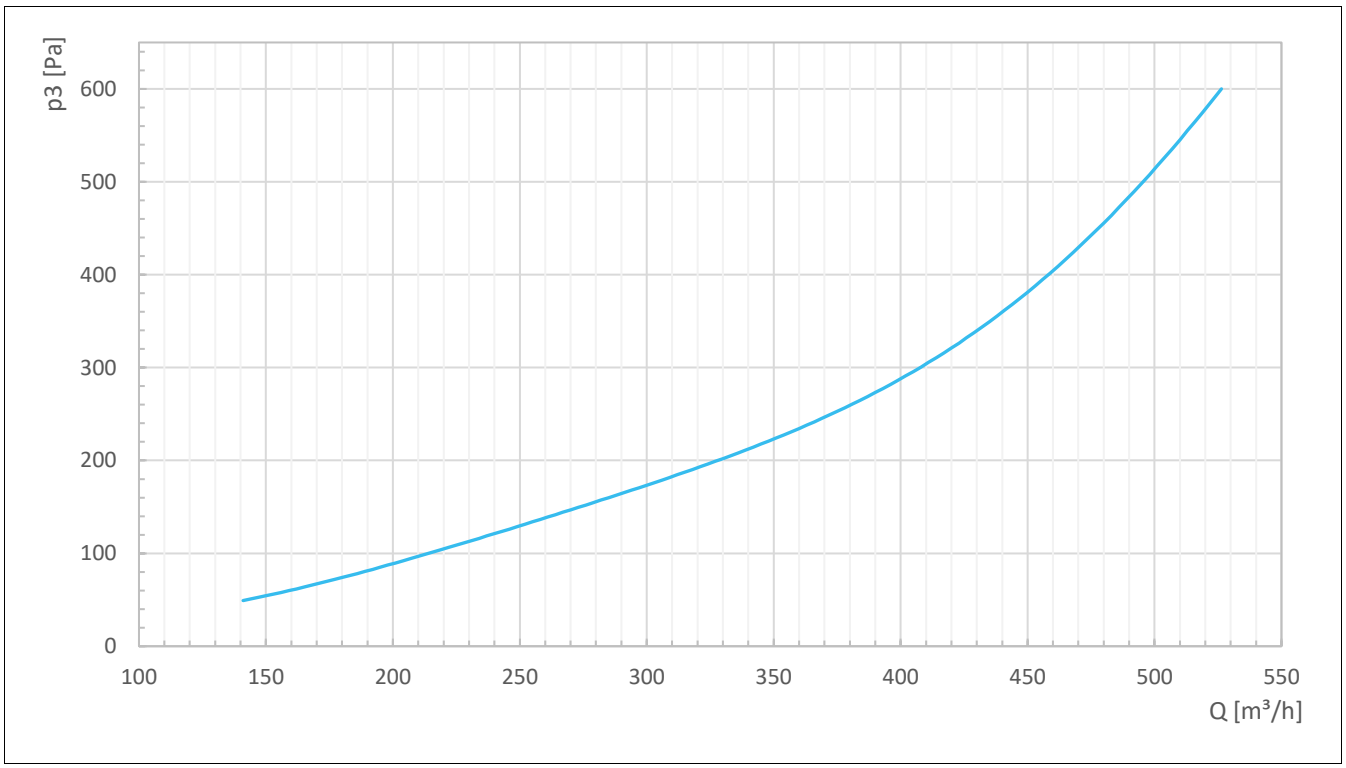
mpv 3

14.4 Purging gas diagram

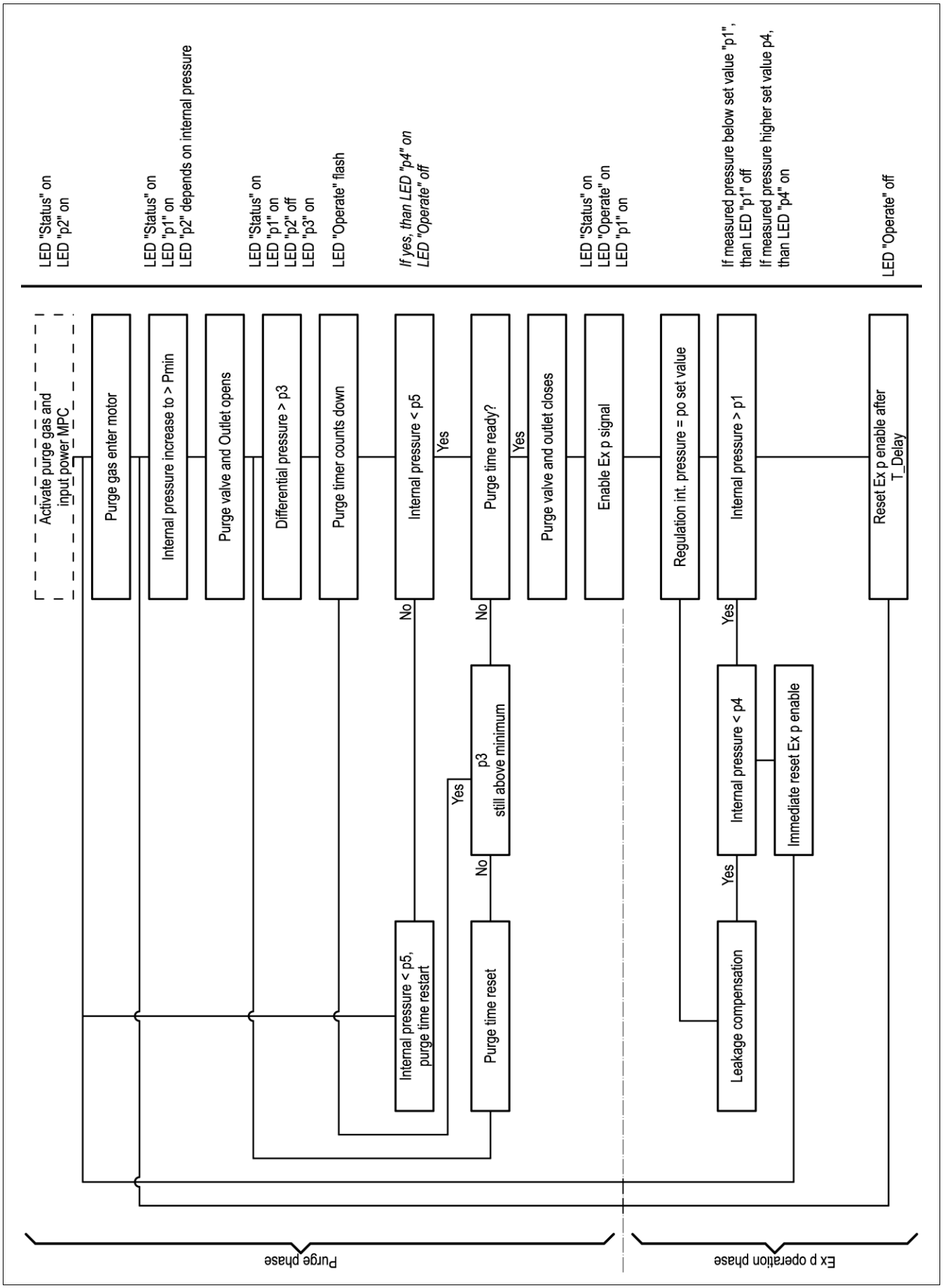
14.4.1 Pressure monitor mpv 2



14.4.2 Pressure monitor mpv 3



14.5 Process control



15 Declaration of Conformity

15.1 Declaration of Conformity Ex px control unit APEX^{mpc}

EU Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de conformité
№ 01-37A2-7C0003-B

BARTEC

Wir	We	Nous
	BARTEC GmbH Max-Eyth-Straße 16 97980 Bad Mergentheim Germany	
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
Ex p Kontrolleinheit	**Ex p control unit**	**Unité de contrôle Ex p**

Typ 07-37A2-*1*1/*M5* APEX^{py} und 07-37A2-*2*1/*M5* APEX^{px}
Type 07-37A2-*1*1/*M5* APEX^{py} and 07-37A2-*2*1/*M5* APEX^{px}
Variante / *Variant* : Motor Purge Controller - mpc

auf das sich diese Erklärung bezieht den Anforderungen der folgenden **Richtlinien (RL)** entspricht	to which this declaration relates is in accordance with the provision of the following **directives (D)**	se référant à cette attestation correspond aux dispositions des **directives (D)** suivantes
ATEX-Richtlinie 2014/34/EU	**ATEX-Directive 2014/34/EU**	**Directive ATEX 2014/34/UE**
EMV-Richtlinie 2014/30/EU	**EMC-Directive 2014/30/EU**	**Directive CEM 2014/30/UE**
RoHS-Richtlinie 2011/65/EU	**RoHS-Directive 2011/65/EU**	**Directive RoHS 2011/65/UE**
RoHS-Richtlinie 2015/863/EU	**RoHS-Directive 2015/863/EU**	**Directive RoHS 2015/863/UE**
WEEE-Richtlinie 2012/19/EU	**WEEE-Directive 2012/19/EU**	**Directive WEEE 2012/19/UE**
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	et est conforme aux normes ou documents normatifs ci-dessous

EN IEC 60079-0:2018/AC:2020
EN 60079-2:2014/AC:2015
EN IEC 60079-7:2015/A1:2018
EN 60079-11:2012
EN 60079-18:2015/A1:2017
EN 60079-31:2014
EN 61010-1:2010 / A1:2019/AC:2019
EN 61000-6-4:2007 +A1:2011
EN 61000-3-2:2014
EN 61000-3-3:2013
EN 61326-1:2013
EN 62061:2021
EN ISO 13849-1:2015
EN ISO 13849-2:2012
EN 60529:1991/A2:2013/AC:2019

Verfahren der EU-Baumusterprüfung / Benannte Stelle	Procedure of EU-Type Examination / Notified Body	Procédure d'examen UE de type / Organisme Notifié
	BVS 19 ATEX E 015 X Rev. - **0158, DEKRA Testing and Certification GmbH, 44809 Bochum**	

CE 0044

Bad Mergentheim, 08.04.2024

i.V. Jens Schurwanz
Global Product Line Manager
Ex p

i.A. Steffen Mika
Team Leader Certification
Management R&D ESS

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15.2 Declaration of Conformity Ex pz control unit SILAS^{mpc}

EU Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de conformité

№ A1-37S2-7C0002-B

BARTEC

BARTEC GmbH
Max-Eyth-Straße 16
97980 Bad Mergentheim
Germany

erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
Ex p Kontrolleinheit	**Ex p control unit**	**Unité de contrôle Ex p**

Typ A7-37S2-*1*1/*M5* SILAS^{pz}
Type A7-37S2-*1*1/*M5* SILAS^{pz}

Variante / *Variant* : Motor Purge Controller - mpc

auf das sich diese Erklärung bezieht den Anforderungen der folgenden **Richtlinien (RL)** entspricht	to which this declaration relates is in accordance with the provision of the following **directives (D)**	se référant à cette attestation correspond aux dispositions des **directives (D)** suivantes
ATEX-Richtlinie 2014/34/EU	**ATEX-Directive 2014/34/EU**	**Directive ATEX 2014/34/UE**
EMV-Richtlinie 2014/30/EU	**EMC-Directive 2014/30/EU**	**Directive CEM 2014/30/UE**
RoHS-Richtlinie 2011/65/EU	**RoHS-Directive 2011/65/EU**	**Directive RoHS 2011/65/UE**
WEEE-Richtlinie 2012/19/EU	**WEEE-Directive 2012/19/EU**	**Directive WEEE 2012/19/UE**
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	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

i.V. Jens Schurwanz
Global Product Line Manager
Ex p

i.A. Steffen Mika
Team Leader Certification
Management R&D ESS

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BARTEC

BARTEC GmbH
Max-Eyth-Str. 16
97980 Bad Mergentheim
Germany

Tel: +49 7931 597 0
Mail: info@bartec.com

bartec.com

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