

## Operating instructions



### Pressure switch model B7, differential pressure switch model D7 and temperature switch model T7

for potentially explosive atmospheres in the European Union according to Directive 2014/34/EU (ATEX) / IECEx

In the following intrinsically safe version:

- B7##CEN6## or B7##CEN7## Pressure switch
- D7##CEN6## or D7##CEN7## Differential pressure switch
- T7##CEN6## or T7##CEN7## Temperature switch



**B7**  
**Pressure switch**



**D7**  
**Differential pressure switch**



**T7**  
**Temperature switch**

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# 1 General

The pressure and temperature switches described in these operating instructions have been designed using the latest standards, guidelines and findings. During the manufacturing process, all components are subject to our high quality and environmental criteria. For this purpose we maintain certified management systems according to ISO 9001 and ISO 14001. For the special requirements of devices for intended use in potentially explosive atmospheres we maintain a management system according to ISO 80079-34.

## 1.1 Purpose of this manual

These operating instructions contain basic instructions for the installation, operation and maintenance of the device. It must be read by the installer, the operator and the specialist personnel responsible for the device before installation and commissioning of the device. These operating instructions must always be available at the place of use.

The following sections on general safety instructions 2 as well as the following special instructions on intended use 2.2 to disposal 11 contain important safety instructions, the non-observance of which may cause health and safety hazards to people, in particular to workers, and possibly to domestic and farm animals, as well as property.

## 1.2 Symbols



### Warning.

...indicates a potentially hazardous situation, the non-observance of which may cause hazards to the health and safety of people, especially workers, and possibly to domestic and farm animals, as well as property.



### Information.

... highlights important information for efficient and trouble-free operation.

## 1.3 Limitation of liability

Improper use of the devices, disregarding the operating instructions, the use of unqualified personnel for installation and maintenance work as well as unauthorized modifications to these devices will inevitably result in the loss of liability claims against the device manufacturer.

## 1.4 Copyright

These operating instructions may only be reproduced and passed on as a complete document without the special consent of the publisher.

Subject to technical changes.

## 1.5 Warranty

For the product described here we grant warranty according to § 6 warranty for defects, in our General Terms and conditions of delivery and payment.

## 1.6 Manufacturer address, customer service

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## 2 Security

### 2.1 General sources of danger

Pressure and temperature switches are usually components of a control and measurement system. These devices have pressure- or temperature-loaded parts, the failure of which can lead to dangerous situations. The switches should be selected in accordance with the applicable standards and regulations and the rules of technology.

### 2.2 Intended use

The intended use of the devices, as determined by the manufacturer, is the measurement / control of pressure and temperature with electrotechnical or electronic components for the evaluation of switching states in potentially explosive atmospheres.

According to the Pressure Equipment Directive 2014/68/EU, the equipment is classified as pressure-maintaining equipment without safety function, module A in accordance with Article 4(3) of the Directive.

When operating the device, it must be ensured that the process medium used is harmless to the selected device material. Process media that show changes in the aggregate state within an application range can influence the functionality. Negative influences must be avoided for this reason. The application areas of these process media must be within the technical limits of the device.

Further technical data for the intended use are summarized in the product data sheets (chapter 12.1).

### 2.3 Responsibility of the operator

The safety instructions for proper operation of the device must be observed. They are to be provided by the operator to the respective qualified personnel for installation, maintenance, inspection and operation. Hazards due to electrical energy and released energy of the medium, due to escaping media and due to improper connection of the device must be excluded. For details, refer to the relevant applicable regulations such as DIN EN, UVV (accident prevention regulations) and, in the case of industry-specific applications (DVGW, Ex- GL, etc.), the VDE guidelines and the regulations of the local utility companies.

The device must be taken out of operation and secured against unintentional operation if it must be assumed that safe operation is no longer possible (chapter 10 Malfunctions).



**The device may only be opened in a non-explosive atmosphere.**

The operational safety of the device and the manufacturer's warranty are only guaranteed if the device is used as intended. The device design must be adapted to the medium and potentially explosive atmosphere used in the plant. The limit values specified in the technical data must not be exceeded. When planning systems in potentially explosive atmospheres, IEC 60079-14 Project Planning, Selection and Installation of Electrical Systems must be applied.

The safety instructions listed in this operating manual, existing national regulations for accident prevention and internal work, operating and safety regulations must be observed by the operator. Furthermore, he is responsible for ensuring that all prescribed maintenance, inspection and installation work is carried out by authorised and qualified personnel.

The device is to be regarded as a pressure-maintaining piece of equipment (with the exception of the T7 temperature switch) within a system in a potentially explosive atmosphere. The operator of this plant is obliged to carry out an ignition hazard analysis and a zone classification.



**The temperature switch T7 may only be used in pressureless processes. If a process pressure is applied, the use of a protective sleeve is necessary.**

## 2.4 Personnel qualification (target group assessment)

The device may only be installed and commissioned by trained specialist personnel.

Qualified personnel are persons who are able to perform the work assigned to them due to their specialized training, experience and knowledge of the country-specific regulations, applicable standards and directives. For explosion-protected devices, the personnel must be trained or instructed or authorized to work on explosion-protected devices in hazardous areas.

## 2.5 Signage/safety marking

The switch is provided with labels. The type designation, measuring range, serial number, Ex marking (including X for special conditions of use) and the manufacturer can be seen on the type plate. In addition, the warning "Do not open when an explosive gas / dust atmosphere present" is noted. The serial number is composed as follows:

- The first two digits indicate the last two digits of the year of manufacture
- The third and fourth digits indicate the month of manufacture.
- The numbers five and six indicate the date of manufacture.
- The digits seven to 10 are a sequential number starting at 0001 with each production day.

The legibility of the nameplate, which is important for use in potentially explosive atmospheres, must be checked by the operator at regular intervals.

If the device is delivered with a switching point setting (option FS), a label with the set switching point is mounted on the back of the device.

The outer carton is labelled with the type designation, order number, item number, measuring range and manufacturer's details.

## 2.6 Safety devices

This device is equipped with anti-rotation devices on the housing cover as well as on the cable line input and earth connections. The measuring element secures the actuating rod in case of leakage and contains two vent holes.

## 2.7 Environmental protection

This device contains electrical components. The requirements listed in the WEEE Directive of the European Union (2012/19/EU) on "Waste Electrical and Electronic Equipment" and by the Electrical and Electronic Equipment Act (ElektroG) have been taken into account and are applicable.

The European Directives (RoHS) 2011/65/EU "On the restriction of the use of certain hazardous substances in electrical and electronic equipment" and the Delegated Directive 2015/863/EU on the extension of the list of hazardous substances in Annex II of Directive 2011/65/EU were taken into account in the manufacture of the products. Compliance with the requirements of these directives is confirmed in the declaration of conformity in the appendix.

Depending on the configuration of our products, the requirements of the directive (REACH) 2006/1907/EC "Registration, Evaluation, Authorisation and Restriction of Chemicals" must be taken into account; the corresponding safety data sheets of the chemical manufacturers can be downloaded from our website. At the end of the product life cycle we recommend to recycle the devices, as they are mainly made of aluminium or stainless steel. Information on disassembly, material separation and disposal can be found in chapter 11.

## 3 Use in potentially explosive atmospheres according to Directive 2014/34/EU (ATEX)

Our Ex products B7/D7/T7 have equipment protection through the application of intrinsically safe circuits "Ex ia" (EN 60079-11) with a very high level of equipment protection. Intrinsic safety by energy limitation of sparks and thermal effects applicable for gases, vapours and dusts in the specified application range.

### 3.1 Range of use:

| Explosive atmosphere | Potentially explosive atmospheres |   | Equipment category 2014/34/EU | Subdivision of gases or dusts | EPL EN 60079-0 |
|----------------------|-----------------------------------|---|-------------------------------|-------------------------------|----------------|
| Gases & Vapours      | Zone 0                            | Is present constantly, for a long time or frequently  | 1G                            | IIC                           | Ga             |
| Gases & Vapours      | Zone 1                            | Occasionally occurs during normal operation   | 1G                            | IIC                           | Ga             |
| Gases & Vapours      | Zone 2                            | occurs in normal operation usually don't show up, or only for a short time                          | 1G                            | IIC                           | Ga             |
| Dust                 | Zone 20                           | is in the form of a cloud permanent, long-term or often present                                     | 1D                            | IIIC                          | Da             |
| Dust                 | Zone 21                           | forms during normal operation occasionally in the form of a cloud                                   | 1D                            | IIIC                          | Da             |
| Dust                 | Zone 22                           | occurs in normal operation in the shape of a cloud normally does not occur or only for a short time | 1D                            | IIIC                          | Da             |

| Temperatures within an application          |                       |
|---|-----------------------|
| Ambient temperature                         | (-20 to 60)°C         |
| Medium temperature                          | min. -20°C, max. 60°C |
| Surface temperature<br>(without dust layer) | max. 130°C            |

Permissible ambient media Air with normal oxygen content (21 %), ambient pressure 80 kPa (0.8 bar) to 110 kPa (1.1 bar)



**Warning! With gaseous media, the device temperature can increase due to compression heat. In such cases, the rate of pressure change must be throttled or the permissible medium temperature reduced.**



**The devices must not be operated in hazardous areas of a plant in which an explosive hybrid mixture of gases and dusts is present in the atmosphere.**



**To avoid additional heating, the devices must not be exposed to direct sunlight during operation!**

#### EC type-examination certificate:

SIRA 04ATEX2081X

CSA Group Netherlands B.V., Notified Body number 2813 in accordance with Articles 17 and 21 of the Directive 2014/34/EU of the European Parliament and of the Council, of 26 February 2014, certified.

that this equipment complies with the essential health and safety requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres set out in Annex II to the Directive.

The Ashcroft® B7, D7, T7 series pressure and temperature switches consist of a two-piece cylindrical housing with a lower housing section and cover. The enclosure is made of injection molded A380 aluminum or 316L stainless steel. The cover is screwed into the lower part of the housing and secured. The lower part of the housing contains the various switch elements as well as the mechanical transmission of a pressure change into a displacement change. The bottom of the housing has a 3/4-inch NPT cable entry on each side. At the bottom of the housing is the process connection with the measuring elements behind it. The process connection as well as the housing part for holding the measuring element are provided with a pressure relief.

The housing guarantees protection class IP6X according to EN 60529.

The switches must be operated via an appropriately certified shunt diode safety barrier or alternatively via an isolating switching relay. These auxiliary power supply devices must be installed outside the hazardous area.



The following limit values must not be exceeded:

$U_i = 30 \text{ V}$        $I_i = 100 \text{ mA}$        $P_i = 650 \text{ mW}$        $L_i = 0$        $C_i = 0$

Conformity with the Essential Health and Safety Requirements (EHRS), except for the elements listed in the Annex to the EC type-examination certificate, is ensured by conformity with the following documents:

| Standards applied for the evaluation of ignition protection |                     |
|---|---------------------|
| IECEX   | ATEX                |
| IEC 60079-0: 2018 Ed 7                                      | EN IEC 60079-0:2018 |
| IEC 60079-11: 2011 Ed 6                                     | EN 60079-11:2012    |

### 3.2 Marking



 2813 II 1GD Ex ia IIC T4 Ga  
 Ex ia IIIC T135°C Db  
 IP 6X

### 3.3 Special operating conditions for safe use in potentially explosive atmospheres

- Maintenance work to be carried out, from chapter 9 by non-authorized personnel, may result in damage and lead to loss of approval. The electrical connection may only be carried out by trained and authorized personnel.
- The epoxy-coated enclosures are non-conductive and may generate ignitable electrostatic charges under certain extreme conditions. The user should ensure that the unit is not installed in a location where it will be exposed to external conditions (such as high pressure steam) that may cause electrostatic charging on non-conductive surfaces. In addition, the device should only be cleaned with a damp cloth.
- The legibility of the type plates must be checked at regular intervals. It must remain legible throughout the entire period of use of the device. If a reliable reading is no longer given, please contact the manufacturer.
- Impacts on the device must be avoided at all costs. Impacts or shocks can produce sparks.
- It is the responsibility of the operator to evaluate attached process components or accessories together with the delivered device by means of an ignition hazard analysis. The operator must recognize the ignition hazards and prevent them by using appropriate protective measures.
- Only Ex-certified cable glands may be used. A tightening torque of at least 90 Nm must be applied when installing the cable gland. A sealant for the 3/4 NPT thread of the cable glands must not be used.
- For the cable glands mounted by the manufacturer, the cable cross-sections to be used are specified depending on the version. The user must install the cable glands with a tightening torque of 55 Nm. This tightening torque is necessary to achieve the ignition protection as well as the IP protection according to the requirements of the EU type examination certificate.  
If an Ex-certified cable gland from an external supplier is used, its installation instructions must be followed.
- It is not permissible to attach several threaded adapters to the cable entries.
- The optional measuring point label NH or NH1 may only be attached within the earthing system. Metal parts attached to the outside of the housing can be a source of ignition due to the coating of the housing. For this reason, grounding of the measuring point label is mandatory.
- Temperature switches T7 with a measuring range of (260 to 400)°C which are suitable for use in hazardous areas are always manufactured with external capillary sensors. Do not mount the switch housing in the immediate vicinity of the process temperature (convection heat).
- Temperature switches T7 for process temperatures from (175 to 275)°C are manufactured with a minimum length of 102 mm. These may only be mounted with the aid of protective sleeves as well as other suitable means for shielding the process temperature.



- For all T7 temperature switches, measures must be taken during installation on site to ensure that the maximum surface temperature is not exceeded.



Plastic blind plugs are used to protect the device during delivery and must be replaced by suitable cable entries in compliance with the above criteria.

## 4 Technical data

For detailed technical data please refer to the documents in the appendix chapter 12.

## 5 Marking of the device

The nameplate is located on the housing perimeter and includes:

- Manufacturer
- Marking of the device for potentially explosive atmospheres (ATEX)
- Type designation
- Electrical ratings of the switching contact
- Measuring range
- Material of the measuring diaphragm
- Serial number (YYMMDDxxxx)
- Overload / test pressure
- Reset values of the switching contact
- Warning "DO NOT OPEN WHEN AN EXPLOSIVE GAS / DUST ATMOSPHERE PRESENTS".

The devices are factory calibrated with a switching point at 90% of the measuring range. Optionally, the devices can be specified with a set switching value. In this case, there is a small label on the back of the device that indicates the switching point and the switching direction (rising or falling).

**Example nameplate:**



*Switch in intrinsically safe design*

## 6 Structure and function

### 6.1 Overview

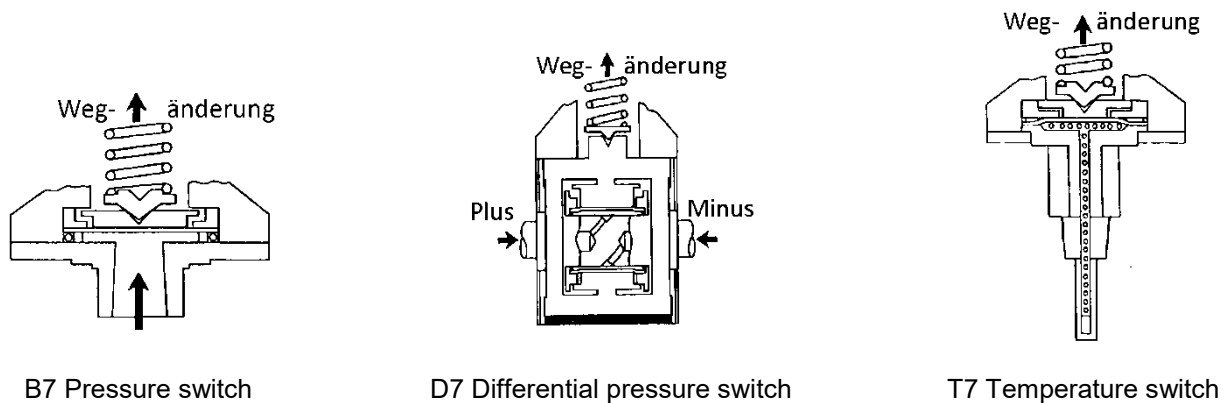


Figure 1

### 6.2 Functional description

The devices are manufactured within a special quality management system ISO 80079-34 conforming to the EU type examination certificates. The precision switches are equipped with a mechanical microswitch and can be used for operation with positive or negative overpressure, differential pressure or temperature with fixed or variable reset differential. Versions with manual reset for rising or falling set point operation are also available. Numerous sensing elements compatible with different pressure media are available in a variety of materials.

### 6.3 Description of the components

#### 6.3.1 Measuring element of pressure switch B7

B-Series positive or negative overpressure switches use two different sensing elements depending on the switch point requirements. For ranges between 150 mbar and 207 bar (2.2 and 3000) psi, the simple, rugged diaphragm-sealed piston actuator is used. This design provides high reliability and allows a wide range of wetted materials for almost any application. For optimum reliability, a welded version is also available for ranges up to 1000 psi (70 bar). This version is available in 316 stainless steel or Monel.

For measuring ranges between 4 and 375 mbar (1.5 and 150 inches H<sub>2</sub>O), a large diaphragm made of suitable elastomers is used for higher sensitivity.

#### 6.3.2 Measuring element of the differential pressure switch D7

Differential pressure switches use a special piston actuator sealed with two diaphragms, which is designed for very high static operating pressures and is very compact at the same time.

For measuring ranges between 12 and 375 mbar (4.5 and 150 inches H<sub>2</sub>O), a large diaphragm made of suitable elastomers is used for higher sensitivity.

#### 6.3.3 Measuring element of the temperature switch T7

T-Series temperature switches feature a SAMA Class II vapor pressure temperature system. This system responds quickly and accurately to changes in process temperature and is only slightly affected by ambient temperature. This is due to the precisely defined relationship between temperature and pressure according to the vapor pressure laws. A wide selection of probes and armored capillary lines are available. The vapour pressure system uses small probes for easy and cost-effective installation.

#### 6.3.4 Switching point adjustment

The adjustment screw (7/8 inch) for the switching point is located centrally in the bottom of the housing.

### 6.3.5 Microswitch

An electric SPDT switch is used as standard and is available in different versions. Two SPDT switch elements assembled together are also available, except for versions with variable switch-back value.

| Coding microswitch |               |   | Electrical ratings |                   |           |            |
|--------------------|---------------|---|--------------------|-------------------|-----------|------------|
| Simple switch      | Double switch | Switch Description  | AC                 |                   | DC        |            |
| SPDT               | 2x SPDT       |   | <i>I</i>           | <i>U</i>          | <i>I</i>  | <i>U</i>   |
| 20                 | 61            | narrow dead zone  | 15 A               | 125 / 250 / 480 V |           |            |
| 21                 | 65            | Ammonia service (Elgiloy spring)                          | 5 A                | 125 / 250 V       | 6 A       | 30 V       |
| 22                 | 67            | low downstream differential values                        | 5 A                | 125 / 250 V       |           |            |
| 23                 |               | high load capacity, with cable                            | 15 A               | 125 / 250 V       |           |            |
| 24                 | 64            | general application, low DC load capacity                 | 15 A               | 125 / 250 V       | 6 A       | 30 V       |
| 25                 |               | high load capacity  | 10 A               | 125 V             | 0.5 A 6 A | 125 V 30 V |
| 26                 | 62            | Protected from environmental influences, narrow dead zone | 15 A               | 125 / 250 V       |           |            |
| 27                 | 63            | high temperatures   | 15 A               | 125 / 250 V       |           |            |
| 31                 | 70            | Gold contacts, with cable                                 | 1 A                | 125 V             |           |            |
| 32                 | 68            | general scope   | 11 A               | 125 / 250 V       | 5 A       | 28 V       |
| 42                 | 71            | Gold contacts   | 1 A                | 125 V             |           |            |
| 50                 |               | adjustable deadband                                       | 15 A               | 125 / 250 V       |           |            |

Table 1: Electrical ratings of the microswitches

### 6.3.6 Housing

Ashcroft switches have a flameproof enclosure conforming to the requirements of the EU Type Examination Certificate. It is made of epoxy coated cast aluminium A380 or optionally of stainless steel 316L (option YW).

Furthermore, the enclosures of these electrical Ex devices have an IP rating, with respect to their suitability for various environmental conditions (contact protection, dust, water) according to EN 60529 of IP6x as well as an enclosure rating according to NEMA 7 and 9.

## 7 Transport

The switch must be protected from rough impact. The device must only be transported in the packaging provided for this purpose. The transport may only be carried out in a cleaned condition (free of residual medium). Plastic blind plugs serve to protect the device during transport and must be replaced by suitable cable entries.

### 7.1 Transport inspection

The delivery must be checked for completeness and transport damage. In the event of transport damage, the delivery is not to be accepted or only with reservations, the extent of the damage is to be noted and, if necessary, the complaint is to be initiated. In such cases, please contact our service department.

### 7.2 Storage

The storage of the devices should exclude external influences as far as possible in order to avoid damage to the devices. Vibrations or impact effects must be avoided, the limit values of the storage temperatures must be taken into account.

Permissible storage temperature: -40 to +60°C

## 8 Mounting



In addition to the measures described here for the installation of Ex devices, IEC 60079-14 must be taken into account.

### 8.1 Preparation

To ensure safe working during installation and maintenance, suitable shut-off valves must be installed in the system by means of which the unit:

- can be depressurised within the installation concerned for the purpose of repair or inspection;
- can be subjected to a functional check on site.

During the work of mounting/installing the switch, the system must be secured against being switched on again.

It is recommended to carry out the assembly / installation without an existing explosive atmosphere (e.g. ventilated room).

### 8.2 Requirements for the installation site

- Check the suitability of the device for the medium to be measured,
- Design of the measuring range to the requirements of the measurement,
- A measuring device holder must be installed if the measuring line does not have sufficient load-bearing capacity.
- Ambient temperature range: -20 to 60 °C
- Medium temperature range: -20 to 60 °C, the temperature limits may vary depending on the diaphragm material
- Please refer to the corresponding data sheets for the materials used and technical data.
- To minimize the risk of injury, the switch must be installed in accordance with the required safety and electrical codes.
- The switch must be protected from moisture, shock and/or extreme vibration.
- Mounting position: The switch can be mounted in any position. However, it is recommended to adjust the switch in the intended operating position.



**Always install the enclosure cover after wiring the switch and before turning on the power.**

- In potentially explosive atmospheres, check that the atmosphere is not explosive and that the power supply is disconnected before removing the cover.
- All anti-rotation and grounding connections must be installed prior to start-up.
- With the T7 temperature switch, damage to the immersion tube and the sensor must be prevented. In the case of temperature switches with external capillary lines, these must not be kinked or laid in too tight a radius.
- Do not press any objects (e.g. screwdrivers) against the diaphragm.
- The pressure measuring ranges B7/D7 may only be overloaded as specified in the data sheets.
- The temperature measuring ranges T7 may only be overloaded according to the specifications in the data sheets.
- The electrical load limits of the microswitches must not be exceeded.

### 8.3 Process connection

As standard, the device is equipped with a pressure connection piece according to EN 837 for pipeline mounting. The device is adjusted at the factory for vertical installation. If the device is mounted in a different position, position errors may occur and the factory-set switching point may vary.

- Connection only by authorized and qualified personnel.
- The three mounting holes around the perimeter of the enclosure allow wall mounting. The hole arrangement is shown in the general overview drawing.
- The switches can also be mounted directly on the pressure line using the process connection. High vibrations must not occur at the selected installation point.

- Use only with mechanical process connection provided - for version, see ordering code on the nameplate of the device with matching thread seal.
- When connecting the device, the lines must be depressurized.
- The pressure measuring line must be laid with a gradient so that, for example, no air pockets can occur during liquid measurements and no water pockets during gas measurements. If the necessary gradient is not achieved, water or air separators must be installed at suitable points.
- The pressure measuring line should be kept as short as possible and should be laid without sharp bends in order to avoid the occurrence of disturbing distortion times.
- In the case of liquid measuring media, the pressure connection line must be vented, as trapped gas bubbles lead to a measuring error.
- If water is used as the measuring medium, the device must be protected against frost.



To mount the switch on the pressure line, always use the wrench flats on the lower part of the housing, do not turn the device itself.

### 8.3.1 Electrical connection



When installing and operating electrical systems in potentially explosive atmospheres, the electrical data in the EU type examination certificate and the locally applicable regulations and directives must be observed (e.g. EN 60079-14 etc.).

- Connection only by authorized and qualified personnel.
- The electrical connection of the device must be carried out in accordance with the relevant regulations of the VDE directive and the regulations of the local utility company.
- Before wiring the electrical connections, the system must be disconnected from the power supply.
- Before putting the switch into operation, close all cable openings and/or terminal boxes in accordance with the required safety and electrical regulations.
  - a) The standard product is provided with two 3/4 NPT cable glands with a permanently inserted plug. If no cable gland is specified the switch is supplied with a plastic blanking plug to protect the device. This must be replaced with an ATEX approved cable gland during commissioning.
  - b) Available ATEX-approved cable glands can be used, taking into account the specified connection torque (see chapter 3.3). Here, the instructions of the manufacturer of the externally purchased ex-certified cable entry must be followed.
- Always follow safety and electrical regulations when connecting these devices.
- The system ground of the device is marked with a green colored screw and/or with the ground symbol.
- ATEX approved switches have an external ground screw that must be connected. The optional measuring point label (NH or NH1) must be mounted at this point and also grounded.

NO (Normally Open) Blue  
 NC (Normally Closed) Red  
 C (Common contact) White

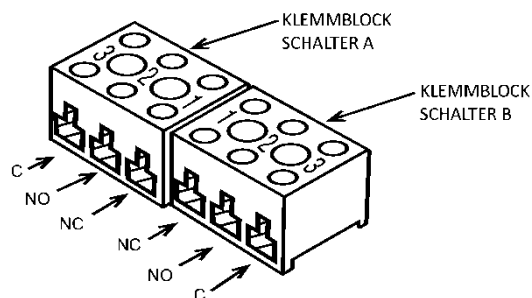


Figure 2: Terminal strips for microswitches and cable colours

- SPDT - direct wiring to the switch according to the wiring diagram.
- 2 SPDT - Wire to front switch terminal block (left) and rear switch terminal block (right) as indicated. Strip 8 mm of cable, insert into correct terminal and tighten terminal screw to secure.

## **8.4 Commissioning and switching point adjustment**

A prerequisite for commissioning is the proper installation of all electrical supply and measuring lines. All connection lines must be laid in such a way that no mechanical forces can act on the device.

Before commissioning, the tightness of the pressure connection line must be checked.



**As indicated below, the switch point adjustment is made using a 7/8-inch screw. The microswitch mounting screws and bracket adjustment screw are factory sealed and must not be broken.**

### **8.4.1 Pressure switch model B7**

The adjustment screw (7/8 inch) for the switching point is located centrally in the bottom of the housing.

For precise switch point calibration, the switch must be mounted on a calibration stand. You need a suitable reference standard to be able to observe pressure changes sufficiently accurately.

If no switching point is specified when ordering, the pressure switch is usually set at the factory to approximately 90 % of the specified range. Pressurize the system to the required switching point and turn the adjusting screw until the switch switches. The direction of rotation is indicated on a label in the switch housing. Once the switch point is reached, raise and lower the pressure to check the switch point.

After setting the switch, screw the housing cover back in to ensure electrical safety and to protect internal parts from environmental influences.



**If the ambient parameters are greater than the set switching values, the NO operating circuit is already closed during installation.**

### **8.4.2 Differential pressure switch model D7 (high pressure measuring range)**

The adjustment screw (7/8 inch) for the switching point is located centrally in the bottom of the housing.

The direction of rotation is indicated on a sticker in the switch housing.

The following is a typical calibration procedure:

|                                    |   |
|------------------------------------|---|
| Static Working Pressure            | - 600 psig (40 bar)                               |
| Adjustable differential range      | - 0.3/14 bar (5/200 psid)                         |
| Differential pressure switch point | - 150 psi (10 bar) above static working pressure. |

Increase the pressure on the negative and positive side simultaneously to 40 bar. Maintain the pressure on the negative side at 40 bar. Increase the pressure on the positive side to 50 bar to obtain a differential of 10 bar.

Turn the adjusting screw until the switch switches at 10 bar differential pressure. Once the switching point is reached, raise and lower the pressure on the positive side to check the switching point.

After setting the switch, screw the housing cover back in to ensure electrical safety and to protect internal parts from environmental influences.

### **8.4.3 Differential pressure switch model D7 (low pressure measuring range)**

The adjustment screw (7/8 inch) for the switching point is located centrally in the bottom of the housing.

The direction of rotation is indicated on a sticker in the switch housing. For precise switch point adjustment, the switch must be mounted on a calibration stand to obtain the desired pressures under operating conditions. For each pressure you need a suitable reference standard.



**Since these switches are extremely sensitive, the volume on the negative side must be large to avoid a switch point shift between calibration and field installation. If this is not possible, a switch point similar to that under operating conditions can be obtained by leaving the negative side open to the atmosphere during adjustment. After installation, the final setting of the switching point can be made.**

Approach the pressure on the negative side. Then increase the pressure on the positive side to the desired switching point and turn the adjusting screw until the switch switches. Once the switch point is reached, raise and lower the pressure on the positive side to control the differential pressure between the positive and negative sides.

After setting the switch, screw the housing cover back in to ensure electrical safety and to protect internal parts from environmental influences.

#### 8.4.4 Temperature switch model T7

The adjustment screw ( $\frac{7}{8}$  inch) for the switching point is located centrally in the bottom of the housing.

The probe of the switch must be immersed in a bath at the desired switching point temperature. The highest accuracy is achieved when the probe is fully immersed. Wait five minutes for the system to thermodynamically stabilize.

If no switching point is specified when ordering, the temperature switch is usually set at the factory to approximately 90% of the specified measuring range. After stabilization, turn the adjustment screw until the switch switches. The direction of rotation is indicated on a sticker in the switch housing. Once the switching point is reached, raise and lower the temperature to check the switching point.

After setting the switch, screw the cover back in to ensure electrical safety and protect internal parts from environmental influences.

#### 8.4.5 B750, D750 and T750 - Switch with adjustable reset value

To adjust the reset value, turn the dial on the precision microswitch. Viewed from the front of the housing, turn to the left to increase the reset value and to the right to decrease it. The letters on the dial can be used as a guide. Achievable reset values can be between 0.5 % and 9 % of the pressure or temperature range, depending on the measuring range and diaphragm type.

Switch Point Adjustment - The factory default setting for the switch is approximately 90% of range. Turn the adjustment dial on the microswitch fully clockwise to obtain the smallest switchback value. Apply pressure or raise the bath temperature to the desired switch point and turn the adjustment screw until the switch operates. Lower the pressure or temperature to reset the switch. Turn the adjustment dial on the microswitch until the desired reset value is reached. The upper switch point is increased by this adjustment. Lower the pressure/temperature to reset the switch. Then raise the pressure/temperature to the desired switch point and turn the adjustment screw until the switch operates. Lower the pressure/temperature and check the reset value and reset differential.

### 8.5 Changes to the installation site



**Do not dismount the switch from one measuring point and mount it at another. There is a risk of mixing media with unpredictable chemical reactions.**

## 9 Maintenance



**All maintenance or inspection work must be carried out in accordance with IEC 60079-17.**

All ASHCROFT switches are virtually or completely maintenance free.

- Ensure that the enclosure remains closed at all times to ensure IP and ignition protection.
- If the switch is exposed to process media that may harden and/or accumulate in the pressure port, the switch may need to be removed and cleaned.

However, in order to ensure reliable operation and a long service life of the device, we recommend that the device be checked regularly.

During maintenance work, no potentially explosive atmospheres may be present in the vicinity of the Ex device, the process lines must be depressurized, in the case of temperature switches, the temperature sensors must cool down to ambient temperature, the electrical connections must be disconnected from the power supply and the system must be secured against being switched on again.

### 9.1 Functional check and recalibration

The function check and recalibration is carried out at regular intervals depending on the application. The exact test cycles are to be adapted to the operating and ambient conditions. When various device components interact, the operating instructions of all other devices must also be observed.

- Verification of the function in conjunction with other components in the process.

- Check the pressure connection lines for leaks.
- Checking the electrical connections.
- Remove any dust deposits
- Checking the legibility of the nameplate
- Possible damage to the housing or the earths

## 9.2 Cleaning and maintenance

Cleaning is carried out with a non-aggressive cleaning agent and a damp, soft cloth to avoid electrostatic charging. In the same work process, care can be taken to detect possible damage to the device at an early stage. If damage is detected, the device should be handed over to the manufacturer's service department immediately.

## 10 Malfunctions



**All defective or deficient equipment shall be taken out of service in accordance with ISO 60079-19.**

Defective or defective switches endanger the operational and process safety of the plant and can lead to danger or damage to persons, the environment or the plant.

### 10.1 Fault table

| Malfunctions  | Possible causes                            | Possible measures  |
|---|--|--|
| Switching point shift and impermissible reset value     | Vibrations of the plant                    | Check mounting errors and installation location.<br>Decoupling plant --- device<br>Readjust device or replace if necessary |
| Random switch function                                  | Damage in transit or external rough impact | Replacement of the device,<br>Repair is usually no longer possible.  |
| Corrosion at the process connection and at the membrane | Incompatible medium                        | Check installation location and replace device   |
| Leakage of process media                                | Seal not perfect                           | Errors during assembly   |
| Immersion tube or sensor bent                           | Errors during assembly                     | Replace device   |
| Sharp-edged bent capillary line                         | Errors during assembly                     | Replace device   |
| Damage to housing or cables                             |  | Repair by the manufacturer,<br>Replace device  |

### 10.2 Behaviour after rectification of the fault

- See chapter 8.3 Assembly/installation

## 11 Dismantling & disposal

### 11.1 Disassembly

- During maintenance work on the device, the lines must be depressurized, the electrical connections disconnected from the power supply and the system secured against being switched on again.
- Remove the switch with a suitable tool.



**Residual media in and on removed switches can endanger people, the environment and equipment. Sufficient precautionary measures must be taken. If necessary, clean the devices thoroughly (see instructions in the safety data sheets).**



## 11.2 Disposal



At the end of the product life cycle, do not dispose of this product with your normal household waste. Take this product to a collection point or waste management facility for recycling of the components.

With the help of the product coding and our data sheets (see appendix 12.1 available on our website) you will receive the necessary information about the materials to be able to carry out a material separation yourself. Our devices described in this manual are mainly made of aluminium (optionally stainless steel) which can be recycled. The switching contact can be removed from the mounting plate and disposed of accordingly. Then the aluminium anti-twist device at the cable entry can be dismantled and recycled. The now removable cable gland and the blind plug are made of stainless steel.

Materials to be recycled:

- Aluminium (housing, cover, anti-rotation device)
- Stainless steel (cable gland and dummy plug, optionally housing and cover)
- Seals

Please help to protect our environment!



Some of the product materials can be reused if you take the product to a collection point or a waste management company. By reusing some parts or raw materials from used products, you are making an important contribution to protecting the environment.

Our products are delivered in optimized packaging. This essentially means that materials are used that can be recycled as secondary raw materials at the local disposal service. For more information on the disposal of packaging, please contact your local authority.

## 12 Appendix







### 12.1 Data sheet for switches B7, D7 and T7

Detailed data sheets are available directly from the manufacturer (see chapter 1.6 Manufacturer's address, customer service).

The following table contains an overview of the individual documents.

| Model | Description                                   | Document      |
|-------|---|---------------|
| B7    | Pressure switch series B4 and B7              | DS BDH Series |
| D7    | Differential pressure switch series D4 and D7 | DS BDH Series |
| T7    | Temperature switch series T4 and T7           | G4.SW10-T     |

## 12.2 EU Declaration of Conformity

|   |   |
|---|---|
| <br>Trust the shield.®   | <b>EU-Konformitätserklärung</b><br><b>EU-Declaration of Conformity</b><br>EN ISO / IEC 17050-1:2010   |
| <b>Ashcroft Instruments GmbH</b><br>Max-Planck-Straße 1-9<br>52477 Alsdorf  |   |
| erklärt in alleiniger Verantwortung, dass die mit CE gekennzeichneten Produkte<br><i>declares in sole responsibility that the products marked with CE</i>   |   |
| Gerät:<br><i>Equipment:</i>   | Druck- / Temperaturschalter vom Typ B7/D7/T7<br>die mittels Wegänderung einen Mikroschalter betätigten.<br><i>Pressure- / Temperature switch, using a micro switch actuated<br/>by movement of a piston cylinder unit.</i>  |
| Kennzeichnung:<br><i>Marking:</i>   | SIRA 04 ATEX 2081X / IECEx SIR 16.0018X   |
|  2813  II 1GD<br>Ex ia IIC T4 Ga<br>Ex ia IIIC T135° C Da<br>Ta= -20°C to +60°C   |   |
| Herstellungsdatum:<br><i>Date of manufacture:</i>   | ab 20.11.2024<br><i>from 20<sup>th</sup> of November 2024</i>   |
| die grundlegenden Sicherheits- und Schutzanforderungen erfüllen, in Übereinstimmung mit den unten genannten Richtlinien und Normen. Die Konformitätsaussage bezieht sich auf die Konzeption und Fertigung der oben genannten Produkte.<br><i>the fundamental safety and protection requirements passed in accordance with the guidelines and standards listed below. This declaration of conformity refers to the design and manufacture of the above products.</i> |   |
| Richtlinie<br><i>Directive</i>  | 2014/34/EU „Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen“<br><i>“equipment and protective systems intended for use in potentially explosive atmospheres”</i>   |
| Harmonisierte Normen<br><i>Used harmonized Standards</i>  | EN IEC 60079-0:2018, EN 60079-11:2012   |
| Benannte Stelle 2813<br><i>Notification Body 2813</i>   | CSA Group Netherlands B.V.<br>Utrechtseweg 310 (B42)<br>6812AR Arnhem, Netherlands  |
| Bericht zur Bewertung<br><i>Assessment Report</i>   | R80111264A  |
| Richtlinie<br><i>Directive</i>  | 2014/35/EU „Niederspannungsrichtlinie“<br><i>“Electrical equipment designed for use within certain voltage limits”</i>  |
| Harmonisierte Normen<br><i>Used harmonized Standards</i>  | IEC 61010-1:2010 + COR:2011<br>EN 60947-7-1 to 3:2010   |
| Richtlinie<br><i>Directive</i>  | <sup>(1)</sup> 2014/68/EU „Druckgeräterichtlinie“<br><i>“Pressure Equipment Directive”</i>  |
| <sup>(1)</sup> PS >200 bar und V <0,1l, Artikel 4 Drucktragende Ausrüstungsteile, Modul A<br><i>PS &gt;200 bar and V &lt;0,1l, Article 4 Pressure Accessories, Module A</i>   |   |
| Richtlinie<br><i>Directive</i>  | 2011/65/EU „Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten“<br><i>“Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment”</i><br>2015/863/EU „Änderung von Anhang II der Richtlinie 2011/65/EU“<br><i>“Amending Annex II to Directive 2011/65/EU”</i> |
| Bewertung<br><i>Evaluation</i>  | Das oben benannte Produkt erfüllt die Anforderungen der derzeit gültigen EU Richtlinien.<br><i>The above-mentioned product comply with the currently valid provisions of EU Directive.</i>  |
| Alsdorf, den 18.11.2024<br>Ort und Datum<br><i>Place and date</i>   | <br>ATEX Verantwortlicher<br>ATEX Manager   |
| Digitale Ausführungen nur mit validierter Unterschrift gültig. Die gültige Validierung ist in einem unveränderten Dokument enthalten.<br><i>Digital executions valid only with validated signature. The valid validation is included in an unmodified document.</i>   |   |
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