BD-Sensors-Str.1; 95199 Thierstein, Germany
Phone: +49 (0) 92 35 98 11 0 | www.bdsensors.com

# Operating Manual

Pressure transmitters / screw-in transmitters for IS-areas

DX14-DMK 351, DX14-DMK 351 P, DX14-LMK 351,
DX14B-DMK 387,
DX19-DMK 331, DX19-DMK 331 P, DX19-DMP 311,
DX19-DMP 321, DX19-DMP 331, DX19-DMP 331 i,
DX19-DMP 331 P, DX19-DMP 331 Pi, DX19-DMP 333,
DX19-DMP 333 i, DX19-DMP 334, DX19-DMP 335,
DX19-DMP 339, DX19-DMP 343, DX19-LMK 331,
DX19-LMP 331, DX19-LMP 331i, DX19-17.600G,
DX19-17.605G, DX19-26.600G

DX19-DMP 331

DMP 331P

74-



**READ THOROUGHLY BEFORE USING THE DEVICE**
**KEEP FOR FUTURE REFERENCE**

ID: BA_DMU-ES_EX_E | Version: 12.2018.0

## 1. General and Safety-Related Information on this Operating Manual

This operating manual enables safe and proper handling of the product, and forms part of the device. It should be kept in close proximity to the place of use, accessible for staff members at any time.

All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information.

**The following documents are an important part of the operating manual:**

- *Data sheet*
- *Type-examination certificate*

For specific data on the individual device, please refer to the respective data sheet.

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phone: +49 (0) 92 35 98 11 0

The IS versions of our products are variants of the standard products.

Example:

Standard: DMK 351 → IS version: DX14-DMK 351

In addition, the applicable accident prevention regulations, safety requirements, and country-specific installation standards as well as the accepted engineering standards must be observed.

For the installation, maintenance and cleaning of the device, the relevant regulations and provisions on explosion protection (VDE 0160, VDE 0165 and/or EN 60079-14) as well as the accident prevention regulations must absolutely be observed. The device was designed by applying the following standards:

DX14: EN60079-0:2012+A11:2013
EN60079-11-2012
EN60079-26:2007

DX14B: EN60079-0:2018
EN60079-11:2012

DX19: EN60079-0:2012+A11:2013
EN60079-11-2012

IEC 60079-0: 2011 Edition 6
IEC 60079-11: 2011 Edition 6
IEC 60079-26: 2006 Edition 2

### 1.1 Symbols Used

| | |
|---|---|
| **Warning word** | - Type and source of danger<br>- Measures to avoid the danger |

| Warning word | Meaning |
|---|---|
| **DANGER** | - Imminent danger!<br>- Non-compliance **will result in** death or serious injury. |
| **WARNING** | - Possible danger!<br>- Non-compliance **may result in** death or serious injury. |
| **CAUTION** | - Hazardous situation!<br>- Non-compliance **may result in** minor or moderate injury. |

**NOTE** - draws attention to a possibly hazardous situation that may result in property damage in case of non-compliance.

✓ Precondition of an action

### 1.2 Staff Qualification

**Qualified persons** are persons that are familiar with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the product and have the appropriate qualification for their activity.

This includes persons that meet at least one of the following three requirements:

- They know the safety concepts of metrology and automation technology and are familiar therewith as project staff.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.
- They are commissioning specialists or are employed in the service department and have completed training that qualifies them for the repair of the system. In addition, they are authorized to put into operation, to ground, and to mark circuits and devices according to the safety engineering standards.

All work with this product must be carried out by qualified persons!

### 1.3 Intended Use

The devices are used to convert the physical parameter of pressure into an electric signal.

The **pressure transmitter** are exclusively suited for measuring positive, negative and absolute pressures.

The **screw-in transmitters** are exclusively suited to filling-level and process measuring technology.

This operating manual applies to devices with explosion protection approval and is intended for the use in IS-areas. A device has an explosion-protection approval if this was specified in the purchase order and confirmed in our order acknowledgement. In addition, the manufacturing label includes a Ex sign.

The user must check whether the device is suited for the selected use. In case of doubt, please contact our sales department: info@bdsensors.de | phone: +49 (0) 92 35 98 11 0

BD|SENSORS assumes no liability for any wrong selection and the consequences thereof!

Permissible media are gases or liquids, which are compatible with the media wetted parts described in the data sheet.

The technical data listed in the current data sheet are engaging and must absolutely be complied with. If the data sheet is not available, please order or download it from our homepage: http://www.bdsensors.com

| | |
|---|---|
| **WARNING** | **Danger through incorrect use**<br>- In order to avoid accidents, use the device only in accordance with its intended use. |

### 1.4 Limitation of Liability and Warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, and alteration of or damage to the device will result in the forfeiture of warranty and liability claims.

### 1.5 Safe Handling

**NOTE** - Treat the device with care both in the packed and unpacked condition!

**NOTE** - The device must not be altered or modified in any way.

**NOTE** - Do not throw or drop the device!

**NOTE** - Excessive dust accumulation (over 5 mm) and complete coverage with dust must be prevented!

**NOTE** - The device is state-of-the-art and is operationally reliable. Residual hazards may originate from the device if it is used or operated improperly.

### 1.6 Safety-Related Maximum Values

**DX14- / DX14B-… / IECEx IBE 18.0019X:**

$U_i$ = 28 V, $I_i$ = 93 mA, $P_i$ = 660 mW, $C_i$ = 27 nF/49,2 nF/14 nF, $L_i$ = 5 µH; $C_{gnd}$ = 27 nF/100 nF
plus cable inductivities 1 µH/m and
cable capacities 160 pF/m (for cable by factory)

application in zone 0 ($p_{atm}$ 0.8 bar up to 1.1 bar): -20 ... 60 °C
DX14: application in zone 1 and higher: -25 ... 70 °C
DX14B: application in zone 1 and higher: -25 ... 65 °C

devices with temperature class T6: -25 … 60°C

**DX19-…:**

$U_i$ = 28 V; $I_i$ = 93 mA; $P_i$ = 660 mW; $C_i \approx 0$ nF; Li ≈ 0 µH;
27 nF opposite GND;
plus cable inductivities 1 µH/m and
cable capacities 160 pF/m (for cable by factory)

application in zone 0 ($p_{atm}$ 0.8 bar up to 1.1 bar): -20 ... 60 °C
application in zone 1 and higher: -40/-20 ... 70 °C

application in zone 1 and higher for ***type DX19- *** i***: -40/-20 ... 65 °C

### 1.7 Scope of Delivery

Check that all parts listed in the scope of delivery are included free of damage, and have been delivered according to your purchase order:

- pressure transmitter or screw-in transmitter
- for mechanical pressure ports DIN 3852: O-ring (pre-mounted)
- this operating manual
- in case of SIL2 version: functional safety manual, safety data sheet

### 1.8 UL Approval (for Devices with UL Marking)

The UL approval was effected by applying the US standards, which also conform to the applicable Canadian standards on safety.

Observe the following points so that the device meets the requirements of the UL approval:

- The device must be operated via a supply with energy limitation (acc. to UL 61010) or an NEC Class 2 energy supply.
- Maximum operating range: see data sheet

## 2. Product Identification

The device can be identified by means of the manufacturing label with order code. The most important data can be gathered therefrom.

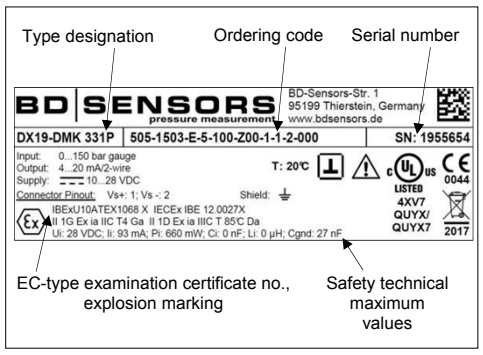



*Fig. 1: Manufacturing label*

**NOTE** - The manufacturing label must not be removed!

**The marking for devices with explosion-protection approval has to include following information:**

**DX 14:**
EC-type examination certificate **IBExU05ATEX1070 X**
explosion marking:
**II 1G, II 1/2G or II 2G Ex ia IIC/IIB T6/T4 Ga, Ga/Gb or Gb**
**II 1D Ex ia IIIC T85°C Da**

**DX 14B:**
EG-Baumusterprüfbescheinigung **IBExU15ATEX1066 X**
**II 1G Ex ia IIB T4 Ga/II 2G Ex ia IIC T4 Gb**
**II 1D Ex ia IIIC T135 °C Da**

**DX 19:**
EC-type examination certificate **IBExU10ATEX1068 X**
marking:
non-metallic pressure port: **II 2G Ex ia IIC T4 Gb**
**II 2D Ex ia IIIC T85°C Db**
metallic pressure port: **II 1G Ex ia IIC T4 Ga**
**II 1D Ex ia IIIC T85°C Da**

## 3. Mounting

### 3.1 Mounting and Safety Instructions

| | |
|---|---|
| **DANGER** | **Danger of death from explosion, airborne parts, leaking fluid, electric shock**<br>- Always mount the device in a depressurized and de-energized condition!<br>- Do not install the device while there is a risk of explosion. |
| **DANGER** | **Danger of death from explosion**<br>- Explosion hazard due to high-charging processes in connection with free-hanging submersible transmitters with cable FEP<br>- Fixed installation of the FEP cable! |

**NOTE** - The technical data listed in the EC-type examination certificate are binding. Download this by accessing www.bdsensors.com or request it by e-mail or phone: info@bdsensors.de | phone: +49 (0) 92 35 98 11 0

**NOTE** - Make sure that the entire interconnection of intrinsically safe components remains intrinsically safe. The owner-operator is responsible for the intrinsic safety of the overall system (entire circuitry).

**NOTE** - If there is increased risk of damage to the device by lightning strike or overvoltage, increased lightning protection must additionally be provided!

**NOTE** - Treat any unprotected diaphragm with utmost care; this can be damaged very easily.

**NOTE** - Provide a cooling line when using the device in steam piping.

**NOTE** - When installing the device, avoid high mechanical stresses on the pressure port! This will result in a shift of the characteristic curve or to damage, in particular in case of very small pressure ranges and devices with a pressure port made of plastic.

**NOTE** - In hydraulic systems, position the device in such a way that the pressure port points upward (ventilation).

**NOTE** - If the device is installed with the pressure port pointing upwards, ensure that no liquid drains off on the device. This could result in humidity and dirt blocking the gauge reference in the housing and could lead to malfunctions. If necessary, dust and dirt must be removed from the edge of the screwed joint of the electrical connection.

**NOTE** - Do not remove the packaging or protective caps of the device until shortly before the mounting procedure, in order to exclude any damage to the diaphragm and the threads!

Protective caps must be kept! Dispose of the packaging properly!

**NOTE** - The specified tightening torques must not be exceeded!

**NOTES - for mounting outdoors or in a moist environment:**

- Please note that your application does not show a dew point, which causes condensation and can damage the pressure transmitter. There are specially protected pressure transmitters for these operating conditions. Please contact us in such case.
- Connect the device electrically straightaway after mounting or prevent moisture penetration, e.g. by a suitable protective cap. (The ingress protection specified in the data sheet applies to the connected device.)
- Select the mounting position such that splashed and condensed water can drain off. Stationary liquid on sealing surfaces must be excluded!
- If the device has a cable outlet, the outgoing cable must be routed downwards. If the cable needs to be routed upwards, this must be done in an initially downward curve.
- Mount the device such that it is protected from direct solar radiation. In the most unfavourable case, direct solar radiation leads to the exceeding of the permissible operating temperature. This must be excluded if the device is used in any explosion-hazardous area!
- For devices with gauge reference in the housing (small hole next to the electrical connection), install the device in such a way, that the gauge reference is protected from dirt and moisture. Should the device be exposed to fluid admission, the functionality will be blocked by the gauge reference. An exact measurement in this condition is not possible. Furthermore this can lead to damages on the device.

### 3.2 Conditions for Devices with 3-A Symbol

The device or its connecting piece must be installed in such a way that the surfaces are self-draining. Make sure that the welding socket is mounted flush inside the tank.

The user is responsible for:

- the correct size of the seal and the choice of an elastomeric sealing material that complies with the 3-A standard
- defining adequate service intervals

### 3.3 Conditions for Oxygen Applications

| | |
|---|---|
| **DANGER** | **Danger of death from explosion**<br>- when used improperly |

Make sure that your device was ordered for oxygen applications and delivered accordingly. (see manufacturing label - ordering code ends with the numbers "007")

Unpack the device directly prior to the installation.

Skin contact during unpacking and installation must be avoided to prevent fatty residues remaining on the device.
Wear safety gloves!

The entire system must meet the requirements of BAM (DIN 19247)!

For oxygen applications > 25 bar, devices without seals are recommended.

Transmitters with o-rings of FKM (Vi 567):
permissible maximum values: 25 bar / 150° C (BAM approval)

### 3.4 Mounting Steps for Connections According to DIN 3852

**NOTE** - Do not use any additional sealing material such as yarn, hemp or Teflon tape!

✓ The O-ring is undamaged and seated in the designated groove.

✓ The sealing face of the mating component has a flawless surface. ($R_Z$ 3.2)

1 Screw the device into the corresponding thread by hand.
2 Devices equipped with a knurled ring: only tighten by hand
3 Devices with a spanner flat must be tightened using a suitable open-end wrench.
- Wrench flat made of steel:
G1/4": approx. 5 Nm G1/2": approx. 10 Nm
G3/4": approx. 15 Nm G1": approx. 20 Nm
- Wrench flat made of plastic: max. 3 Nm

### 3.5 Mounting Steps for Connections According to EN 837

✓ A suitable seal for the medium and the pressure to be measured is available. (e.g. a copper seal)

✓ The sealing face of the mating component has a flawless surface. ($R_Z$ 6.3)

1 Screw the device into the corresponding thread by hand.
2 Then tighten it using an open-end wrench: G1/4": approx. 20 Nm; G1/2": approx. 50 Nm

**NOTE** - permitted pressure ranges according to EN 837

| | | |
|---|---|---|
| G1/4" EN 837 | $P_N \leq$ 600 bar | Counterpart has to be of steel according to DIN 17440 with strength $R_p$ 0.2 ≥ 190 N/mm² |
| G1/2" EN 837 | $P_N \leq$ 1000 bar | |
| G1/4" EN 837 | $P_N >$ 600 bar, $P_N \leq$ 1000 bar | Counterpart has to be of steel according to DIN 17440 with strength $R_p$ 0.2 ≥ 260 N/mm² |
| G1/2" EN 837 | $P_N >$ 1000 bar, $P_N \leq$ 1600 bar | |

### 3.6 Mounting Steps for NPT Connections

✓ Suitable fluid-compatible sealing material, e.g. PTFE tape, is available.

1 Screw the device into the corresponding thread by hand
2 Then tighten it using an open-end wrench: 1/4" NPT: approx. 30 Nm; 1/2" NPT: approx. 70 Nm

### 3.7 Mounting Steps for Internal Threads M20x1.5 and 9/16" UNF (for High-Pressure Devices)

| | |
|---|---|
| **WARNING** | **Danger of injury**<br>- Due to wrong installation<br>- Do not use any seal! |

**NOTE** - The high-pressure tube will seal metal-to-metal in the chamfer of the pressure port. (sealing cone 60°)

1 Screw the high-pressure fitting into the internal thread of the pressure transmitter.

2 Then tighten it using an open-end wrench. The required tightening torque depends on the manufacturer's specifications for the high-pressure pipe you are using. (permissible tightening torque for pressure transmitter: max 120 Nm)

### 3.8 Mounting Steps for Dairy Pipe Connections

✓ The O-ring is undamaged and seated in the designated groove.

1 Centre the dairy pipe connection in the counterpart.
2 Screw the cup nut onto the mounting part.
3 Then tighten it using a hook wrench.

### 3.9 Mounting Steps for Clamp and Varivent® Connections

✓ A suitable seal for the measured fluid and the pressure to be measured is available.

✓ Chapter "3.2 Conditions for devices with 3-A symbol" was noticed.

1 Place the seal onto the corresponding mounting part.

2 Centre the clamp connection or Varivent® connection above the counterpart with seal.

3 Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions

### 3.10 Mounting Steps for Flange Connections

✓ A suitable seal for the measured fluid and the pressure to be measured is available. (e.g. a fiber seal)

1 Put the seal between connecting flange and counter flange
2 Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

## 4. Electrical Connection

### 4.1 Connection and Safety Instructions

| | |
|---|---|
| **DANGER** | **Danger of death from electric shock or explosion**<br>- Explosion hazard if the operating voltage is too high (max. 28 $V_{DC}$) or by opening the field housing while an explosion hazard exists.<br>- Always mount the device in a depressurized and de-energized condition!<br>- Do not install the device while there is a risk of explosion.<br>- Operate the device only within the specification! (data sheet) |

✓ The limit values listed in the EC-type examination certificate are observed. (Capacity and inductance of the connection cable are not included in the values.)

✓ The supply corresponds to protection class III (protective insulation).

**NOTE** - If the device is equipped with a **cable gland** or **cable socket,** it must be ensured that the external diameter of the cable used is within the permissible clamping range. (cable gland M12x1.5 cable Ø 3 – 6.5 mm, cable socket ISO 4400 cable Ø 4.5 - 10 mm). Moreover you have to ensure that it lies in the cable gland firmly and cleftlessly!

**NOTE** - for devices with **cable outlet**
- When routing the cable, following bending radiuses have to be complied with:
cable without ventilation tube:
static installation: 5-fold cable diameter
dynamic application: 10-fold cable diameter
cable with ventilation tube:
static installation: 10-fold cable diameter
dynamic application: 20-fold cable diameter
- In case of devices with **cable outlet** and integrated ventilation tube, the PTFE filter located at the cable end on the air tube must neither be damaged nor removed! Route the end of the cable into an area or suitable connection box which is as dry as possible and free from aggressive gases, in order to prevent any damage.

**NOTE** - When devices with **ISO 4400 or Buccaneer connector** are used, the cable socket must be properly mounted so that the ingress protection specified in the data sheet is ensured! Ensure that the delivered seal is placed between plug and cable socket. After connecting the cable, fasten the cable socket on the device by using the screw.

**NOTE** - On devices with **field housing**, the terminal clamps are situated under the metal cap. To install the device electrically, the cap must be screwed off. Before the cap is screwed on again, the O-ring and the sealing surface on the housing have to be checked for damages and if necessary to be changed! Afterwards screw the metal cap on by hand and make sure that the field housing is firmly locked again.

**NOTE** - For a clear identification, the intrinsically safe cables are marked with light blue shrink tubing (over the cable insulation). If the cable has to be modified (e. g. shortened) and the marking at the cable end has been lost in the process, it must be restored (for example, by marking it again with light blue shrink tubing or an appropriate identification sign).

**NOTE** - Use a shielded and twisted multicore cable for the electrical connection.

### 4.2 Conditions for the IS-area

**Danger generated by electrostatic charging**

| | |
|---|---|
| **DANGER** | **Danger of death from explosion**<br>- Explosion hazard due to spark formation from electrostatic charging of plastic components.<br>- For devices with cable outlet, the cable must be installed tightly.<br>- Do not clean the device and, if applicable, the connection cable, in a dry state! Use a moist cloth, for example. |

The following warning sign is affixed on devices with plastic components.

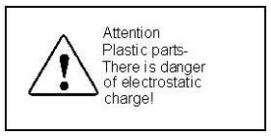



*Fig. 2: Warning sign*

**NOTE** - The warning sign must not be removed from the device!

**Particularity for TRIM TRIO® connector (code 5T2)**

For devices with TRIM TRIO® connector by SOURIAU, the use in explosion-hazardous areas is restricted. This design type can be identified by the code "5T2" in the "Electrical Connection" segment of the order code. The identification on the manufacturing label of the device as well as the order documents provide information on the approved areas of application.

**Overvoltage protection**

If the pressure transmitter is used as electrical equipment of category 1 G, then a suitable overvoltage protection device must be connected in series (attend the valid regulations for operating safety as well as EN60079-14).

**Schematic circuit**

The operation of an intrinsically safe transmitter in intrinsic safe areas requires special care when selecting the necessary Zener barrier or transmitter repeater devices to allow the utilization of the device's properties to the full extent. The following diagram shows a typical arrangement of power supply, Zener barrier and transmitter.

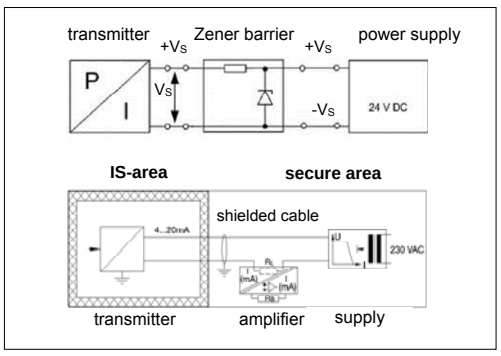



*Fig. 3 circuit diagrams*

**NOTE** - Observe item (17) of the type-examination certificate which specifies special conditions for intrinsically safe operation.

**Exemplary circuit description**

The supply voltage of e.g. 24 $V_{DC}$ provided by the power supply is led across the Zener barrier. The Zener barrier contains series resistances and breakdown diodes as protective components. Subsequently, the operating voltage is applied to the transmitter and, depending on the pressure, a particular signal current flows.

| | |
|---|---|
| **DANGER** | **Danger of death from explosion**<br>- Operation of intrinsically safe devices as zone-0 equipment only with ungrounded and galvanically isolated power supply. |

**Functional selection criteria for Zener barriers and galvanic power supply**

The minimum supply voltage $V_{S\ min}$ of the transmitter must not fall short since a correct function of the device can otherwise not be guaranteed. The minimum supply voltage has been defined in the respective product-specific data sheet under "Output signal / supply".

When using a galvanically insulated amplifier with linear bonding, note that the terminal voltage of the transmitter will decrease like it does with a Zener barrier. Furthermore, you have to note that the supply will additionally decrease with an optionally used signal amplifier.

**Test criteria for the selection of the Zener barrier**

In order not to fall below $V_{S\ min}$, it is important to verify which minimum supply voltage is available at full level control of the transmitter. The full level control, i.e. a maximum or nominal output signal (20 mA), can be reached by applying the maximum physical input signal (pressure).

The technical data of the barrier will usually provide the information needed for the selection of the Zener barrier. However, the value can also be calculated. If a maximum signal current of 0.02 A is assumed, then – according to Ohm's law – a particular voltage drop will result from the series resistance of the Zener barrier.

This voltage drop is subtracted by the voltage of the power supply and as a result, the terminal voltage is obtained which is applied on the transmitter at full level control. If this voltage is smaller than the minimum supply voltage, another barrier or a higher supply voltage should be chosen.

**NOTE** - When selecting the ballasts, the maximum operating conditions according to the EC type-examination certificate must be observed. When assessing these, refer to their current data sheets to ensure that the entire interconnection of intrinsically safe components remains intrinsically safe.

**Calculation example for the selection of the Zener barrier**

The nominal voltage of the power supply in front of the Zener barrier is 24 $V_{DC}$ ± 5 %. This results in:

- maximum supply voltage:

  $V_{Sup\ max}$ = 24 V * 1.05 = 25.2 V

- minimum supply voltage:

  $V_{Sup\ min}$ = 24 V * 0.95 = 22.8 V

The series resistance of the Zener barrier is listed with 295 ohm. The following values must still be calculated:

- voltage drop at the barrier (with full conduction):

  $V_{ab\ barrier}$ = 295 Ω * 0.02 A = 5.9 V

- terminal voltage at the transmitter with Zener barrier:

  $V_{KI} = V_{S\ up\ min} – V_{ab\ Barriere}$ = 22.8 V – 5.9 V = 16.9 V

- minimum supply voltage of the transmitter (according to data sheet):

  $V_{KI\ min}$ = 12 $V_{DC}$ (corresponding to $V_{S\ min}$)

Condition:

$V_{KI} \geq V_{KI\ min}$

Result:

The terminal voltage of the transmitter with Zener barrier lies at 16.9 V and is therefore higher than the minimum supply voltage of the transmitter which lies at 12 $V_{DC}$. This means, the Zener barrier has been selected correctly regarding the supply voltage.

**NOTE** - Note that no line resistances have been listed in this calculation. However, these will lead to an additional voltage drop that must be taken into account.

### 4.3 Electrical Installation

Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

*Pin configuration:*

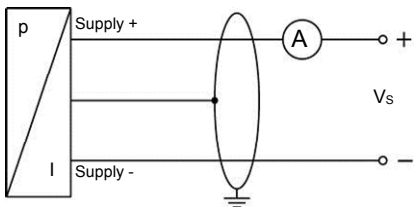
| Electrical connections | ISO 4400 | Binder 723 (5-pin) | M12x1 (4-pin) |
|---|---|---|---|
| Supply +<br>Supply – | 1<br>2 | 3<br>4 | 1<br>2 |
| Shield | ground contact | 5 | 4 |

| Electrical connections | Buccaneer (4-pin) | TRIM TRIO® (4-pin) |
|---|---|---|
| Supply +<br>Supply – | 1<br>2 | 1<br>2 |
| Shield | 4 | 4 |

| Electrical connections | Bayonet MIL-C-26482 (10-6) |
|---|---|
| Supply +<br>Supply – | A<br>B |
| Shield | pressure port |

| Electrical connections | Field housing | Cable colours (IEC 60757) |
|---|---|---|
| Supply +<br>Supply – | IN +<br>IN - | wh (white)<br>bn (brown) |
| Shield | ⏚ | gnye (green-yellow) |

*Wiring diagram:*




## 5. Commissioning

| | |
|---|---|
| **DANGER** | **Danger of death from explosion**<br>- Explosion hazard if the operating voltage is too high (max. 28 $V_{DC}$)!<br>- Operate the device only within the specification! (according to data sheet) |

✓ The device has been installed properly.

✓ The device does not have any visible defect.

✓ The device is operated within the specification. (see data sheet and EC-type examination certificate)

**In case of highly precise devices** with an accuracy of 0.1 % FSO, a microcontroller-controlled electronic system is used for signal processing. This electronic system is used for signal improvement. Due to the principle, the processing of measured values requires a longer time than with purely analogue sensors, which only comprise amplification circuitry. Due to the longer processing time, the output signal follows the measured value not continuously but in jumps. In case of relatively stable and slowly changing measured values, this property plays a minor role. Compare this with the information on the adjusting time in the data sheet.

**In the case of i-devices** with optional communication interfaces can also be configured by these electronics. Offset, span and damping are programmable within the limits given in the data sheet. For configuring the device, the programming kit CIS 510 consisting of Adapt 1, Windows® compatible programming software P-Scale 510, power supply and connecting cable is necessary. This can be ordered additionally from BD SENSORS.

## 6. Maintenance

| | |
|---|---|
| **DANGER** | **Danger of death from airborne parts, leaking fluids, electric shock**<br>- Always service the device in a depressurized and de-energized condition! |
| **WARNING** | **Danger of injury from aggressive fluids or pollutants**<br>- Depending on the measured medium, this may constitute a danger to the operator.<br>- Wear suitable protective clothing e.g. gloves, safety goggles. |

If necessary, clean the housing of the device using a moist cloth and a non-aggressive cleaning solution.

The cleaning medium for the media wetted parts (pressure port/ diaphragm/seal) may be gases or liquids which are compatible with the selected materials. Also observe the permissible temperature range according to the data sheet.

Permitted cleaning temperature for flush mounted 3A / EHEDG certified pressure ports:

acids / bases: max. 70 ° C
steam: max. 150 ° C / 60 min

Deposits or contamination may occur on the diaphragm/ pressure port in case of certain media. Depending on the quality of the process, suitable maintenance intervals must be specified by the operator. As part of this, regular checks must be carried out regarding corrosion, damage to the diaphragm and signal shift.

If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please note the chapter "Service/Repair" below.

**NOTE –** Wrong cleaning or improper touch may cause an irreparable damage on the diaphragm. Therefore, never use pointed objects or pressured air for cleaning the diaphragm

## 7. Troubleshooting

| | |
|---|---|
| **DANGER** | **Danger of death from airborne parts, leaking fluids, electric shock**<br>- If malfunctions cannot be resolved, put the device out of service (proceed according to chapter 8 up to 10) |
| **DANGER** | **Danger of death from explosion**<br>- As a matter of principle, work on energized parts, except for intrinsically safe circuits, is prohibited while there is an explosion hazard. |

In case of malfunction, it must be checked whether the device has been correctly installed mechanically and electrically. Use the following table to analyse the cause and resolve the malfunction, if possible.

| **Fault:** no output signal | |
|---|---|
| **Possible cause** | **Fault detection / remedy** |
| Connected incorrectly | Checking of connections |
| Conductor/wire breakage | Checking of all line connections. |
| Defective measuring device (signal input) | Checking of ammeter (miniature fuse) or of analogue input of your signal processing unit |

| **Fault:** analogue output signal too low | |
|---|---|
| **Possible cause** | **Fault detection / remedy** |
| Load resistance too high | Checking of load resistance (value) |
| Supply voltage too low | Checking of power supply output voltage |
| Defective energy supply | Checking of the power supply and the supply voltage being applied to the device |

| **Fault:** slight shift of the output signal | |
|---|---|
| **Possible cause** | **Fault detection / remedy** |
| Diaphragm of senor is severely contaminated | Cleaning using a non-aggressive cleaning solution and soft paintbrush or sponge |
| Diaphragm of sensor is calcified or crusted | **Recommendation:** Have the decalcification or cleaning performed by BD\|SENSORS |

| **Fault:** large shift of the output signal | |
|---|---|
| **Possible cause** | **Fault detection / remedy** |
| Diaphragm of sensor is damaged (caused by overpressure or mechanically) | Checking of diaphragm; when damaged, send the device to BD\|SENSORS for repair |

| **Fault:** wrong or no output signal | |
|---|---|
| **Possible cause** | **Fault detection / remedy** |
| Cable damaged mechanically, thermally or chemically | Checking of cable; pitting corrosion on the stainless-steel housing as a result of damage on cable; when damaged, send the device to BD\|SENSORS for repair |

## 8. Removal from Service

| | |
|---|---|
| **DANGER** | **Danger of death from airborne parts, leaking fluids, electric shock**<br>- Disassemble the device in a depressurized and de-energized condition! |
| **WARNING** | **Danger of injury from aggressive media or pollutants**<br>- Depending on the measured medium, this may constitute a danger to the operator.<br>- Wear suitable protective clothing e.g. gloves, goggles. |

**NOTE** - After dismounting, mechanical connections must be fitted with protective caps.

## 9. Service/Repair

Information on service / repair:

- www.bdsensors.com
- info@bdsensors.de
- Service phone: +49 (0) 92 35 98 11 0

### 9.1 Recalibration

During the life-time of a transmitter, the value of offset and span may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

### 9.2 Return

| | |
|---|---|
| **WARNING** | **Danger of injury from aggressive media or pollutants**<br>- Depending on the measured medium, this may constitute a danger to the operator.<br>- Wear suitable protective clothing e.g. gloves, goggles. |

Before every return of your device, whether for recalibration, decalcification, modifications or repair, it has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required.

Appropriate forms can be downloaded from our homepage. Download these by accessing www.bdsensors.com or request them:

info@bdsensors.de | phone: +49 (0) 92 35 / 98 11 0

In case of doubt regarding the fluid used, devices without a declaration of decontamination will only be examined after receipt of an appropriate declaration!

## 10. Disposal

| | |
|---|---|
| **WARNING** | **Danger of injury from aggressive media or pollutants**<br>- Depending on the measured medium, this may constitute a danger to the operator.<br>- Wear suitable protective clothing e.g. gloves, goggles. |

The device must be disposed of according to the European Directive 2012/19/EU (waste electrical and electronic equipment). Waste equipment must not be disposed of in household waste!

**NOTE** - Dispose of the device properly!

## 11. Warranty Terms

The warranty terms are subject to the legal warranty period of 24 months, valid from the date of delivery. If the device is used improperly, modified or damaged, we will rule out any warranty claim. A damaged diaphragm will not be accepted as a warranty case. Likewise, there shall be no entitlement to services or parts provided under warranty if the defects have arisen due to normal wear and tear.

## 12. EU Declaration of conformity / CE

The delivered device fulfils all legal requirements. The applied directives, harmonised standards and documents are listed in the EC declaration of conformity, which is available online at: http://www.bdsensors.com.
Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

DX14-…:


BD|SENSORS pressure measurement

CE

EU-Konformitätserklärung
EC Declaration of Conformity

BD Sensors GmbH erklärt hiermit in alleiniger Verantwortung, dass die Produkte
BD Sensors GmbH declares on its own responsibility that the products

DMK 361 DMK 361P LMK 351 LMK 358 LMK 381 LMK 382 LMK 457 LMK 809 LMK 858

mit den aufgeführten Richtlinien und Normen übereinstimmen.
fulfil the below mentioned requirements and standards.

2014/30/EU (EMC) EN 61326-1:2013
2011/65/EU (RoHS)

Für Geräte mit Ex-Zulassung:
for devices with IS approval:

2014/34/EU (ATEX) DX14-DMK 351 DX14-DMK 351P DX14-LMK 351 DX14-LMK 358 DX14-LMK 381 DX14-LMK 382 DX14-LMK 457

IBExU08ATEX1079 X EN 60079-0:2012+A11:2013, EN 60079-11:2012, EN 60079-26:2007

Benannte Stelle / Kennnummer
Notified Body / identification number: IBExU Institut für Sicherheit GmbH / 0637

TÜV 10 ATEX 382477 Q EN ISO/IEC 80079-34:2012

Benannte Stelle / Kennnummer
Notified Body / identification number TÜV NORD CERT GmbH / 0044

Thierstein, 2018-01-22

D. Sanvenero
Leiter Konstruktion/
Mechanical Design Manager

M. Martin
Leiter Elektronikentwicklung/
Electronics Design Manager

BD SENSORS GmbH
BD-Sensors-Straße 1
D - 95199 Thierstein

Tel. +49 (0) 92 35 / 98 11- 0
Fax +49 (0) 92 35 / 98 11- 11

www.bdsensors.com
info@bdsensors.de

DX14B-…:


BD|SENSORS pressure measurement

CE

EU-Konformitätserklärung
EC Declaration of Conformity

BD Sensors GmbH erklärt hiermit in alleiniger Verantwortung, dass die Produkte
BD Sensors GmbH declares on its own responsibility that the products

DMK 387, LMK 387, LMK 387H, LMK 487, LMK 487H

mit den aufgeführten Richtlinien und Normen übereinstimmen.
fulfil the below mentioned requirements and standards.

2014/30/EU (EMC) EN 61326-1:2013
2011/65/EU (RoHS)

Für Geräte mit Ex-Zulassung:
for devices with IS approval:

2014/34/EU (ATEX) DX14B-DMK 387, DX14B-LMK 387, DX14B-LMK 387H, DX14B-LMK 487, DX14B-LMK 487H

IBExU07ATEX1066 X EN 60079-0:2018, EN 60079-11:2012

Benannte Stelle / Kennnummer
Notified Body / identification number: IBExU Institut für Sicherheit GmbH / 0637

TÜV 10 ATEX 382477 Q EN ISO/IEC 80079-34:2012

Benannte Stelle / Kennnummer
Notified Body / identification number TÜV NORD CERT GmbH / 0044

Thierstein, 2018-08-20

D. Sanvenero
Leiter Konstruktion/
Mechanical Design Manager

M. Martin
Leiter Elektronikentwicklung/
Electronics Design Manager

BD SENSORS GmbH
BD-Sensors-Straße 1
D - 95199 Thierstein

Tel. +49 (0) 92 35 / 98 11- 0
Fax +49 (0) 92 35 / 98 11- 11

www.bdsensors.com
info@bdsensors.de

DX19-…:


BD|SENSORS pressure measurement

CE

EU-Konformitätserklärung
EC Declaration of Conformity

BD Sensors GmbH erklärt hiermit in alleiniger Verantwortung, dass die Produkte
BD Sensors GmbH declares on its own responsibility that the products

DMK 331 DMK 331P DMK 457 DMP 311 DMP329 DMP 321 DMP 321P DMP 321PT DMP 331 DMP331i DMP 331_5Ei DMP 331P DMP 331Pi DMP 333 DMP 333i DMP 334 DMP 334i DMP 335 DMP 339 DMP 343 DMP 457 LMK 331 LMP 331 LMP 331i EP 600

mit den aufgeführten Richtlinien und Normen übereinstimmen.
fulfil the below mentioned requirements and standards.

2014/30/EU (EMC) EN 61326-1:2013
2011/65/EU (RoHS)

Für Geräte mit Ex-Zulassung:
for devices with IS approval:

2014/34/EU (ATEX) DX19-DMK 331 DX19-DMK 331P DX19-DMK 457 DX19-DMP 311 DX19-DMP 321 DX19-DMP 321P DX19-DMP 321PT DX19-DMP 331 DX19-DMP331i DX19-DMP 331P DX19-DMP 331Pi DX19-DMP 333 DX19-DMP 333i DX19-DMP 334 DX19-DMP 335 DX19-DMP 339 DX19-DMP 342 DX19-DMP 457 DX19-LMK 331 DX19-LMP 331 DX19-LMP 331i

IBExU10ATEX1068 X EN60079-0:2012+A11:2013, EN 60079-11:2012

Benannte Stelle / Kennnummer
Notified Body / identification number: IBExU Institut für Sicherheit GmbH / 0637

TÜV 10 ATEX 382477 Q EN ISO/IEC 80079-34:2012

Benannte Stelle / Kennnummer
Notified Body / identification number TÜV NORD CERT GmbH / 0044

In Erfüllung der Druckgeräterichtlinie 2014/68/EU und als Ergebnis des darin geforderten Konformitätsbewertungsverfahrens wird folgendes Modul gewählt:
In conformance to the Pressure Equipment Directive 2014/68/EU and as result of therein demanded conformity assessment procedures the following module has been chosen:

Für Geräte mit maximal zulässigem Überdruck > 200 bar:
for devices with maximum permissible overpressure > 200 bar:
Bewertungsverfahren Modul A
assessment procedure Module A

Thierstein, 2018-01-11

D. Sanvenero
Leiter Konstruktion/
Mechanical Design Manager

M. Martin
Leiter Elektronikentwicklung/
Electronics Design Manager

BD SENSORS GmbH
BD-Sensors-Straße 1
D - 95199 Thierstein

Tel. +49 (0) 92 35 / 98 11- 0
Fax +49 (0) 92 35 / 98 11- 11

www.bdsensors.com
info@bdsensors.de


BD|SENSORS pressure measurement

CE

EU-Konformitätserklärung
EC Declaration of Conformity

BD Sensors GmbH erklärt hiermit in alleiniger Verantwortung, dass die Produkte
BD Sensors GmbH declares on its own responsibility that the products

17.600G 17.605G 26.600G

mit den aufgeführten Richtlinien und Normen übereinstimmen.
fulfil the below mentioned requirements and standards.

2014/30/EU (EMC) EN 61326-1:2013
2011/65/EU (RoHS)

Für Geräte mit Ex-Zulassung:
for devices with IS approval:

2014/34/EU (ATEX) DX19-17.600G DX19-17.605G DX19-26.600G

IBExU10ATEX1068 X EN 60079-0:2012+A11:2013, EN 60079-11:2012

Benannte Stelle / Kennnummer
Notified Body / identification number: IBExU Institut für Sicherheit GmbH / 0637

TÜV 10 ATEX 382477 Q EN ISO/IEC 80079-34:2012

Benannte Stelle / Kennnummer
Notified Body / identification number TÜV NORD CERT GmbH / 0044

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In conformance to the Pressure Equipment Directive 2014/68/EU and as result of therein demanded conformity assessment procedures the following module has been chosen:

Für Geräte mit maximal zulässigem Überdruck > 200 bar:
for devices with maximum permissible overpressure > 200 bar:
Bewertungsverfahren Modul A
assessment procedure Module A

Thierstein, 2018-01-11

D. Sanvenero
Leiter Konstruktion/
Mechanical Design Manager

M. Martin
Leiter Elektronikentwicklung/
Electronics Design Manager

BD SENSORS GmbH
BD-Sensors-Straße 1
D - 95199 Thierstein

Tel. +49 (0) 92 35 / 98 11- 0
Fax +49 (0) 92 35 / 98 11- 11

www.bdsensors.com
info@bdsensors.de