BARTEC

Operating instructions

Steuerung SILAS Control unit Type: A7-3741-1110/....; Pressure monitor Type: 17-51P3-1604

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BARTEC

Operating Instructions

SILAS controller

Control unit

Type: A7-3741-1110/….

Pressure monitor

Type: 17-51P3-1604

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Contents	Germany
English	1 - 60
Appendix	EU Declaration of Conformity

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- EMPTY PAGE -

1.	**Safety**	**6**
1.1	This Manual	6
1.1.1	Languages	7
1.2	Handling the Product	7
1.3	Use in Accordance with the Intended Purpose	7
1.3.1	Exclusive Purpose	7
1.3.2	Improper Use	7
1.4	Operator's Obligations	7
1.5	Safety Instructions	8
1.5.1	General Safety Instructions	8
1.5.2	Safety Instructions for Operation	8
1.6	Standards Conformed To	9
1.7	Ex Protection Type and Certification	10
1.8	Warranty	11
2.	**Product Description**	**12**
2.1	"Pressurised Enclosure" Type of Protection	12
2.2	SILAS Controller	12
2.3	Schematic Diagram of the SILAS Controller in Zone 2	13
2.4	Schematic Diagram of the SILAS Controller in Zone 22	14
2.5	SILAS Control Unit	15
2.6	Pressure Monitor	16
2.7	Digital Purge Gas Valve	16
2.8	Pressure Reducer with Pressure Gauge	17
2.9	Purge Gas Nozzle	17
2.10	Purge Gas Nozzle Zone 22	17
2.11	Mounting Kit for Internal Installation	18
3.	**Installation**	**19**
3.1	Mounting Positions	19
3.2	SILAS Controller - External Mounting	20
3.2.1	Control Configuration	20
3.2.2	Installation of the Control Unit	21
3.3	SILAS Controller - Internal Mounting	22
3.3.1	Control Configuration	22
3.3.2	Mounting the Control Unit	23
3.3.3	Mounting Atmosphere Measuring Point	24
3.4	Mounting Pressure Monitor	25
3.5	Purge Gas Supply	26
3.5.1	Installation of the G1/4" Purge Gas Supply	27
3.5.2	Mounting of the G1/2" Purge Gas Supply	28
3.5.3	Installation of the Purge Gas Supply for Enclosures Used in Dust Explosion-Endangered Areas	29
4.	**Connections**	**30**
4.1	Pneumatic Connections	30
4.2	Electrical Connections	31
4.2.1	Safety Instructions for the Electrical System	31
4.2.2	Directions for Wiring the SILAS Control Unit	31
4.2.3	Electrical Connections to the SILAS Control Unit	32
5.	**Operation**	**33**
5.1	Setting of Parameters	33
5.2	"ON/OFF" Rotary Switch	33
5.3	"Parameters" Rotary Switch	33
5.4	"+", "-" and "SET" Buttons	34

5.5	Changing of Levels	34
6.	**Commissioning**	**35**
6.1	General Settings for Commissioning	35
6.1.1	Purging Function	35
6.1.2	K3 Relay	35
6.2	Commissioning of the SILAS Controller for Zone 2	36
6.2.1	Defining the Operating Pressure	36
6.2.2	Determination of the purging pressure	37
6.2.3	Purge time Calculate	37
6.2.4	Checking the Purging Phase	38
6.2.5	Checking the Operating Phase	39
6.3	Commissioning of the SILAS Controller for Zone 22	40
6.3.1	Define the Operating Pressure	40
6.3.2	Checking the Operating Phase	40
6.4	Adjusting the Leakage Air Needle	41
6.5	Safety During Operation	42
6.6	Types of Purge gas	42
7.	**Operation**	**43**
7.1	Operating Phases of the SILAS Controller for Zone 2	43
7.2	Flow Diagram	43
7.3	Preparatory Phase	43
7.4	Purging Phase	44
7.5	Operating Phases of the SILAS Controller for Zone 22	45
7.5.1	Flow Diagram	45
7.5.2	Preparatory Phase	45
7.5.3	Operating Phase	45
7.6	Bypass-Operation During the Operating Phase	46
8.	**Maintenance and Care**	**47**
8.1	Inspection Table for Commissioning and Maintenance	48
9.	**Malfunctioning and Troubleshooting**	**49**
9.1	Fault Table	49
10.	**Technical Data**	**51**
10.1	SILAS Control Unit	51
10.2	Pressure Monitor	52
10.3	Digital Purge Gas Valve with Leakage Air Needle Valve	52
10.4	Requirements for Purge Gas	52
10.5	SILAS Control Purge Gas Diagram	53
11.	Order Numbers	54
11.1	SILAS Control Unit	54
11.2	Pressure Monitor	54
11.3	Accessories and Spare Parts	54
11.3.1	Digital Purge Gas Valve	54
11.3.2	Pressure Reducer	54
11.3.3	Adjustable Purge Gas Nozzle for Zone 22	54
11.3.4	Accessories for the SILAS Control	54
12.	**Appendix**	**55**
12.1	Borehole Pattern for the SILAS Control Unit	55
12.2	Test and Assessment Report Form	56
13.	**Declaration of Conformity and Approvals**	**58**
13.1	Declaration of Conformity	58

1. Safety

1.1 This Manual

Operating Instructions

It is essential to read and observe the contents of this documentation and this chapter in particular before you install and operate the SILAS control unit.

This manual contains the information required to use the control unit in accordance with its intended purpose. It is addressed to technically qualified personnel.

Familiarity with and the technically perfect implementation of the safety instructions and warnings described in this manual are preconditions for safe installation and commissioning. The safety notes and warnings in this documentation are given in a general way and only qualified personnel will have the necessary specialised know-how to interpret and implement them correctly in specific individual cases.

This manual is an integral part of the scope of supply even if for logistical reasons it can be ordered and delivered separately. If you need any further information, please ask the BARTEC branch that is near you or responsible for your area.

Particularly important points in this documentation are marked with a warning symbol:

⚠ DANGER

The **DANGER** sign draws attention to a DANGER which will lead to death or serious injury if not avoided.

⚠ WARNING

WARNING draws attention to a danger which can lead to death or serious injury if it is not avoided.

⚠ CAUTION

CAUTION draws attention to a danger which can lead to an injury if it is not avoided.

ATTENTION

ATTENTION draws attention to measures which should be taken to prevent damage to property.

ⓘ Note

Important instructions and information on effective, economical and environmentally compatible handling.

1.1.1 Languages

ⓘ Note	
	The **original** operating instructions were written in German. All other available languages are translations of the original operating instructions.

The operating instructions are available in various languages. They are enclosed with the product in the languages German, English, French, Italian, Spanish and Russian.

If you require any other languages, please ask BARTEC or request them when placing the order.

1.2 Handling the Product

The product described in these operating instructions has been tested and left the factory in perfect condition as regards meeting safety requirements. To maintain this condition and ensure that this product operates perfectly and safely, use it only in the manner described by the manufacturer. Appropriate transportation, suitable storage and careful operation are also essential for the perfect and safe operation of this product.

The SILAS control unit must be mounted properly and securely onto the pressurised enclosure if it is to work perfectly and correctly.

1.3 Use in Accordance with the Intended Purpose

1.3.1 Exclusive Purpose

The SILAY controller serves exclusively as a controlling and monitoring device for pressurised enclosures and is intended for use in Explosion Group II, Category 3G/D and Temperature Class T4 or T6.

The permissible operating data for the device being used must be observed.

1.3.2 Improper Use

Any other use is not in accordance with the intended purpose and can cause damage and accidents. The manufacturer will not be liable for any use beyond that of its exclusive intended purpose.

1.4 Operator's Obligations

The operator undertakes to restrict permission to work on the SILAS control unit to people who:

- are familiar with the basic regulations on safety and accident prevention and have been instructed in the use of the SILAS control unit;
- have read and understood the documentation, the chapter on safety and the warnings.
- The owner/managing operator checks that the safety regulations and accident prevention rules applicable to the respective application are being observed.

1.5 Safety Instructions

1.5.1 General Safety Instructions

- Do not wipe devices with a dry cloth or clean them in a hazardous area!
- Do not open devices in a hazardous area.
- The general statutory regulations or directives relating to safety at work, accident prevention and environmental protection legislation must be observed, e.g. the German industrial health and safety ordinance (BetrSichV) or the applicable national ordinances.
- In view of the risk of dangerous electrostatic charging, wear appropriate clothing and footwear.
- Keep the devices away from moisture.

1.5.2 Safety Instructions for Operation

When setting up or operating explosion-resistant electrical systems, the IEC/EN 60079-14 (NEC for USA/CEC for Canada) and all relevant installation and operating regulations must be observed.

Upkeep

- For electrical systems the relevant installation and operating regulations must be complied with (e.g. Directive 99/92/EC, Directive 94/9/EC, German industrial health and safety ordinance (BetrSichV), the applicable national ordinances IEC 60079-14 and the DIN VDE 0100 series)!
- The disposal of this equipment must comply with the national regulations on the disposal of waste.

Maintenance

- Regular maintenance is not necessary if the device is operated correctly, in accordance with the installation instructions and environmental conditions. See Chapter 8 on “Maintenance and Care”.

Inspection

- Under IEC 60079-19 and EN 60079-17, the owner/managing operator of electrical installations in hazardous areas is obliged to have these installations checked by a qualified electrician to ensure that they are in a proper condition.

Repairs

- Repairs on explosion-protected operating equipment may be done only by authorised persons working in accordance with the latest developments in technology and using original spare parts. The relevant regulations must be observed.

Commissioning

- Before commissioning, check that all components and documents are there.

1.6 Standards Conformed To

The SILAS control unit conforms to Directive 94/9/EC for devices and protective systems for use for their intended purpose in hazardous areas (ATEX Directive). Pursuant to this directive, the following standards serve as a basis for the SILAS control unit:

Standard	Designation
EN 60079-0:2012 + A11:2013 IEC 60079-0:2011 + Cor. 2012 + Cor.2013 Edition: 6.0	Explosive atmospheres - Part 0: Equipment - General requirements
EN 60079-2:2014 IEC 60079-2:2014 + Cor. 2015 Edition: 6	Explosive Atmospheres - Part 2: Equipment protection by pressurised enclosure “p”
EN 60079-15:2010 IEC 60079-15:2010 Edition: 4	Electrical apparatus for explosive gas atmospheres - Part 15: Construction, test and marking of type of protection "n" electrical apparatus
EN 60079-31:2014 IEC 60079-31:2013 Edition: 2	Explosive Atmospheres - Part 31: Equipment dust ignition protection by enclosure “t”
EN 61000-6-3:2007 + A1:2011 IEC 61000-6-3:2006 + A1:2010	Electromagnetic Compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 60529:1991 + A1:2000+A2:2013 IEC 60529:1989 + A1:1999 + A2:2013	Electromagnetic Compatibility (EMC) - Part 6-4: Generic standards - Immunity for residential, commercial and light-industrial environments
EN 60529:1991 + A1:2000+A2:2013 IEC 60529:1989 + A1:1999 + A2:2013	Degrees of protection provided by enclosures (IP code)
EN 61010-1:2010 IEC 61010-1:2010 + Cor. 2011	Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements

1.7 Ex Protection Type and Certification

The devices are certified for installation in the following areas:

ATEX (Europe)	
Ex type of protection	Ⓔx II 3 G Ex nA nC [pzc] IIC T4 Gc Ⓔx II 3 G Ex nA nC [pzc] IIC T6 Gc Ⓔx II 3 D Ex tc [pzc] IIIB T85 °C Dc
Certification	TÜV 09 ATEX 553359 X
IECEx (International / Australia)	
Ex type of protection	Ex nA nC [pzc] IIC T4 Gc Ex nA nC [pzc] IIC T6 Gc Ex tc [pzc] IIIB T85 °C Dc
Certification	IECEx TUN 10.0030X
CSA (USA / Canada)	
Ex type of protection	Class I, Zone 2 AEx nA nC [pz] IIC T4/T6 Gc Class II, Zone 22 AEx tc [p] IIIB T85 °C Dc
Certification	CSA 13.2654547 X
TR (Russia / Kazakhstan / Belarus)	
Ex type of protection	ExnAnCIICT6 ExnAnCIICT4
Certification	EAC TC RU C-DE.ГБ06.B.00434
CNEx (China)	
Ex type of protection	Ex nA nC [pz] IIC T4 Gc Ex nA nC [pz] IIC T6 Gc Ex tc [p] IIIB T85 °C Dc
Certification	CNEx 13.1355 X
KTL (Korea)	
Ex type of protection (gas)	Ex tc [pzc] IIIB T85 °C
Certification	KTL 13-KB4BO-0313 KTL 17-KA4BO-0245X (with viewing glas)
Ex type of protection (gas)	Ex tc [pzc] IIIB T85 °C
Certification	KTL 13-KB4BO-0635X KTL 17-KA4BO-0246X (with viewing glas)
DNV (Marine approval)	
Certification	DNV A-13179

1.8 Warranty

⚠ Warning	
	**No modifications or conversions may be made unless the manufacturer gives his approval in writing.** Explosion protection will no longer be ensured if non-specified components are used. It cannot be guaranteed that parts procured from other suppliers will have been designed and produced in conformance with safety requirements and with the necessary stress tolerance. ➢ Before making any modifications or implementing any conversions, contact the manufacturer and obtain approval. Use only original spare parts and original expendable parts.
ⓘ Note	
	The manufacturer grants a complete guarantee only and exclusively for the spare parts ordered from the manufacturer.

As a basic rule, our “General Conditions of Sale and Delivery” apply. These are available to the owner/managing operator at the latest on formation of a contract. Guarantee and liability claims for personal injury and damage to property are excluded if they are due to one or more of the following reasons:

- use of the SILAS control unit for a purpose other than that for which it is intended.
- incorrect installation, commissioning, operation and maintenance of the SILAS control unit.
- non-compliance with the instructions in the manual with respect to transport, storage, assembly, commissioning, operation and maintenance.
- structural modifications to the SILAS control unit without our prior authorisation.
- inadequate monitoring of components that are subject to wear.
- repairs done incorrectly.
- disasters due to the effects of foreign matter or force majeure.

We guarantee the SILAS control unit and its accessories for a period of 1 year starting on the date of delivery from the Bad Mergentheim factory. This guarantee covers all parts of the delivery and is restricted to the replacement free of charge or the repair of the defective parts in our Bad Mergentheim factory. As far as possible, the delivery packaging should be kept for this purpose. In the event of such a claim, the goods must be returned to us after written arrangement. The customer cannot claim to have the repairs done at the site of installation.

2. Product Description

2.1 "Pressurised Enclosure" Type of Protection

The Ex p type of protection, referred to as "pressurised enclosure", is based on the measure of purging out any explosive gases that are in a closed enclosure and then generating and maintaining a level of pressure that is higher than that of the ambient atmosphere. As the pressure inside the enclosure is higher than the atmospheric pressure, it is not possible at any time for explosive gases to penetrate the inside of the enclosure. This creates an Ex-free area in which electrical devices that are not themselves explosion-proof can be installed and operated.

The SILAS control unit described in these operating instructions functions with "pressurised enclosure with leakage loss compensation" technology. Specifically this means that the positive pressure in an enclosure is maintained by the addition of purge gas to compensate for the leakage losses from the enclosure.

To ensure that an explosive atmosphere that has penetrated during downtimes cannot become a danger, the enclosure must be flushed with purge gas (compressed air or inert gas) before it is commissioned. The quantity depends on the inspection during first-time operation. The rate of flow is measured or determined at the pressurised enclosure's outlet.

Since a safe condition in the enclosure is not reached until the beginning of the operating phase, it is necessary to use explosion-proof versions of the SILAS controller with its components and the purge gas valve.

2.2 SILAS Controller

Die SILAS controller is an automatic control for monitoring the pressure of the pressurised control cabinets in the hazardous areas of Zone 2 (Ex pz) or 22 (Ex pD). It consists of the SILAS control unit, the SILAS pressure monitor, a digital purge gas valve and a pressure reducer.

The SILAS controller is suitable for all standard applications for pressurised enclosures.

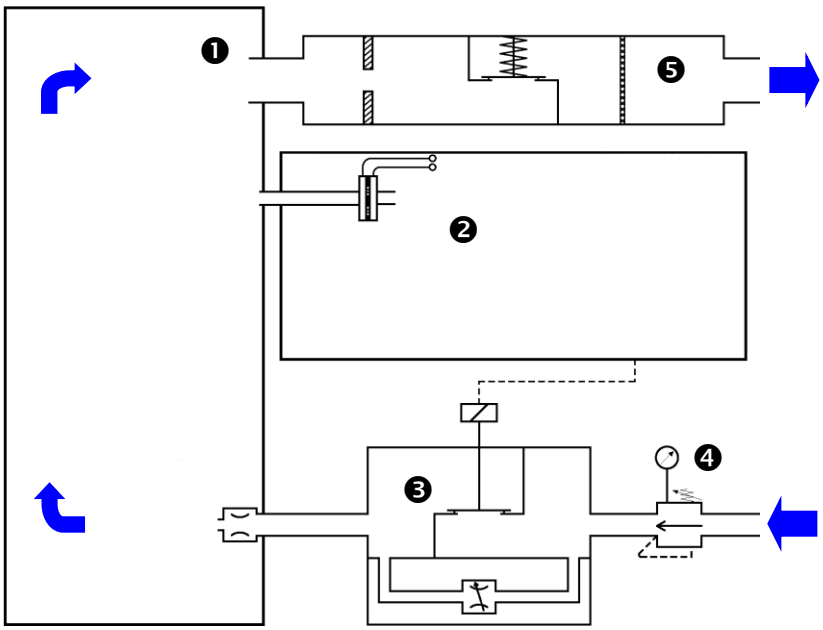
The electrical installed parts inside the pressurised enclosure are enabled by the SILAS control unit directly or with an additional switching device.

Once the SILAS control unit with its individual assembly groups have been mounted on the pressurised enclosure and the mains voltage and purge gas have been connected, the pressurised system starts automatically.

The SILAS controller controls the flow of purge gas and the pressure inside the enclosure during the purging phase.

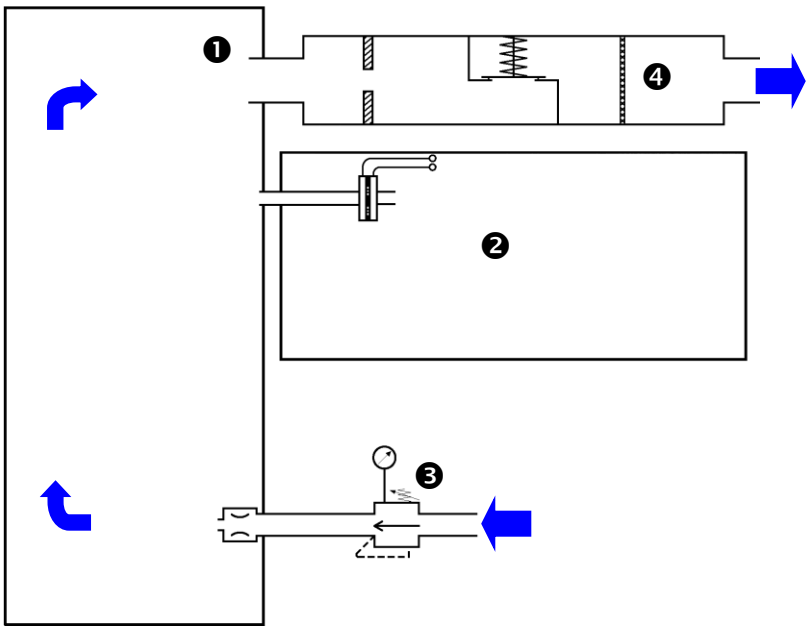
When the operating phase is initiated, the components mounted in the pressurised enclosure are automatically activated by the SILAS control unit. The pressure inside the pressurised enclosure is maintained automatically during the operating phase and any leakage losses are compensated.

2.3 Schematic Diagram of the SILAS Controller in Zone 2



Item	Designation
➡	Purge gas flow
❶	Pressurised enclosure
❷	SILAS control unit
❸	Purge gas valve with purge gas nozzle (purging flow restriction)
❹	Pressure reducer with pressure gauge
❺	SILAS pressure monitor module

2.4 Schematic Diagram of the SILAS Controller in Zone 22



Position	Designation
➡	Purge gas flow
❶	Pressurised enclosure
❷	SILAS control unit
❸	Pressure reducer with pressure gauge
❹	Pressure monitor module

2.5 SILAS Control Unit

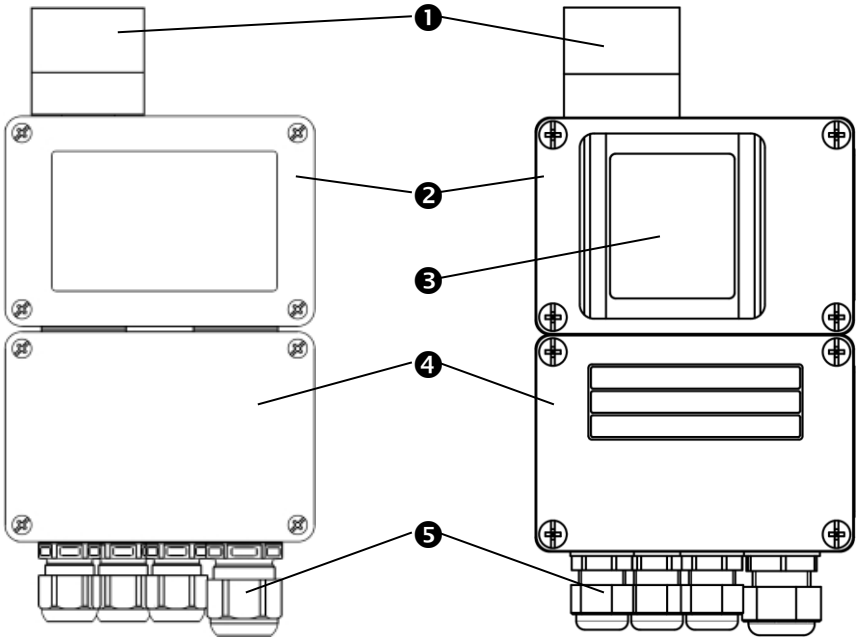
⚠ Warning	
	**Processes with high electromagnetic radiation.** The SILAS control unit must not be mounted in areas in which high levels of electromagnetic radiation can arise. ➢ Inspect the site of installation for electromagnetic radiation.

The SILAS control unit can be mounted inside or outside the pressurised enclosure. For internal installation, e.g. on the mounting plate, it will also be necessary to use the internal installation kit.

The system pressure levels and the system parameters can be shown on the integrated display inside the control unit. The levels can be changed by pressing pushbuttons.

Construction

Standard Optionale Schauscheibe



Item	Designation	Function
❶	Pressure measuring head	Pressure measurement
❷	Top enclosure	Control unit
❸	Opt. Viewing glass	Viewing glass
❹	Bottom enclosure	Junction box
❺	Cable glands	Cable entry

2.6 Pressure Monitor

⚠ DANGER	
⚠	**DANGER due to deposits of dust.** When used in Dust Ex applications, deposits of dust can build up in the pressure monitor. ➢ If a lot of dust accumulates, clean the pressure monitor twice a year.

The pressure monitor has two functions inside the SILAS control. Firstly, it serves as a pressure control valve which opens if the internal pressure is too high and reduces the excessive pressure. Secondly, an orifice is integrated in the pressure monitor which determines the flow during the purge time.

The pressure monitor must be mounted separately from the SILAS control unit in the pressurised enclosure.

2.7 Digital Purge Gas Valve

⚠ Warning	
⚠	**The digital purge gas valve is permitted only for operation with a SILAS control unit which has a suitable valve fuse.** If the digital purge gas valve is operated with a control module which has inadequate fusing, there is a risk that the valve fuse will be destroyed. ➢ Check that the purge gas valve is compatible with the SILAS control unit.

The digital purge gas valve controls the supply of purge gas.

It is an upstream solenoid valve and its function is to introduce purge gas into a pressurised enclosure for Zone 2.

Here, the digital purge gas valve is controlled by the SILAS control unit to allow the purge gas valve to open to purge the pressurised enclosure and close again when the purging is finished.

Two side-mounted, adjustable needles for air leakage ensure that the leakages arising in the pressurised enclosure are compensated.

2.8 Pressure Reducer with Pressure Gauge

Attention
Material damage when the maximum permissible internal pressure is exceeded in the pressurised enclosure. If the supply pressure is set at too high a level, there is a risk of destroying the pressurised enclosure. ➢ Mark the supply pressure on the pressure gauge. ➢ The supply pressure setting on the pressure gauge must be checked regularly. ➢ Lock the pressure reducer.

The upstream pressure reducer is a diaphragm pressure regulator with secondary venting for lowering the pressure of externally supplied purging air.

The levels for the pressure reducer are set by means of a hand wheel and the adjusted reduced pressure can be read on the pressure gauge.

Pressure reducers are available in sizes G1/4" and G1/2" for supply to the pressurised enclosure.

The relevant technical data can be found in the data sheet.

To select the pressure reducer, see Chapter 3.5 "Purge gGas Supply".

2.9 Purge Gas Nozzle

Attention
Material damage caused by the absence of a purge gas nozzle. The build-up of internal pressure can give rise to the risk of excessive stress on the pressurised enclosure. ➢ Make sure there is a purge gas nozzle there.

The purge gas nozzle serves to mechanically restrict the maximum flow.

It restricts the maximum flow if the purge gas valve is defective.

2.10 Purge Gas Nozzle Zone 22

Attention
Material damage caused by the absence of a purge gas nozzle. The build-up of internal pressure can give rise to the risk of excessive stress on the pressurised enclosure. ➢ Make sure there is a purge gas nozzle there.

The purge gas nozzle for Zone 22 is adjustable and serves to limit the maximum pressure inside the pressurised enclosure.

It is used in a pD version of a pressurised enclosure.

2.11 Mounting Kit for Internal Installation

The mounting kit for internal installation is necessary if the SILAS control unit is fitted into a pressurised enclosure. In this case, the reference connection for atmospheric pressure is conducted outwards by means of a hose line.

The mounting kit consists of:

- a straight M5 screw-in connector for a hose with an external diameter of 4 mm
- an R 1/8" atmospheric connection, a 90° connector for a 4-mm hose, sleeve with sealing washers
- 2-m hose 4 x 2 mm
- a set of mounting instructions

3. Installation

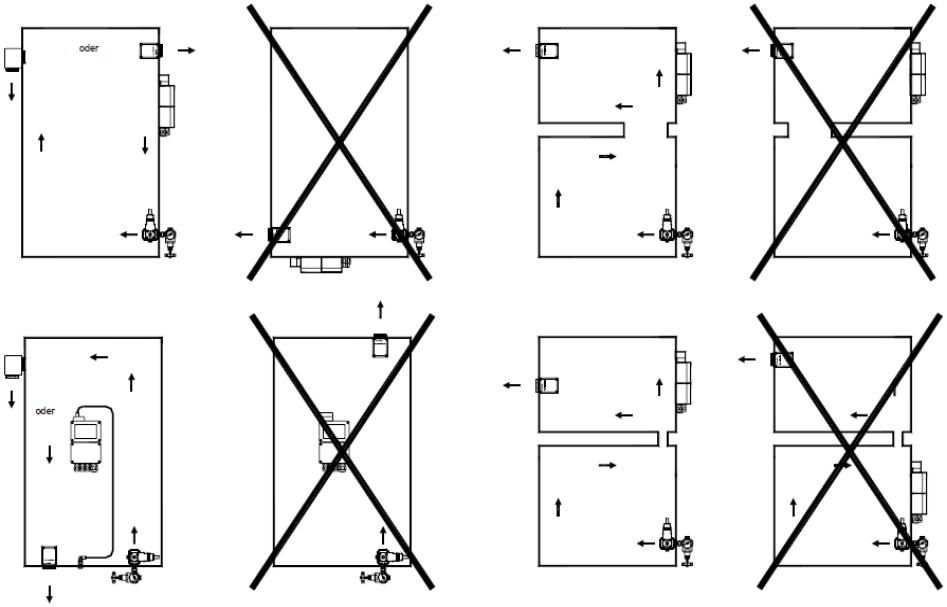
The SILAS controller can be mounted in various installation positions on the pressurised enclosure. The positioning of the SILAS controller on the pressurised enclosure is described in the following chapter.

The SILAS control unit can be mounted in the interior or on the exterior of the pressurised enclosure.

The pressure monitor and the purge gas valve must be installed separately from the SILAS control unit.

3.1 Mounting Positions

For ideal purging, the SILAS controller (consisting of: SILAS control unit, pressure monitor and purge gas valve) should be installed in one of the following positions:



3.2 SILAS Controller - External Mounting

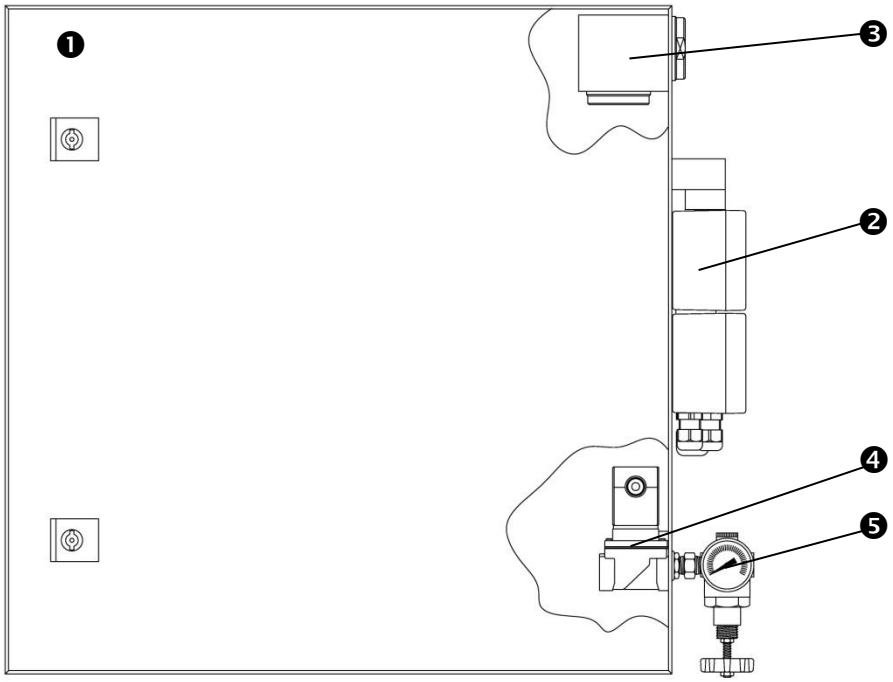
3.2.1 Control Configuration

⚠ DANGER

Death or serious physical injury if the purge gas supply and the pressure monitor outlet are installed incorrectly.

This interferes with the purging action in the pressurised enclosure. Gas bubbles can form inside the pressurised enclosure and lead to an explosion when the installed parts are activated.

- Purging gas valve and pressure monitor must not be mounted exactly opposite each other
- If mounted opposite each other, it is necessary to use elbow fittings or other mechanical aids to lay the purging gas flow in a way that permits clean flushing.
-



Item	Designation	Function
❶	Pressurised enclosure	
❷	SILAS control unit	Control
❸	Pressure monitor	Functional unit positive pressure
❹	Purge gas valve	Purge gas feed
❺	Pressure reducer	Adjustment of purge gas pressure

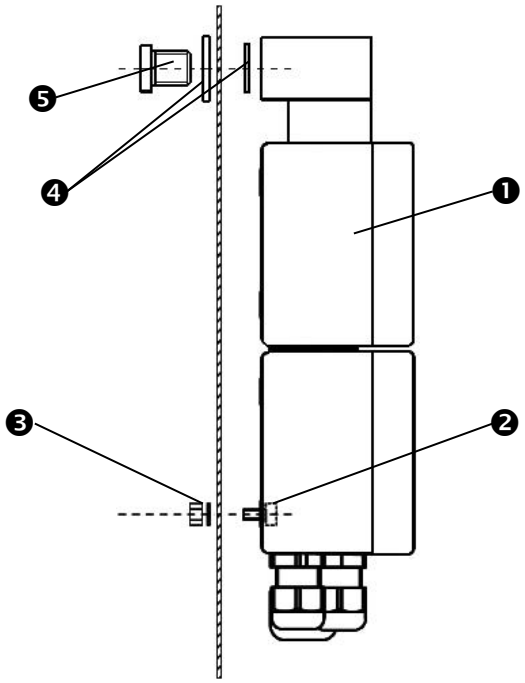
ⓘ Note

When a pressurised enclosure is set up for the explosive dust hazardous area, the purge gas valve (❹) is replaced with an adjustable purge gas nozzle.

3.2.2 Installation of the Control Unit

To install the SILAS control unit, the boreholes must be made at the desired point in the pressurised enclosure as shown in the drilling pattern in the appendix.

To mount the SILAS control unit onto a surface, it is first necessary to remove the lower lid. The SILAS control unit can be screwed on to the pressurised enclosure equipment the mounting holes provided for that purpose.



Item	Designation
❶	SILAS control unit
❷	M4 screw
❸	M4 nut with M4 retaining ring
❹	Sealing inside and outside
❺	Bulkhead union

Required assembly material:

Quantity	Material
2	M4 hexagonal screw
2	M4 retaining ring
2	M4 nut

ⓘ Note	
	The borehole pattern for affixing the SILAS control unit can be found in the appendix to these Operating Instructions. The assembly material for the SILAS control unit is not included in the scope of supply.

3.3 SILAS Controller - Internal Mounting

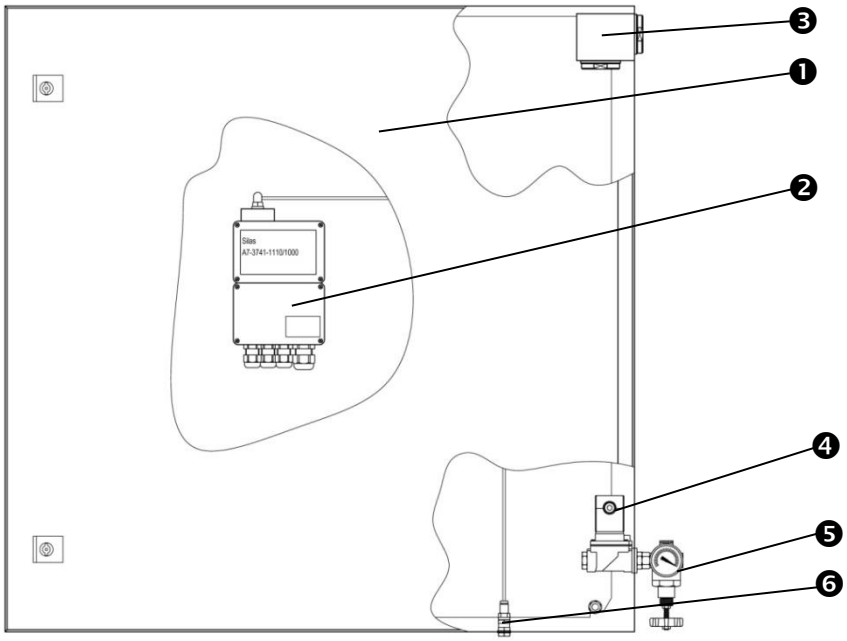
3.3.1 Control Configuration

⚠ DANGER

Death or serious physical injury if the purge gas supply and the pressure monitor outlet are installed incorrectly.

This interferes with the purging action in the pressurised enclosure. Gas bubbles can form inside the pressurised enclosure and lead to an explosion when the installed parts are activated.

- Purging gas valve and pressure monitor must not be mounted exactly opposite each other
- If mounted opposite each other, it is necessary to use elbow fittings or other mechanical aids to lay the purging gas flow in a way that permits clean flushing.



Item	Designation	Function
❶	Pressurised enclosure	
❷	SILAS control unit	Control
❸	Pressure monitor module	
❹	Purge gas valve	Purge gas feed
❺	Pressure reducer	Adjustment of purge gas pressure
❻	Atmosphere measuring point	Reference pressure

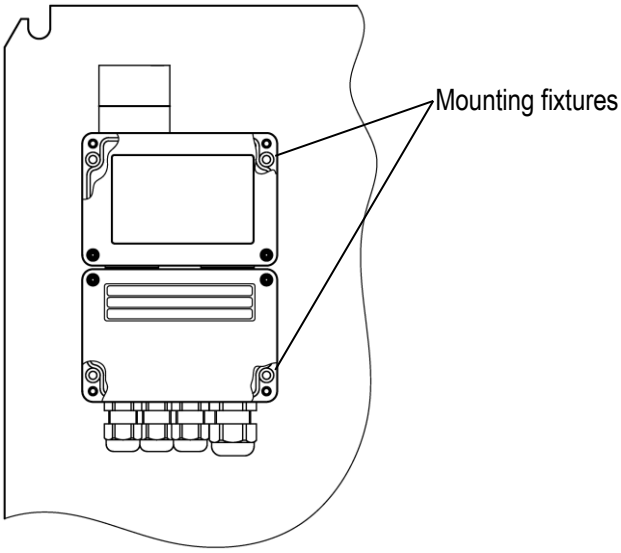
ⓘ Note

When a pressurised enclosure is set up for the explosive dust hazardous area, the purge gas valve (❹) is replaced with an adjustable purge gas nozzle.

3.3.2 Mounting the Control Unit

The SILAS control unit is screwed to the mounting plate using the mounting fixtures integrated in the enclosure.

For this purpose, the SILAS control unit is affixed to the mounting plate using four M4 screws.



Required assembly material when mounting using threaded holes:

Quantity	Material
4	M4 x 25 hexagonal screws

ⓘ Note

The borehole pattern for affixing the SILAS control unit can be found in the appendix to these Operating Instructions.

The assembly material for the SILAS control unit is not included in the scope of supply.

3.3.3 Mounting Atmosphere Measuring Point

Attention

Protect the atmosphere measuring point from dirt.

Dirt on the atmosphere measuring point causes faulty measurements of operating pressure levels. As a result of the faulty measurement, the pressurised enclosure is deactivated and cannot be operated.

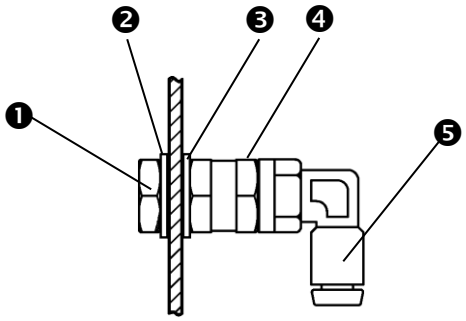
➢ Check the atmosphere measuring point for dirt at regular intervals.

To enable the SILAS control unit to measure the operating pressure levels correctly, an atmosphere measuring point must be set in the "internal installation" version. All parts required for this are contained in the scope of supply for the "internal installation" mounting kit.

Procedure

- Make a 9.6-mm-diameter borehole at the mounting position provided for that purpose in the pressurised enclosure.
- Put the screw plug (❶) with the 1-mm-diameter borehole and the sealing ring (❷) through the borehole.
- Put the second sealing ring (❸) on the inside over the threading projecting out of the hole.
- Screw the sleeve (❹) onto the threading.
- Screw the quick plug-in connector (❺) into the sleeve (❹).

The following diagram is intended to clarify the installation procedure:



3.4 Mounting Pressure Monitor

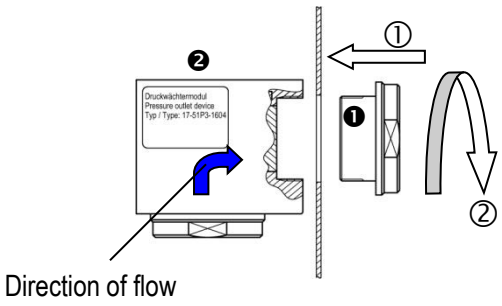
⚠ Warning	
	**Death or risk of injury due to excessive internal pressure in the pressurised enclosure.** The enclosure can be destroyed. ➢ Make sure the outlet threaded connection is not covered from the outside. ➢ Check if the direction of flow in the pressure monitor is from the inside to the outside.

A through hole of 37 mm in the wall of the pressurised enclosure is required for mounting the pressure monitor.

Procedure

- Make a 37-mm-diameter borehole at the mounting position provided for that purpose in the pressurised enclosure.
- Unscrew the outlet threaded connection (❶) out of the pressure monitor enclosure (❷).
- Put the pressure monitor enclosure ① on in a position which ensures that the air inside the pressurised enclosure can flow outwards.
- Screw the pressure monitor module together ②.
- Tighten the outlet threaded connection (❶) and the pressure monitor enclosure (❷) until the pressure monitor module is positioned securely.

The following diagram is intended to clarify the installation procedure:



3.5 Purge Gas Supply

Attention

Material damage caused by the absence of a purge gas nozzle.

Due to the build-up of internal pressure there is a risk of excessive strain on the pressurised enclosure.

- Check if the purge gas nozzle is there.

Note

Not enough purge gas because the purge gas supply line is too small.

The insufficient flow prevents the pressurised enclosure from starting operation.

Adapt the internal diameter of the purge gas supply line to the required flow.

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

The purge gas supply must be selected in accordance with the following table.

Capacity	Pressure	Pressure reducer	Pressure monitor	Purge gas nozzle	Feed pipe
< 50 litres	2 bar	1/4"	12	2.8 mm	10 mm
50 to 300 litres	2 bar	1/4"	15	3.9 mm	10 mm
300 to 700 litres	2 bar	1/2"	15	4.5 mm	15 mm
700 to 1,000 litres	3 bar	1/2"	18 / 2 x 18	4.5 mm	15 mm
as of 1,000 litres	3 bar	1/2"	2 x 18	5.5 mm	20 mm

(The levels specified in the table are reference values and can vary.)

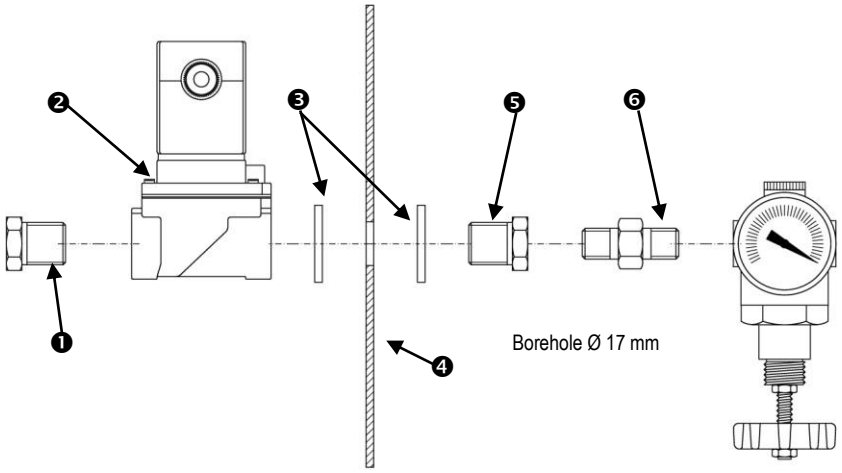
The pressure reducer for lowering the pressure of the supplied purge gas is mounted on the outside of the pressurised enclosure. The purge gas valve, which releases the purge gas, is mounted inside the pressurised enclosure. The purge gas nozzle restricts the maximum flow of the purge gas and accordingly prevents pressure increasing to the maximum level inside the pressurised enclosure when a purge gas valve is defective.

The following shows the assembly of the purge gas supply. The required assembly material is included in the scope of supply.

3.5.1 Installation of the G1/4" Purge Gas Supply

The purge gas supply must be installed carefully. To ensure that the screwed parts are leak-tight, they can be sealed with Teflon® tape.

Care must be taken to prevent the penetration of foreign particles during assembly.



Procedure

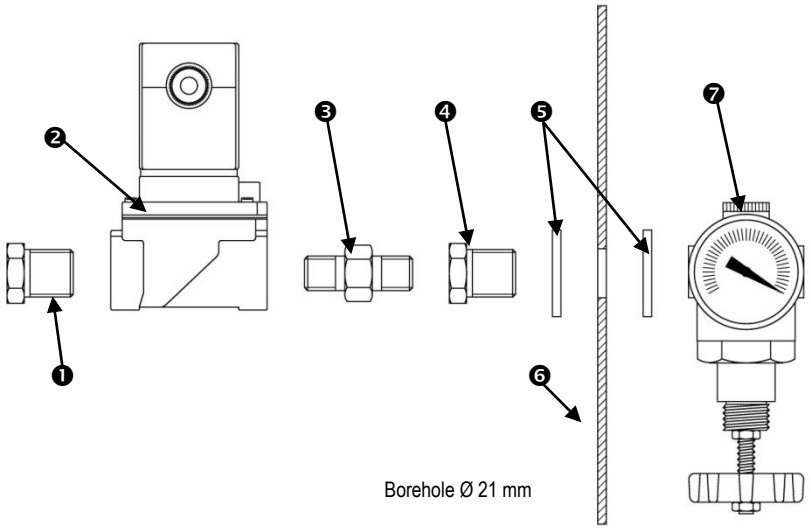
- Make a 17-mm-diameter borehole at the mounting position provided for that purpose in the pressurised enclosure (❹).
- Mount the purge gas valve (❷) onto the pressurised enclosure using the reducing sleeve (❺) and the sealing washers (❸).
- Screw in the purge gas nozzle (❶) at the purge gas valve outlet (❷).
- Screw the detachable double threaded nipple (❻) into the reducing sleeve (❺).
- Screw the G1/4" pressure reducer (❼) onto the detachable double threaded nipple (❻).

Item	Material
❶	Purge gas nozzle with borehole
❷	Purge gas valve
❸	Sealing washer
❹	Pressurised enclosure
❺	G1/4"i / G3/8"a reducing sleeve
❻	G1/4" detachable double threaded nipple, on both ends
❼	G1/4" pressure reducer

3.5.2 Mounting of the G1/2" Purge Gas Supply

The purge gas supply must be installed carefully. To ensure that the screwed parts are leak-tight, they can be sealed with Teflon® tape.

Care must be taken to prevent the penetration of foreign particles during assembly.



Procedure

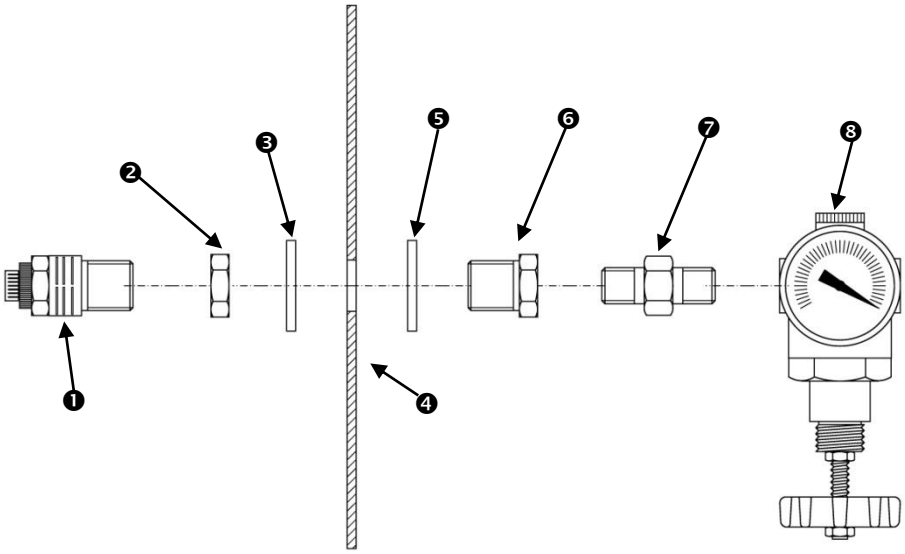
- Make a 21-mm-diameter borehole at the mounting position provided for that purpose in the pressurised enclosure (❻).
- Mount the G1/2" pressure reducer (❼) onto the pressurised enclosure using the reducing sleeve (❹) and the sealing washers (❺).
- Screw the detachable double threaded nipple (❸) into the reducing sleeve (❹).
- Screw the purge gas valve (❷) onto the detachable double threaded nipple (❸).
- Screw in the purge gas nozzle (❶) at the purge gas valve outlet (❷).

Item	Material
❶	Purge gas nozzle
❷	Purge gas valve
❸	Detachable G3/8" bulkhead nipple
❹	G3/8"i / G1/2"a reducing sleeve
❺	Sealing washer
❻	Pressurised enclosure
❼	G1/2" pressure reducer

3.5.3 Installation of the Purge Gas Supply for Enclosures Used in Dust Explosion-Endangered Areas

The purge gas supply must be installed carefully. To ensure that the screwed parts are leak-tight, they can be sealed with Teflon® tape.

Care must be taken to prevent the penetration of foreign particles during assembly.



Procedure

- Make a 17-mm-diameter borehole at the mounting position provided for that purpose in the pressurised enclosure (❹).
- Mount the reducing sleeve (❻) with sealing washers (❺ and ❸) using the G3/8" nut (❷) in the pressurised enclosure.
- Screw in the adjustable purge gas nozzle (❶) into the reducing sleeve (❻) inside the pressurised enclosure.
- Screw the detachable double threaded nipple (❼) into the reducing sleeve (❻).
- Screw the G1/4" pressure reducer (❽) onto the detachable double threaded nipple (❼).

Item	Material
❶	Adjustable purge gas nozzle
❷	G3/8" nut
❸	G3/8" sealing washer
❹	Pressurised enclosure
❺	G3/8" sealing washer
❻	G1/4"i / G3/8"a reducing sleeve
❼	Detachable G1/4" double threaded nipple, on both sides
❽	G1/4" pressure reducer

4. Connections

4.1 Pneumatic Connections

When the SILAS controller is used, an atmosphere measuring lead need be fitted only in the “internal installation” version. This serves to correctly measure the positive pressure inside the pressurised enclosure.

You will find installation details in the “Mounting the Atmosphere Measuring Point” chapter or in the assembly instructions included with the mounting kit.

These measuring lines are connected as standard in the SILAS control unit for external mounting and they therefore do not need to be produced by the user.

4.2 Electrical Connections

4.2.1 Safety Instructions for the Electrical System

⚠ DANGER	
	**Death or serious physical injury due to work on live parts.** Risk of fatal injury from electric current. ➢ Observe the 5 safety rules for work on electrical systems: disconnect from mains; protect against unintended reconnection; verify the absence of voltage; earth and short-circuit; cover or safeguard nearby live parts.

4.2.2 Directions for Wiring the SILAS Control Unit

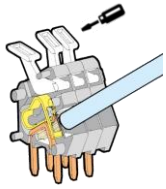
⚠ DANGER	
	**Death or serious physical injury when the cover on the SILAS control unit is opened in an explosive atmosphere.** Risk of explosion. ➢ Before opening the lid of the enclosure, check the atmosphere for any explosive gases.

Attention
Short-circuits due to loose or protruding wires in the SILAS control unit. The SILAS controller can become damaged. ➢ All core wires, including those not required, must be connected to a terminal. ➢ Make sure none of the wires are loose or jut out/protrude.

The following describes the procedure for feeding and connecting wires to the SILAS control unit:

Procedure

- Loosen the 4 fastening screws in the lower lid of the SILAS control unit and take off the lid.
- Feed the supply, data and enable line through the cable glands into the junction box.
- Conduct the electrical connections in accordance with the pin assignment
- Connect and release conductors by pressing the actuator.



- Put the shields and earthing connections onto the shield bus.
- Use appropriate closures to seal cable glands that are not in use.
- Tighten the cable glands with 3.0 Nm.
- Put the lid onto the SILAS control unit and tighten the 4 fastening screws with 1.4 Nm.

4.2.3 Electrical Connections to the SILAS Control Unit

Attention

Avoid damage to the sealings.

Cancellation of the Ex protection strategy.

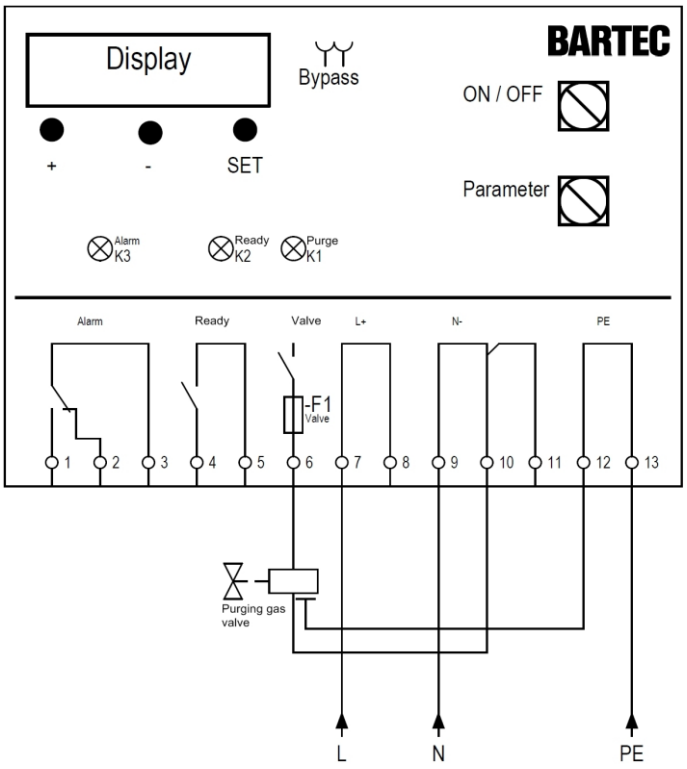
- ➢ When closing the SILAS control unit, visually check the sealing (intactness, cleanliness and secure fitting).

Attention

Damage to the controller resulting from insulation measurement.

The SILAS control device can be irreparably damaged.

- ➢ Disconnect the SILAS control device when conducting insulation measurements.

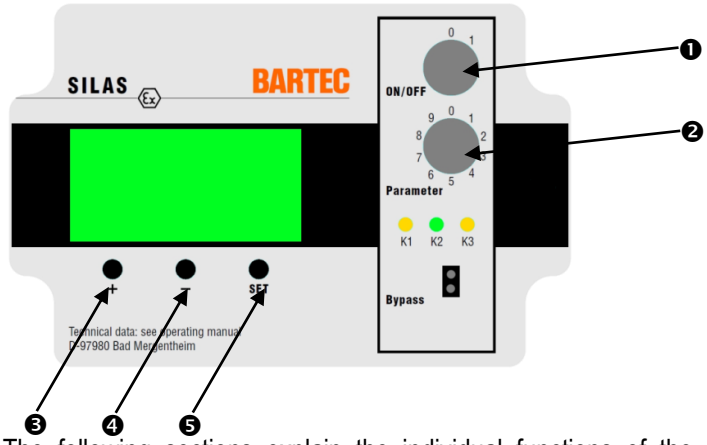


Terminal	Connection	Function
1-3	K3 relay – alarm	Freely programmable relay
4-5	K2 relay – ready signal	Release relay
6	Purge gas valve	Actuation of the purge gas valve
7-8	L+	Voltage supply
9-11	L-	Voltage supply
12-13	PE	Earthing
Bypass	Bypass	Activation of the bypass

5. Operation

5.1 Setting of Parameters

The parameters are set via the SILAS operating menu. For this purpose, there are three buttons and one rotary switch on the SILAS control unit.



The following sections explain the individual functions of the rotary switch and the buttons.

5.2 "ON/OFF" Rotary Switch

The "ON/OFF" rotary switch (❶) activates or deactivates the SILAS control unit.

5.3 "Parameters" Rotary Switch

The "Parameters" rotary switch (❷) is used to display the different parameters in the SILAS control unit display.

Item	Parameter	Display	Action
0	Operating	Internal pressure /purge time	Display of purge time / current pressure level
1	Purging function	-	Defines the purging function. See Chapter "6.1.1 Purging Function"
2	Purge time	PT	Adjustment of purge time
3	P1	P1	Minimum positive pressure (MIN) – disconnection level
4	P2	P2	Pre-alarm – purge gas valve opens briefly when pressure drops below the P2 level.
5	P3	P3	Purging pressure – if P3 pressure level is exceeded, the time starts to run down.
6	P4	P4	Maximum pressure (MAX) - disconnection level
7	Relay function	-	Defines the function of the K3 relay. See Chapter "5.4 K3 Relay"."
8	Time delay	DLY	General switching delay for purge time bypassing and "MIN" disconnection
9	Bypass	NORMAL	Bypass activation, see Chapter 7.6 "Bypass-Operation During the Operating Phase".

5.4 "+", "-" and "SET" Buttons

The "+" (❸), "-" (❹) and "SET" (❺) buttons serve to change and save the switching levels selected by the "Parameters" rotary switch (❷).

Pressing the "+" or "–" key once alters the level by 0.1 mbar. The saved level is marked by an "*".

5.5 Changing of Levels

The levels set in the SILAS control unit can be changed by means of the three buttons and the "Parameters" rotary switch in the front plate.

Procedure to change parameters

- Turn the "Parameters" switch (❷) to the position for the parameters to be adjusted.
- Use the "-" (❹) or "+" (❸) to adjust the respective parameters.
- Save each set level with the "SET" (❺) key.
- Turn the "Parameters" switch to the "0" position when you have set all parameters. (Exception: "9" position in bypass operation.)
- Put the top cover on again and tighten the fastening screws again.

6. Commissioning

6.1 General Settings for Commissioning

6.1.1 Purging Function

Various purging functions can be assigned to the SILAS control unit to suit the application. The behaviour of the SILAS control unit changes depending on the purging function selected.

The following table shows the possible functions:

Program	Functions			
	Purge time necessary	Purge time starts when P1 is exceeded	Purge time stops once P4 is reached	K2 switches off once the internal pressure drops below the P1 level
PRG YES	Yes	No	No	No
PRG YP1	Yes	Yes	No	No
PRG YP2	Yes	Yes	No	Yes
PRG YP3	Yes	Yes	Yes	No
PRG NO	No	No	No	No

6.1.2 K3 Relay

Various functions can be assigned to the floating K3 relay. The following table shows the possible functions:

Level	Function	
K2+	Release	Switches simultaneously with K2
P1+	MIN alarm	Switches on if the P1 pressure switching level is exceeded
P1-	MIN alarm	Switches on if the level drops below the P1 pressure switching level
P2+	Preliminary alarm	Switches on if the P2 pressure switching level is exceeded
P2-	Preliminary alarm	Switches on if the level drops below the P2 pressure switching level.
P3+	Purging pressure	Switches on if the P3 pressure switching level is exceeded
P4+	Max alarm	Switches on if the P4 pressure switching level is exceeded
PT+	Purge time	Switches on when the purge time counts down
BYP	Bypass	Switches on when the bypass is activated
ALR	Functions alarm	Switches on if internal malfunctioning is detected.

6.2 Commissioning of the SILAS Controller for Zone 2

Procedure for Commissioning

- Before commissioning, check the electrical devices installed inside the pressurised enclosure.
- Make sure the pressurised enclosure is purged sufficiently.
- The relevant safety regulations and rules must be observed.
- Select and set the purging variant.
  (See Chapter 6.1.1).
- Define the operating pressure
  (See Chapter 6.2.1).
- Determine the purging pressure
  (See Chapter 6.2.2).
- Calculate and set the purge time
  (See chapter 6.2.3).
- Check the purging phase
  (See Chapter 6.2.4).
- Check the operating phase
  (See Chapter 6.2.5).

6.2.1 Defining the Operating Pressure

According to the standard, the level for the positive pressure inside the pressurised enclosure must be higher than 0.25 mbar.

To ensure that the minimum pressure will be maintained, it is necessary to adjust the valve`s rate of air leakage because there is some leakage from every pressurised enclosure.

Procedure

- Set the required input pressure on the pressure reducer.
  ☞ *e.g. 2 bar*

Leave the leakage air needle on the purge gas valve at the pre-set level.

- Close the pressurised enclosure.
- Connect the mains voltage and set the “ON/OFF” rotary switch on the SILAS control unit to position 1.
- Reduce the P3 level until the purging phase starts to run.
  ☞ *e.g. 1.0 mbar*

Wait for the purging phase and set the “Parameters” rotary switch to position 0.

- The operating pressure builds up and settles at a level which is shown in the SILAS control unit display. This should be kept at a constant level of approx. 2.0 mbar.
- ☞*If there is a* **drop** *in minimum pressure, increase the flow at the leakage air needle.*
- ☞*If there is an* **increase** *in the minimum pressure, reduce the flow at the leakage air needle.*

6.2.2 Determination of the purging pressure

To determine the purging pressure, close the pressurised enclosure and put the SILAS control unit into operation.

Procedure:

- Set the “ON/OFF” rotary switch to position 1.
- Set the “Parameters” rotary switch to position 5.
- Use the “Plus (+)” key on the SILAS control unit to increase the P3 setpoint and confirm with the “SET” key.
  ☞ *e.g. 15 mbar*
- Set the “Parameters” rotary switch to position 0.
- Connect the purge gas and set the required input pressure on the pressure reducer.
  ☞ *e.g. 2 bar*
- Record and note the maximum internal pressure.
  ☞ *e.g. indicated level 12.5 mbar*
- Set the “Parameters” rotary switch to position 5.
- Use the plus (+) or minus (-) keys on the SILAS control unit to set the P3 setpoint to the registered level of -0.5 mbar and confirm with the “SET” key.
  ☞ *e.g. in this example 12.0 mbar*
- Set the “Parameters” rotary switch to position 2.
- Calculate the purge time on the basis of Chapter “6.3 Purge time”.
- Use the Plus (+) or Minus (-) keys on the SILAS control unit to set the purge time and confirm with the “SET” key.
  ☞ *e.g. in this example 6 minutes*
- Set the “ON/OFF” rotary switch to position 0.
- Set the “Parameters” rotary switch to position 0.
- Set the “ON/OFF” rotary switch to position 1.
  - The SILAS control unit starts and the purge time starts to count down automatically.

6.2.3 Purge time Calculate

The purge time is calculated with the following formula:

$$\frac{\text{Cabinet capacity[litres]} \times \text{Purging factor}}{\text{Flow } \left[\frac{\text{l}}{\text{h}}\right]} \times \text{Quantity factor} = \text{Purge time [Minutes]}$$

The flow is calculated on the basis of the P3 purging pressure reached and the relevant flow diagram (See appendix).

Quantity factor:

60 = if one pressure monitor module is used

30 = if two pressure monitor modules are used

Example of how to calculate purge time:

Cabinet capacity = 140 l

Purging = 5 times

Set the "P3" = 12.0 mbar switching level" as described in Chapter 6.2.2 "Determination of the purging pressure ".

Flow in accordance with diagram = 14,000 l/h

Quantity factor with 1 pressure monitor = 60; with 2 pressure monitors = 30

The purge time is calculated as follows:

With a pressure monitor of the type 17-51P3-1604
140 x 10 : 14,000 x 60 = **3 minutes**

with two pressure monitors of the type 17-51P3-1604
140 x 10 : 14,000 x 30 = **1 minute 30 Secounds**

6.2.4 Checking the Purging Phase

ⓘ Note	
	**Safe operation with fluctuations in pressure.** For safe operation (pressure fluctuations), raise the pressure reducer's setpoint inlet pressure by 0.5 bar.

When commissioning the pressurised enclosure, it is necessary to check the individual operating phases. For this purpose, all preceding work steps must be completed. The operating pressure, leakage compensation and purge time must be set.

Procedure:

- Set up the pressurised enclosure to be ready for operation.
- Activate the SILAS control unit.
- Activate the purge gas supply.
  - The K1 LED lights up.
  - The purge time shown on the sensor module's display counts down.
- Reduce the purge gas supply by lowering the pressure at the pressure reducer
  - The purge time in the display on the SILAS control unit is stopped.
- Reset the purge gas supply by increasing the pressure on the pressure reducer to the initial level.
  - The purge time shown in the sensor module's display counts down.
  - At the end of the purge time, the "K2" LED lights up and the "K2" relay is activated.

6.2.5 Checking the Operating Phase

When commissioning the pressurised enclosure, it is necessary to check the individual operating phases. For this purpose, all preceding work steps must be completed. The operating pressure, leakage compensation and purge time must be set.

Procedure:

- Set up the pressurised enclosure to be ready for operation.
- Activate the SILAS control unit.
- Activate the purge gas supply.
- Let the purge time count down.
  - The K2 LED lights up, the “K2” relay activates fitted components inside the pressurised piece of operating equipment.
- Reduce the purge gas supply by lowering the pressure at the pressure reducer
  - The purge time in the display on the SILAS control unit is stopped.
  - The “K2” LED goes out, the “K2” deactivates fitted components inside the pressurised piece of operating equipment

6.3 Commissioning of the SILAS Controller for Zone 22

Procedure for commissioning:

- Before commissioning, check the electrical devices installed inside the pressurised enclosure.
- Make sure the pressurised enclosure is purged sufficiently.
- The relevant safety regulations and rules must be observed.
- Select and set the “PRG NO” purging variant.
  (See Chapter 6.1.1 “Purging Function”).
- Define the operating pressure
  (See Chapter 6.3.1 “Define the Operating Pressure”).
- Check the operating phase.
  (See Chapter 6.3.2 “Checking the Operating Pressure”).

6.3.1 Define the Operating Pressure

According to the standard, the level for the positive pressure inside the pressurised enclosure must be higher than 0.25 mbar.

To ensure that the minimum pressure will be maintained, the flow rate through the adjustable purge gas nozzle must be adjusted because every pressurised enclosure leaks to some degree.

Procedure:

- Set the required input pressure on the pressure reducer.
  ☞ *e.g. 2 bar*
- Open the purge gas nozzle with approx. 2 complete turns.
- Close the pressurised enclosure.
- Connect the mains voltage and set the “ON/OFF” rotary switch on the SILAS control unit to position 1.
  - The operating pressure builds up and settles at a level which is shown in the SILAS control unit display. This should be kept at a constant level of approx. 1.5 mbar.
  - ☞ *If there is a drop in minimum pressure, increase the flow at the* purge gas nozzle.
  - ☞ *If there is an increase in the minimum pressure, reduce the flow at the* purge gas nozzle.

6.3.2 Checking the Operating Phase

When commissioning the pressurised enclosure, it is necessary to check the individual operating phases. For this purpose, all preceding work steps must be completed. The operating pressure and the leakage compensation must be set.

Procedure:

- Set up the pressurised enclosure to be ready for operation.
- Activate the SILAS control unit.
- Activate the purge gas supply.
- Once the internal pressure has built up, the pressurised enclosure is ready for operation.
  - The “K2” LED lights up, the “K2” relay activates fitted components inside the pressurised operating equipment.

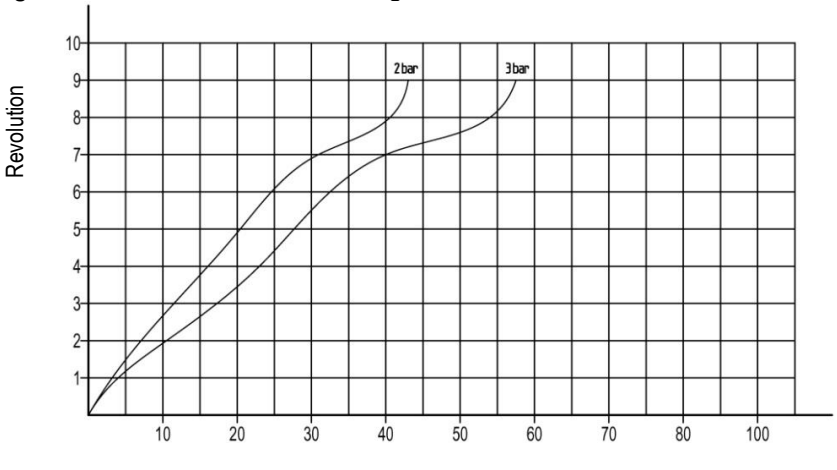
6.4 Adjusting the Leakage Air Needle

The leakage air needle for the digital purge gas valve must be adjusted during commissioning or when altering the leakage air quantity.

Procedure

- Set the “ON/OFF” rotary switch to position “1”.
- Set the “Parameters” rotary switch to position “0”.
- Set the required input pressure on the pressure reducer.
- Let the purge time for the SILAS control unit count down.
- Do not alter the leakage air needle on the purge gas valve.
- The internal pressure at that particular moment is shown in the display.
  - ☞ *If there is a drop in pressure, increase the flow at the leakage air needle.*
  - ☞ *If there is an increase in pressure, reduce the flow at the leakage air needle.*
- Increase the flow at the leakage air needle:
  Use a small (2 mm) screwdriver to turn the screw in the leakage air needle in ¼ revolutions in an anti-clockwise direction.
- Check the internal pressure again to determine if the level remains constant, increases or continues to fall.
  - If the internal pressure remains constant, the leakage air needle is adjusted.
- Reduce the flow at the leakage air needle:
  Use a small (2 mm) screwdriver to turn the screw in the leakage air needle in ¼ revolutions in a clockwise direction.
- Check the internal pressure again to determine if the level remains constant, increases or continues to fall.
  - If the internal pressure remains constant, the leakage air needle is adjusted.

Diagram of the flow rate at the leakage air needle:



6.5 Safety during Operation

⚠ DANGER	
	**Damage to the explosion protection measure.** If it can be assumed that safe operation is no longer possible, the SILAS control unit must be put out of operation and secured against restarting.

6.6 Types of Purge gas

⚠ DANGER	
	**Risk of suffocation when using inert gas as a purge gas.** The use of inert gas as a purge gas forces oxygen out of the pressurised enclosure. ➢ Stop the supply of purge gas when opening the pressurised enclosure and make sure the escaping purge gas cannot be inhaled directly.

Only an inert gas (e.g. oxygen) or cleaned and dry instrument air may be used as purge gas. In each case, a filter must be placed upstream if the right quality with respect to the absence of foreign particles is not assured.

The following quality characteristic requirements at least must be met by the purge gas:

- Residual dust: < 40 µm
- Residual water: dew point +3 °C
- Residual oil content: 1 mg/m³
- Maximum temperature: +40 °C

7. Operation

7.1 Operating Phases of the SILAS Controller for Zone 2

The operation of a pressurised enclosure constructed for explosive gas atmospheres can be divided into three phases. The three phases break down into the preparatory, purging and operating phases.

7.2 Flow Diagram

Operating phase	Requirements	Effect
Preparatory phase	- Mains voltage connected	Initiation of the purging phase
	- Internal pressure less than P4 and greater than P1	
	- Purge time set	
	- Purge time not ended	
Purging phase	- Internal pressure greater than P3	Purge time on
	- Internal pressure less than P4	
	- Purge time ended	Initiation of the operating phase
Operating phase	- Internal pressure greater than P1	Pressurised enclosure enabled
	- Internal pressure less than P4	
	- Purge time ended	

7.3 Preparatory Phase

The preparatory phase begins when the supply voltage for the SILAS control unit is switched on and the purge gas supply starts. The purge gas flows through the purge gas valve into the pressurised enclosure.

Preparatory phase sequence:

- The influx of purge gas increases the pressure inside the pressurised enclosure.
- The “P1” minimum pressure in the enclosures is exceeded.
- The purge gas valve is opened by means of the SILAS control unit.
- The next phase, the “purging phase”, is initiated.

7.4 Purging Phase

Attention
Interruption of the purge time. If the pressure levels drop below or exceed the specified pressure setpoints, the purge time for the SILAS control unit stops. ➢ Check the purge gas supply. ➢ Check the control unit settings.

The pressurised enclosure is purged with the purge gas in order to remove any explosive gas-and-air mixture inside or to dilute it to a harmless concentration before the possible sources of ignition in the pressurised enclosure are activated.

This process prepares the pressurised enclosure for the operating phase. The required quantity of purging medium depends on the free capacity in the pressurised enclosure. The purging process is constantly monitored by the sensors in the sensor module and the pressure monitor.

Purging phase sequence:

- The purge gas flow is increased by opening the purge gas valve.
- The plate integrated in the pressure monitor is raised.
- "P1" minimum pressure switching level, "P3" purging pressure levels are exceeded.
- The purge time in the display counts down.
- The purge gas valve closes after the end of the purge time
- Operating phase

The operating phase starts when the purge gas valve closes.

The operating pressure must be maintained throughout the entire operation of the pressurised enclosure to prevent the penetration of combustible substances. The "K2" relay in the SILAS control unit sends a signal that the pressurised enclosure is enabled and ready.

If the pressure in the enclosure drops below the set minimum levels during the operating phase, all electrical fitted components in the pressurised enclosure, which are not themselves explosion-proof, are switched off and the purging process starts again.

Operating phase sequence:

- The purge valve closes and the leakage losses are compensated by means of the integrated leakage air valve.
- The "K2" LED lights up.
- The "K2" relay connects and activates the mains voltage and enables readiness.
- The "K3" relay switches depending on the configuration.
- The remaining purge time display goes out and the existing pressure inside the enclosure is shown on the display.

7.5 Operating Phases of the SILAS Controller for Zone 22

The operation of a pressurised enclosure constructed for explosive dust atmospheres can be divided into two phases: the preparatory and operating phases.

7.5.1 Flow Diagram

Operating phase	Requirements	Effect
Preparatory phase	- Mains voltage connected	Initiation of the operating phase
	- Internal pressure greater than P1	
Operating phase	- Internal pressure greater than P1	Pressurised enclosure enabled

7.5.2 Preparatory Phase

In the preparatory phase, all internal deposits of dust must be removed before the pressurised enclosure is activated. After cleaning the pressurised enclosure, the door is closed, the SILAS control unit is put into operation and the purge gas supply is activated.

When the purge gas supply is activated, the purge gas is conducted into the pressurised enclosure by means of the leakage air needle and accordingly a level of pressure is reached which is higher than that in the surrounding atmosphere.

Preparatory phase sequence:

- The influx of purge gas increases the pressure inside the pressurised enclosure.
- The “P1” minimum pressure in the enclosure is exceeded.
- The next phase, the “operating phase” is initiated.

7.5.3 Operating Phase

The operating phase begins when the purge gas flows in. This builds up a level of pressure in the pressurised enclosure that is higher than atmospheric pressure. The internal pressure of the pressurised enclosure is measured on the SILAS control unit and compared with the setpoint limits. Once there is a positive level of pressure inside and the minimum switching level has been exceeded, the readiness of the pressurised enclosure is signalled via the “K2” relay on the SILAS control unit.

During the operating phase the penetration of dust is prevented by the maintenance of a constant level of pressure that is higher than that of the surrounding atmosphere. The internal pressure is monitored by the SILAS control unit’s pressure monitor. If the internal pressure drops during operation to below the “P1” switching level, e.g. when the door is opened, a message to that effect can be sent in the form of an alarm.

Operating phase sequence:

- The internal level of pressure is higher than atmospheric pressure.
- The “K2” LED lights up.
- “K2” relay connects mains voltage and enables readiness.
- “K3” relay switches according to configuration.

7.6 Bypass-Operation During the Operating Phase

⚠ DANGER	
	**Risk of explosion during active bypass operation.** The activation of the bypass operation can cause explosive gas to penetrate the pressurised enclosure. ➢ Determination of the concentration of gas in the surrounding atmosphere. ➢ Approval by the plant manager or his appointee (fire permit) for the activation of bypass operation. ➢ Limit the duration of activation of the bypass operation.

During the operating phase, it may be necessary to change settings on internally mounted components. The SILAS control unit provides the bypass function for this purpose.

If the bypass operation is activated, it must be ensured that there are no explosive gases in the atmosphere. The concentration of gas in the surrounding atmosphere must be established by means of a gas detector.

Once the bypass operation is activated, the door of the pressurised enclosure can be opened without interrupting the operation of the internal components. The required settings can be carried out and, once done, the pressurised enclosure must be closed again. The operation of the pressurised enclosure is not interrupted during this time.

Procedure:

- Measure to ensure hazardous substances in the surrounding atmosphere are below regulatory limits.
- Take the top cover off the SILAS control unit.
- Set the “Parameters” rotary switch to position 9.
- Insert the “bypass” jumper.
  - Information shown in the display changes from “NORMAL” to “BYPASS”.
- Open the door on the pressurised enclosure.
  - The enabling by the “K2” relay is not reset.
- Do the required work inside the pressurised enclosure.
- Close the door on the pressurised enclosure.
- The purging time in the display is counted down.
- Remove the “bypass” jumper.
  - Information shown in the display changes from “BYPASS” to “NORMAL”.
- Set the “parameters” rotary switch to position 0.
- Put the top cover onto the SILAS control unit.

8. Maintenance and Care

ⓘ Note	
	Maintenance intervals Regular maintenance is not necessary if the device is operated appropriately in compliance with the installation instructions and ambient conditions. The recommendation is: ➢ An inspection every year in accordance with the table in Chapter 8.1.
	**Maintenance and Care** – The currently applicable provisions in the national regulations must be observed for the upkeep, maintenance and inspection of the operating equipment! – Operating and maintenance work may be done by trained specialist personnel only. The statutory regulations and other binding directives on workplace safety, accident prevention and environmental protection must be adhered to. – Live parts can become exposed when covers are opened or parts removed, except where this is possible by hand. Connection parts may be live too.

The table in Chapter 8.1 serves as a minimum requirement for the maintenance or commissioning of a pressurised enclosure.

8.1 Inspection Table for Commissioning and Maintenance

Item	Inspection point	Commissioning	Main-tenance
		OK	OK
1	Visual inspection for damage		
2	Attachment of the SILAS control unit according to the manual		n/a
3	Diagonal purging of enclosure assured		n/a
4	Check that the fitted devices are fastened securely.		
5	Sufficient purging of installed devices		n/a
6	Note devices with integrated capacitors (it may be necessary to affix a sign).		n/a
7	Note devices with hot surfaces (if necessary, affix a sign.)		
8	Set up equipotential bonding for the pressurised enclosure		
9	Check the wiring		n/a
10	Check wiring in accordance with the relevant directives		n/a
11	Any inspection glasses there are made of safety glass (at least 2 panes) or of plastic (“Avoid electrostatic charging, wipe with a damp cloth” sign affixed).		n/a
12	General state of the mounted elements in the pressurised enclosure (device feet, rain shelter, cable glands)		
13	Agreement of the connection voltage for the individual devices with mains voltage		n/a
14	Total power consumption of the devices lower than the control unit’s maximum switching capacity		n/a
15	Separation of any data lines checked		n/a
16	Maximum surface temperature checked		n/a
17	Pressure test with 1.5 x Pmax passed, no permanent deformations in the enclosure		n/a
18	Enclosure capacity determined		n/a
19	Purging phase checked		
20	SILAS controller’s switching levels checked		
21	Correct functioning of the SILAS controller tested		
22	Correct functioning of any bypass operation tested		
23	Sign conforming to EN 60079-2 affixed to enclosure		

9. Malfunctioning and Troubleshooting

It is assumed here that all external electrical and mechanical units have been connected correctly. For that reason, it should first be checked that the electrical units have indeed been set up and connected properly.

9.1 Fault Table

Fault	Possible Cause	Remedy
Device is not working, Nothing on display.	No mains voltage	Check mains voltage supply line
	Device defective	Return to manufacturer
The electrical devices are connected and activated without purging phase	Bypass connector & rotary switch S2 in position 9	Remove the bypass connector and set S2 rotary switch to position 0.
	Incorrect programming of the purging function in the SILAS control unit	Check programming of purging function. See Chapter 6.1.1
The digital purge gas valve switches off briefly during the purge time.	Excessive quantity of purge gas is introduced into the pressurised enclosure	Reduce the diameter of the purge gas nozzle.
Purge time does not count down.	No purge gas	Connect purge gas
	Purge gas valve does not open.	Check purge gas valve for supply voltage (terminals 6 and 9)
		Check purge gas valve for foreign particles in the mechanical part.
	Insufficient purge gas flowing through the pressurised enclosure	Increase input pressure to setpoint level.
		Increase the diameter of the purge gas nozzle.
		Check the “P3” purge gas pressure.
		Increase the cross-section in the purge gas supply line.
	The pressure reducer’s setpoint pressure is not reached	Increase the cross-section of the supply line.
	Enclosure leaks during the purging phase due to an increase in internal pressure.	Use suitable measures to seal the enclosure or reinforce the walls of the enclosure.

Fault	Possible Cause	Remedy
Digital purging gas valve does not close after the purging phase.	Internal pressure drops below P2, Losses through leakage are too high.	Fix leaks.
Control unit switches electrical devices off with 5 sec. time delay after the purge time.	The leakage air needle for the digital valve is too small	Increase the air flow rate in the leakage air needle.
Digital purge gas valve connects briefly during the operating phase.	Internal pressure drops below P2	Increase the leakage air compensation
The electrical devices do not switch off when the pressure drops.	Bypass activated	Deactivate bypass.

10. Technical Data

10.1 SILAS Control Unit

Parameters	Specifications
Type	A7-3741-1110/.00.
Ambient temperature during storage and transport	-20 °C to +60 °C
Ambient temperature during operation	-20 °C to +60 °C (T4) -20 °C to +40 °C (T6)
Dimensions	110 x 188 x 55.5 mm (WxHxD)
Material	Glass fibre reinforced polyester, black
Mains voltage	AC 230 V, AC 115V or DC 24 V (variant-dependent)
Max. power consumption	8 watts
K1 relay	Up to $T_{ambient}$ 40°C: Max AC 253V; 5 A; cos φ 0.7
K2 and K3 relays	Up to $T_{ambient}$ 60°C: Max AC 253V; 0.5 A; cos φ 0.7 Up to $T_{ambient}$ 60°C: Max AC 253V; 0.5 A; cos φ 0.7
Pressure range	0 to 25 mbar for all pressure switching levels
Tolerance range	± 0.5 to ± 1.0 % throughout entire measuring range
Purge time	0 to 60 minutes (adjustable)
Connection terminals	Max. 2.5 mm²
Weight	1.2 kg
Protection class	Min. IP 54
Cable glands	3x M16, clamping range 4.5 - 9 mm 1x M20, clamping range 7 - 13 mm

10.2 Pressure Monitor

Parameters	Specifications
Type	17-51P3-1604
Dimensions	55 x 70 x 57 mm (WxHxD)
Material	POM
Opening pressure	3 mbar
Mounting borehole	37 mm
Weight	Approx. 0.2 kg
Ambient temperature storage	-20 °C to + 80 °C
Ambient temperature operation	-20 °C to + 80 °C
See product data sheet for more technical data	

10.3 Digital Purge Gas Valve with Leakage Air Needle Valve

Parameters	Specifications
Type	03-5110-00..
Ex protection type	Ⓔx II 3G Ex nA II T4
Mains voltage	AC 230 V, AC 115V or DC 24 V (variant-dependent)
Corresponding valve fuse	AC 230 V = Fuse rating: T 80 mA AC 115 V = Fuse rating T 160 mA DC 24 V = Fuse rating T 500 mA Fuse type: fine wire fuse 5 x 20
Dimensions	58 x 118 x 48 mm (WxHxD)
Valve connection	G 3/8“
Nominal diameter	6 mm
Pressure range	0 to 4 bar
Mounting borehole	17 mm
Ambient temperature storage	-20 °C to + 80 °C
Ambient temperature operation	-10 °C to + 40 °C
Protection class	IP 65 with mounted socket
Purging gas medium	Cleaned industrial compressed air or inert gas
See product data sheet for more technical data	

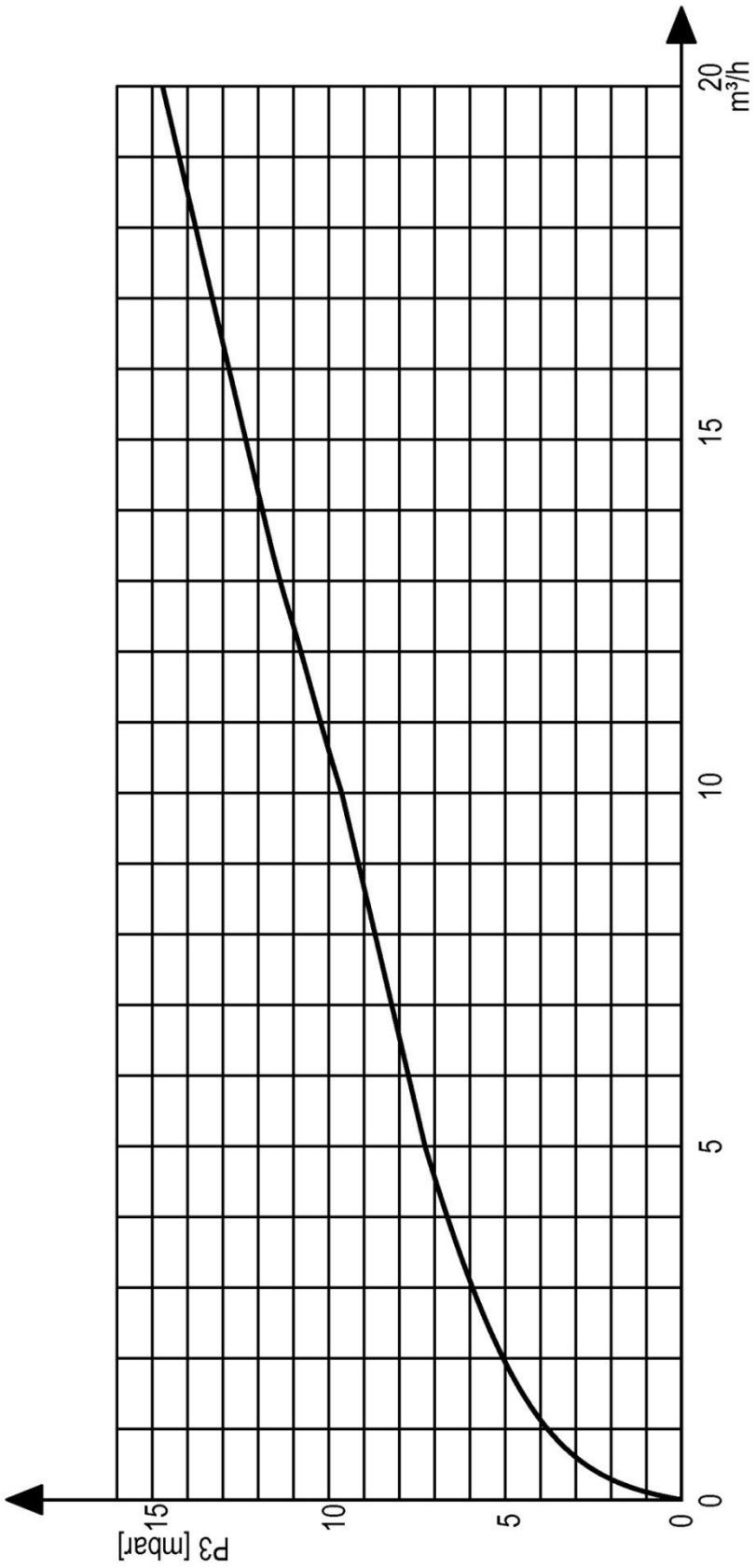
10.4 Requirements for Purge Gas

The quality of the purge gas must conform to class 543 under DIN ISO 8573-1 .

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

10.5 SILAS Control Purge Gas Diagram

The following flow rate diagram relates to the SILAS control.



11. Order Numbers

11.1 SILAS Control Unit

SILAS control unit, AC 230 V, ATEX and TÜV marking	A7-3741-1110/1000
SILAS control unit, AC 115 V, ATEX and TÜV marking	A7-3741-1110/2000
SILAS control unit, DC 24 V, ATEX and TÜV marking	A7-3741-1110/4000
SILAS control unit, AC 230 V, ATEX and TÜV marking With Viewing glass	A7-3741-1110/1002
SILAS control unit, AC 115 V, ATEX and TÜV marking With Viewing glass	A7-3741-1110/2002
SILAS control unit, DC 24 V, ATEX and TÜV marking With Viewing glass	A7-3741-1110/4002

11.2 Pressure Monitor

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

11.3 Accessories and Spare Parts

11.3.1 Digital Purge Gas Valve

Digital valve with leakage air needle valve; G3/8", 2x Purge gas nozzle undrilled, AC 230 V, NC	03-5110-0081
Digital valve with leakage air needle valve; G3/8", 2x Purge gas nozzle undrilled, AC 110 V, NC	03-5110-0082
Digital valve with leakage air needle valve; G3/8", 2x Purge gas nozzle undrilled, DC 24 V, NC	03-5110-0083

11.3.2 Pressure Reducer

Pressure reducer 1/4", 0.5-6 bar, max. 0.5 m³/h with attachment parts	05-0056-0007
Pressure reducer 1/2", 0.5-6 bar, max. 50 m³/h with attachment parts	05-0056-0041
Pressure reducer in stainless steel version	on request

11.3.3 Adjustable Purge Gas Nozzle for Zone 22

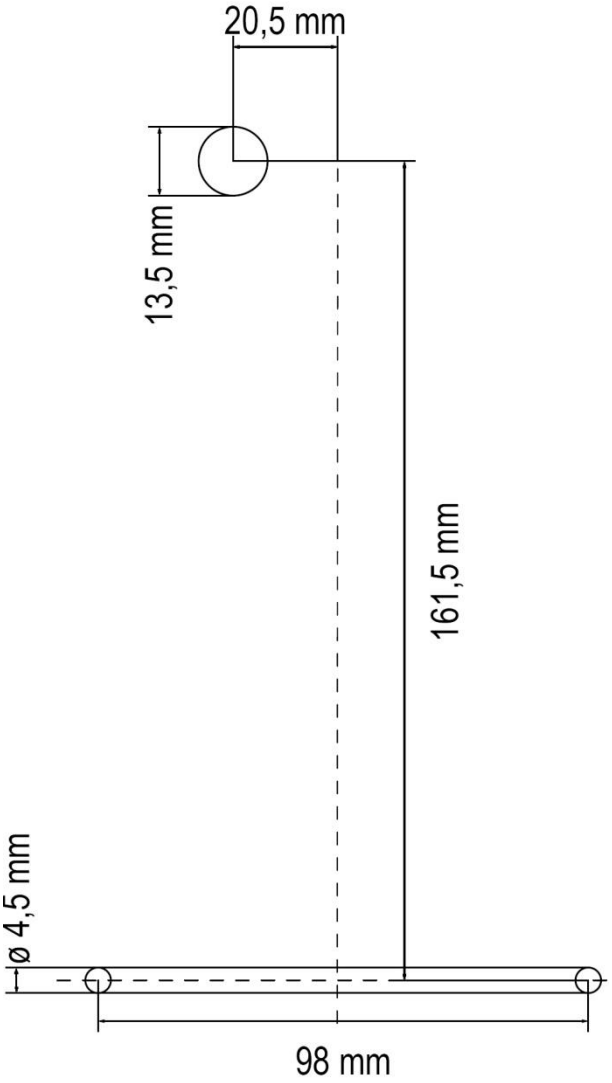
Purge gas nozzle 1/4", with attachment parts	05-0056-0062

11.3.4 Accessories for the SILAS Control

Mounting set for mounting the SILAS control unit inside the pressurised enclosure	05-0091-0117

12. Appendix

12.1 Borehole Pattern for the SILAS Control Unit



12.2 Test and Assessment Report Form

Test report/checklist for Ex pz/p operating equipment					
Part:			Customer:		
Type:			Order:		
Installation of the Ex p operating equipment in:					
☐ Zone 2 (Ex pz) ☐ Zone 22 (Ex p)					
Characteristics of the Ex pz/p operating equipment					
Serial number	**Mains voltage**	**Current consumption**	**Power dissipation**	**Manufacturing**	
Purge valve	(0) not there; (1) is there				
Purge gas nozzle	Ø				mm
Type of function	Compensation of leakage losses = 1; constant purging = 2				
Purging medium	Instrument air = 1; Inert gas = 2				
Leakage losses	Maximum				l/min
Capacity of the Ex pz/p operating equipment					
Dimensions: W x H x D					litres
Purge gas flow rate					
In accordance with the diagram, the purge gas flow rate during the purging phase at _____ mbar enclosure pressure und _____ bar input pressure at the input valve switch/pressure reducer					litres/h
Determination of purging time after calculation based on diagram					
Using the flow diagram (_ fold purging volume), the purging time calculated was:					___ minutes ___ seconds

Characteristics of the SILAS control unit			
Parameters	**Rotary switch S2 in position.**	**Description**	**Switching level**
Function	1	The type of function must be selected as in the “Purging Function” chapter.	PRG _____
Purge time	2	The purge time is	_____min _____ sec
P1	3	Minimum pressure in enclosure higher than atmospheric pressure (switching-off level)	mbar
P2	4	Preliminary alarm	mbar
P3	5	Minimum pressure in enclosure higher than atmospheric pressure (purging pressure)	mbar
P4	6	Maximum pressure in enclosure higher than atmospheric pressure (switching-off level)	mbar
K3	7	Function of the K3 relay	
Delay	8	General time delay of relays K1 to K3 for fluctuations in compressed air	seconds

Further tests		
Test	**Description**	**Passed**
Pressure test	Test at 1.5 times the maximum pressure for 2 minutes: no permanent deformation	
Switching-off MIN	Test of alarm/disconnection minimum pressure. SILAS emits alarm or switches Ex pz/pD operating equipment off.	
Bypass	Test of bypass operation. SILAS does not emit an alarm or does not switch the Ex pz/pD operating equipment off.	

Comments

	Date	
	Test engineer	
	Test engineer’s mark	

13. Declaration of Conformity and Approvals

13.1 Declaration of Conformity

EU Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de conformité

№ A1-3741-7C0001_D

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

Wir	We	Nous
BARTEC GmbH,		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
Steuerung SILAS	**Control System SILAS**	**Contrôleur SILAS**
Typ A7-3741-1110/****		
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**	**ATEX-Directive 2014/34/UE**
EMV-Richtlinie 2014/30/EU	**EMC-Directive 2014/30/EU**	**CEM-Directive 2014/30/UE**
RoHS-Richtlinie 2011/65/EU	**RoHS-Directive 2011/65/EU**	**RoHS-Directive 2011/65/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 60079-0:2012+A11:2013 **EN 60079-2:2014** **EN 60079-15:2010** **EN 60079-31:2014**	**EN 60529:1991+A1:2000+ A2:2013** **EN 61000-6-2:2005** **EN 61000-6-3:2007+A1:2011** **EN 61010-1 :2010**	
Kennzeichnung	**Marking**	**Marquage**
Ⓔx **II 3G**	**Ex nA nC [pzc] IIC T4 Gc** **Ex nA nC [pzc] IIC T6 Gc**	
Ⓔx **II 3 D**	**Ex tc [pzc] IIIB T85°C Dc**	
Verfahren der internen Fertigungskontrolle	**Procedure of internal control of production**	**Procédure de contrôle interne de fabrication**

TÜV 09 ATEX 553359 X
0044, TÜV NORD CERT, Am TÜV 1, 30519 Hannover, D

A1-3741-7C0001

CE

Bad Mergentheim, den 30.06.2017

ppa. Paul Wielsch
BU Leiter

i.V. Michael Schulte
Leiter GW PZ

03-0383-0364

Seite / page / page 1 von / of / de 1

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