



## 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 336, DX19-DMP 339, DX19-DMP 343, DX19-LMK 331, DX19-LMP 331, DX19-LMP 331i, DX19-17.600G, DX19-17.605G, DX19-26.600G



READ THOROUGHLY BEFORE USING THE DEVICE  
KEEP FOR FUTURE REFERENCE

ID: BA\_DMU-ES\_EX\_E | Version: 04.2023.0

### 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.

Download these by accessing [www.bdsensors.de](http://www.bdsensors.de) or request them: info@bdsensors.de | 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: EN IEC 60079-0:2018; EN 60079-11:2012

DX14B: EN 60079-0:2018; EN 60079-11:2012;

IECEX IBE 18.0019X: IEC 60079-0: 2017 Edition 7;

IEC 60079-11: 2011 Edition 6

DX19: EN IEC 60079-0:2018; EN 60079-11:2012;

IECEX IBE 12.0027X: IEC 60079-0: 2011 Edition 6;

IEC 60079-11: 2011 Edition 6

#### 1.1 Symbols used

	<ul style="list-style-type: none"><li>- Type and source of danger</li><li>- Measures to avoid the danger</li></ul>
--	--

Warning word	Meaning
	<ul style="list-style-type: none"><li>- Imminent danger!</li><li>- Non-compliance <b>will result in</b> death or serious injury.</li></ul>
	<ul style="list-style-type: none"><li>- Possible danger!</li><li>- Non-compliance <b>may result in</b> death or serious injury.</li></ul>
	<ul style="list-style-type: none"><li>- Hazardous situation!</li><li>- Non-compliance <b>may result in</b> minor or moderate injury.</li></ul>

**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 device is intended for converting the physical parameter of pressure into an electric signal. It has to be used only for this purpose, considering the following information.

The above listed pressure transmitters have, according to the type, been developed for applications in overpressure and vacuum as well as for absolute pressure measurement.

The screw-in transmitters are intended for level and process measurement.

Devices with 3-A and / or EHEDG certified process connection have been developed especially for applications in food and pharmaceutical industry. The process connection is hygienic and can be sterilized.

Permissible measuring and cleaning media are gases or liquids, which are compatible with the media wetted parts of the device (according to data sheet) and your system. This must be ensured for the application.

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 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!

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.de>

#### 1.4 Incorrect use

	<b>Danger through incorrect use</b> <ul style="list-style-type: none"><li>- Only use the device in permissible media and in accordance with its intended use.</li><li>- Do not use the device as a ladder or climbing aid.</li><li>- The device must not be altered or modified in any way.</li><li>- BD SENSORS is not liable for damage caused by improper or incorrect use.</li></ul>
--	--

#### 1.5 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.

#### 1.6 Safe handling

**NOTE** - Do not use any force when installing the device to prevent damage of the device and the plant!

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

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

**NOTE** - Excessive dust accumulation 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.

#### 1.7 Safety-related maximum values

**DX14- ...:**

U<sub>i</sub> = 28 V, I<sub>i</sub> = 93 mA, P<sub>i</sub> = 660 mW, C<sub>i</sub> = 14 nF, L<sub>i</sub> ≈ 0 μH;

C<sub>gnd</sub> = 27 nF; plus cable inductivities 1.5 μH/m and

cable capacities 220 pF/m (for cable by factory)

application in zone 0 (p<sub>am</sub> 0.8 bar up to 1.1 bar): -20 ... 60 °C

application in zone 1 and higher: -25 ... 70 °C

devices with temperature class T6:

**DX14B-DMK 387:**

U<sub>i</sub> = 28 V, I<sub>i</sub> = 93 mA, P<sub>i</sub> = 660 mW, C<sub>i</sub> = 14 nF, L<sub>i</sub> ≈ 0 μH,

C<sub>gnd</sub> = 27 nF; plus cable inductivities 1 μH/m and

cable capacities 160 pF/m (for cable by factory)

application in zone 0 (p<sub>am</sub> 0.8 bar up to 1.1 bar): -20 ... 60 °C

application in zone 1 and higher: -25 ... 65 °C

**DX19- ...:**

U<sub>i</sub> = 28 V; I<sub>i</sub> = 93 mA; P<sub>i</sub> = 660 mW; C<sub>i</sub> ≈ 0 nF; L<sub>i</sub> ≈ 0 μH;

C<sub>gnd</sub> = 27 nF; plus cable inductivities 1 μH/m and

cable capacities 160 pF/m (for cable by factory)

application in zone 0 (p<sub>am</sub> 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

#### 1.8 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
- for SIL2 version: safety data sheet

#### 1.9 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:

- only indoor usage
- maximum operating voltage: according to data sheet
- The device must be operated via a supply with energy limitation (acc. to UL 61010) or an NEC Class 2 energy supply.

#### 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.

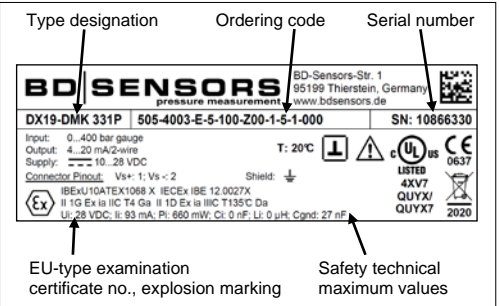


Fig. 1: Example of manufacturing label

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

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

**DX14- ...:**

EU-type examination certificate IBExU05ATEX1070 X

metallic pressure port: II 1G Ex ia IIC o. IIB T6 o. T4 Ga

II 1D Ex ia IIIC T110°C Da

non-metallic pressure port: II 1/2G Ex ia IIC T4 Ga/Gb

II 1/2D Ex ia IIIC T110°C Da/Db

**DX14B-DMK 387:**

EU-type examination certificate IBExU15ATEX1066 X

metal housing: II 1G Ex ia IIC T4 Ga

PVDF or PP housing: II 2G Ex ia IIC T4 Gb

all types: II 1D Ex ia IIIC T135 °C Da

**DX19- ...:**

EU-type examination certificate IBExU10ATEX1068 X

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 T135°C Da

### 3. Mounting

#### 3.1 Mounting and safety instructions

	<b>Danger of death from explosion, airborne parts, leaking fluid, electric shock</b> <ul style="list-style-type: none"><li>- Always mount the device in a depressurized and de-energized condition!</li><li>- Do not install the device while there is a risk of explosion.</li></ul>
	<b>Danger of death from explosion</b> <ul style="list-style-type: none"><li>- Explosion hazard due to high-charging processes in connection with free-hanging submersible transmitters with cable FEP</li><li>- Fixed installation of the FEP cable!</li></ul>

**NOTE** - The technical data listed in the EU-type examination certificate are binding. Download this by accessing [www.bdsensors.de](http://www.bdsensors.de) 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 and clarify the material compatibility.

**NOTE** - The measuring point must be designed in such a way that cavitation and pressure surges are avoided.

**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 permissible tightening torque depends on the conditions on site (material and geometry of the mounting point). The specified tightening torques for the pressure transmitter 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 (permissible installation position 273° ... 87°).

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
- an easy to clean installation position of the pressure transmitter with little dead space, as well as definition / verification / validation of a suitable cleaning process
- defining adequate service intervals

#### 3.3 Conditions for devices, with EHEDG certificate

Install the device according to the requirements given in EHEDG Guidelines 8, 10 and 37. That is to mount the device in a self-draining orientation. The device should be installed flush to the process area. If mounting in a T-piece, the ratio between the depth of the upstand (L) and the diameter (D) of the upstand shall be L/D<1. If welded adapters are used, the food contact surface must be smooth, and the welding has to be done according to EHEDG Guideline 9 and 35. Suitable pipe couplings and process connections must be applied according to the EHEDG Position Paper. (List the available ones.)

#### 3.4 Conditions for oxygen applications

	<b>Danger of death from explosion</b> <ul style="list-style-type: none"><li>- when used improperly</li></ul>
--	--

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)

#### 3.5 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. (Rz 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. Permissible tightening torques for pressure transmitter:
  - wrench flat made of steel:
    - G1/4": approx. 5 Nm
    - G3/4": approx. 15 Nm
    - G1 1/2": approx. 25 Nm
  - wrench flat made of plastic: max. 3 Nm

#### 3.6 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. (Rz 6.3)

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

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

G1/4" EN 837	p ≤ 600 bar	Counterpart has to be of steel according to DIN 17440 with strength R <sub>p0.2</sub> ≥ 190 N/mm <sup>2</sup>
G1/2" EN 837	p ≤ 1000 bar	
G1/4" EN 837	p > 600 bar, p ≤ 1000 bar	Counterpart has to be of steel according to DIN 17440 with strength R <sub>p0.2</sub> ≥ 260 N/mm <sup>2</sup>
G1/2" EN 837	p > 1000 bar, p ≤ 1600 bar	

**NOTE** - Please refer to data sheet or contact sales department at BD|SENSORS regarding max. permitted pressure of device.

#### 3.7 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. Permissible tightening torques for pressure transmitter:
  - 1/4" NPT: approx. 30 Nm; 1/2" NPT: approx. 70 Nm

#### 3.8 Mounting steps for G1" cone connection

- 1 Screw the device into the mating thread by hand (seal produced metallically)
- 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:
  - p<sub>N</sub> < 10 bar: 30 Nm
  - p<sub>N</sub> ≥ 10 bar: 60 Nm

#### 3.9 Mounting steps for internal threads M20x1.5 and 9/16" UNF (for high-pressure devices)

	<b>Danger of injury</b> <ul style="list-style-type: none"><li>- Due to wrong installation</li><li>- Do not use any seal!</li></ul>
--	--

**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)

#### 3.10 Mounting steps for dairy pipe connections

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

- ✓ Chapter "3.2 and/or 3.3" have been noticed. EHEDG conformity is only ensured in combination with an approved seal for codes M73, M75, M76. This is e.g.: ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH

- 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.

#### 3.11 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 and/or 3.3" have been noticed. EHEDG conformity is only ensured in combination with an approved seal. This is e.g.: for Clamp connections - codes C61, C62, C63: T-ring seal from Combifit International B.V. for Varivent® connections - codes P40, P41: EPDM-O-ring which is FDA-listed

- Note, that P40 can only be used for tank flanges.
- 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.

#### 3.12 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

	<b>Danger of death from electric shock or explosion</b> <ul style="list-style-type: none"><li>- Explosion hazard if the operating voltage is too high (max. 28 V<sub>DC</sub>) or by opening the field housing while an explosion hazard exists.</li><li>- Always mount the device in a depressurized and de-energized condition!</li><li>- Do not install the device while there is a risk of explosion.</li><li>- Operate the device only within the specification! (data sheet)</li></ul>
--	--

- ✓ The limit values listed in the EU-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 **plug ISO 4400** or **field housing**, it must be ensured that the external diameter of the used cable is within the permissible clamping range: cable socket ISO 4400: Ø 4 ... 6 mm field housing code 850: Ø 2 ... 8 mm field housing code 880: Ø 5 ... 14 mm

Moreover you have to ensure that it lies in the cable gland firmly and cleflessly!

**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.



