EN

BD|SENSORS
pressure measurement

DMP 331P

**Operating Manual**

74-

Industrial pressure transmitter DMK / DMP,
screw-in transmitter LMK / LMP and
OEM pressure transmitter

DMK 331, DMK 331 P, DMK 351, DMK 351 P, DMP 311, DMP 320, DMP 321, DMP 331, DMP 331i, DMP 331 P, DMP 331 Pi, DMP 333, DMP 333i, DMP 334, DMP 334i, DMP 335, DMP 335P, DMP 339, DMP 343, LMK 331, LMK 351, LMP 331, LMP 331i, 17.6XX, 17.6XX G, 18.6XX, 18.6XX G, 26.6XX, 26.6XX G, 30.6XX, 30.6XX G

DMP 331

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## 1. General information

### 1.1 Information on the operating manual

This operating manual contains important information on proper usage of the device. Read this operating manual carefully before installing and starting up the pressure measuring device.

Adhere to the safety notes and operating instructions which are given in the operating manual. Additionally applicable regulations regarding occupational safety, accident prevention as well as national installation standards and engineering rules must be complied with!

This operating manual is part of the device, must be kept nearest its location, always accessible to all employees.

– Technical modifications reserved –

### 1.2 Symbols used

⚠ DANGER! – dangerous situation, which may result in death or serious injuries

⚠ WARNING! – potentially dangerous situation, which may result in death or serious injuries

⚠ CAUTION! – potentially dangerous situation, which may result in minor injuries

! CAUTION! – potentially dangerous situation, which may result in physical damage

☞ NOTE – tips and information to ensure a failure-free operation

### 1.3 Target group

⚠ WARNING! To avoid operator hazards and damages of the device, the following instructions have to be worked out by qualified technical personnel.

### 1.4 Limitation of liability

By non-observance of the operating manual, inappropriate use, modification or damage, no liability is assumed and warranty claims will be excluded.

### 1.5 Intended use

- The **pressure transmitter DMK/DMP** and **OEM-pressure transmitter** have, according to the type, been developed for applications in overpressure and vacuum as well as for absolute pressure measurement. The **screw-in transmitters LMK/LMP** have been particularly developed for level and process measurement. It is the operator's responsibility to check and verify the suitability of the device for the intended application. If any doubts remain, please contact our sales department in order to ensure proper usage. BD SENSORS is not liable for any incorrect selections and their effects!

! Permissible media are gases or liquids, which are compatible with the media wetted parts described in the data sheet. In addition it has to be ensured, that this medium is compatible with the media wetted parts.

! The technical data listed in the current data sheet are engaging. If the data sheet is not available, please order or download it from our homepage.
(http://www.bdsensors.com)

⚠ WARNING! Danger through improper usage!

### 1.6 Package contents

Please verify that all listed parts are undamaged included in the delivery and check for consistency specified in your order:

- pressure transmitter or screw-in transmitter
- for mechanical pressure ports DIN 3852: o-ring (pre-assembled)
- mounting instructions
- with option SIL2 version:
  Functional Safety Manual, Functional Safety Data Sheet®

### 1.7 UL - approval (for devices with UL-identification)

The UL – Approval was done with respect to U.S. standards norms which also correspond with the applicable Canadian standards norms for safety.

Note the following points, so that devices fulfils the demands of UL approval:

- The transmitter shall be supplied by Limited Energy Source (per UL 61010) or NEC Class 2 Power Source.
- maximum operating voltage: see technical data

## 2. Product identification

The device can be identified by its manufacturing label. It provides the most important data. By the ordering code the product can be clearly identified.

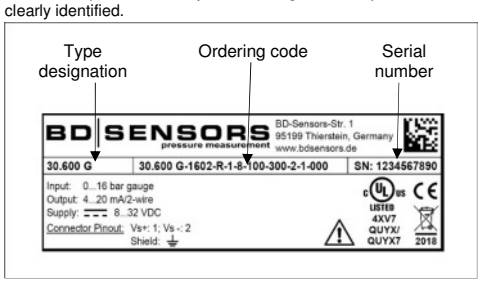



*Fig. 1 manufacturing label*

! The manufacturing label must not be removed from the device!

## 3. Mechanical installation

### 3.1 Mounting and safety instructions

⚠ WARNING! Install the device only when depressurized and currentless!

⚠ WARNING! This device may only be installed by qualified technical personnel who has read and understood the operating manual!

! Handle this high-sensitive electronic precision measuring device with care, both in packed and unpacked condition!

! There are no modifications/changes to be made on the device.

! Do not throw the package/device!

! To avoid damaging the diaphragm, remove packaging and protective cap directly before starting assembly. The delivered protective cap has to be stored!

! Place the protective cap on the pressure port again immediately after disassembling.

! Handle the unprotected diaphragm very carefully - it is very sensitive and may be easily damaged.

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

! For installations outdoor and in damp areas following these instructions:
  - To prevent moisture admission in the plug the device should be installed electrically after mounting, at once. Otherwise a moisture admission has to be blocked e.g. by using a suitable protection cap. (The ingress protection in the data sheet is valid for the connected device.)
  - Choose an assembly position, which allows the flow-off of splashed water and condensation. Avoid permanent fluid at sealing surfaces!
  - When using a cable gland or outlet device, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain.
  - Install the device in such a way that it is protected from direct solar irradiation. Direct solar irradiation can lead to the permissible operating temperature being overstepped in the worst case. By this the operability of the device can be affected or damaged. If the internal pressure increases due to solar irradiation, measurement errors may be caused.

! 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.

☞ Take note that no inadmissibly high mechanical stresses occur at the pressure port as a result of the installation, since this may cause a shifting of the characteristic curve or to the demage. This is especially important for very small pressure ranges as well as for devices with a pressure port made of plastic.

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

☞ Provide a cooling line when using the device in steam piping.

☞ If there is any danger of damage by lightning or overpressure when the device is installed outdoor, we suggest putting a sufficiently dimensioned overpressure protection between the supply or switch cabinet and the device.

☞ If the device is installed with the pressure connection up, it has to be made sure that no liquid drain off at the case. Humidity and dirt can block the relative cover in the case and it could lead to malfunctions through this. Dust and dirt must be removed from the edge of the thread connection of the electrical connection if required.

### 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! When used improperly, special versions of devices suitable for oxygen applications may explode! To ensure a usage without danger, the following points must be adhered to:

Make sure that your device has been ordered as a special version for oxygen applications and that it has been delivered conformably. You can check this easily by reading the manufacturing label (see figure 1). If your ordering code ends with the numbers "007", your device is suitable for the oxygen application.

When being dispatched the device is packed into a plastic bag to keep it from impurity. The indication label with the text "Device for oxygen, unpack only directly before assembling" has to be observed! Furthermore any skin contact must be avoided during unpacking and installing the device, so that no fatty residue remains on the device!

For installing the respective regulations for explosion protection have to be fulfilled. Please check if an ATEX-approval is necessary for the application in addition to the acceptability for oxygen. (the delivered device has no ATEX-approval)

Consider that the entire construction must correspond to the standards of BAM (DIN 19247).

For oxygen applications over 25 bar are recommended pressure transmitter without seals.

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

### 3.4 General installation steps

- Carefully remove the pressure measuring device from the package and dispose of the package properly.
- Go ahead as detailed in the specific instructions below.

### 3.5 Installation steps for DIN 3852

⚠ **DO NOT USE ANY ADDITIONAL SEALING MATERIALS, LIKE YARN, HEMP OR TEFLON TAPE!**

- Check to ensure the proper groove fitting of the o-ring and additionally to ensure no damage to the o-ring.
- Ensure that the sealing surface of the taking part is perfectly smooth and clean. ($R_Z$ 3.2)
- Screw the device into the corresponding thread by hand.
- If you have a device with a knurled ring, the transmitter has to be screwed in by hand only.
- Devices with a spanner flat have to be tightened with an open-end wrench (wrench size of steel: G1/4": approx. 5 Nm; G1/2": approx. 10 Nm; G3/4": approx. 15 Nm; G1": approx. 20 Nm; G1 1/2": approx. 25 Nm; wrench size of plastic: max. 3 Nm).
- **The indicated tightening torques must not be exceeded!**

### 3.6 Installation steps for EN 837

- Use a suitable seal, corresponding to the medium and the pressure input (e. g. a cooper gasket).
- Ensure that the sealing surface of the taking part is perfectly smooth and clean. ($R_Z$ 6.3)
- Screw the device into the corresponding thread by hand.
- Tighten it with a wrench (for G1/4": approx. 20 Nm; for G1/2": approx. 50 Nm).
- **The indicated tightening torques must not be exceeded!**
- **Note: permitted pressure ranges according to EN 837!**

  for G1/4“ and G1/2“ according to EN837:

| | | |
|---|---|---|
| G1/4“ EN837 | $P_N \leq 600$ bar | Counterpart has to be of steel according to DIN17440 with strength $R_p 0.2 \geq 190$ N/mm² |
| G1/2“ EN837 | $P_N \leq 1000$ bar | |
| G1/4“ EN837 | $P_N > 600$ bar, $P_N \leq 1000$ bar | Counterpart has to be of steel according to DIN17440 with strength $R_p 0.2 \geq 260$ N/mm² |
| G1/2“ EN837 | $P_N > 1000$ bar, $P_N \leq 1600$ bar | |

### 3.7 Installation steps for NPT

- Use a suitable seal (e. g. a PTFE-strip).
- Screw the device into the corresponding thread by hand.
- Tighten it with a wrench (for 1/4" NPT: approx. 30 Nm; for 1/2" NPT: approx. 70 Nm).
- **The indicated tightening torques must not be exceeded!**

### 3.8 Installation steps for flare

- Cut the end at right angle to the piping and remove all internal and external burrs.
- Make the flare; depending on the usage, the device has to be tightened with max. 10 Nm.
- **The indicated tightening torques must not be exceeded!**

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

- Screw the high pressure connection into the internal thread
- 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)

⚠ **DANGER! The high pressure tube seals metal-to-metal in the chamfer of the pressure port. No further seal is allowed with this high pressure connection. A wrong installation can cause enormous danger!**

**3.10 Installation steps for dairy pipe**

- Check to ensure that the O-ring fits properly into the intended groove in the mounting part.
- Center the dairy pipe connection in the counterpart.
- Screw the cup nut onto the mounting part.
- Then tighten it with a hook wrench.

**3.11 Installation steps for Clamp and Varivent®**

☞ Note the chapter "3.2 Conditions for devices with 3-A symbol "

- Use a suitable seal corresponding to the medium and the pressure input.
- Put the seal onto the corresponding mounting part.
- Center the Clamp or Varivent® connection on the fitting counterpart with seal.
- 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 Installation steps for connecting flanges**

- Use a suitable seal corresponding to the medium and pressure input. (e. g. a fiber gasket).
- Put the seal between connecting flange and counter flange.
- Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

**4. Electrical Installation**

⚠ WARNING! Install the device in currentless condition only!

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

☞ The communication interface RS232 may not be connected directly to the PC (suitable adapter is available as an accessory).

*Pin configuration:*

| Electrical connection | ISO 4400 | Binder 723 (5-pin) | Binder 723 (7-pin) |
|---|---|---|---|
| Supply + | 1 | 3 | 3 |
| Supply – | 2 | 4 | 1 |
| Signal + (for 3-wire) | 3 | 1 | 6 |
| Shield | ground pin | 5 | 2 |
| Communication - RxD | - | - | 4 |
| interface TxD | - | - | 5 |
| GND | - | - | 7 |

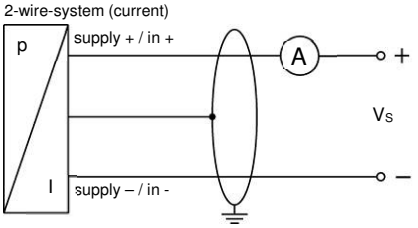
| Electrical connection | M12x1 metal (4-pin) | field housing | cable colours (DIN47100) |
|---|---|---|---|
| Supply + | 1 | IN + | wh (white) |
| Supply – | 2 | IN – | bn (brown) |
| Signal + (for 3-wire) | 3 | OUT + | gn (green) |
| Shield | 4 | ⏚ | gnye (green-yellow) |

| Electrical connection | Buccaneer (4-pin) | TRIM TRIO® (4-pin) |
|---|---|---|
| Supply + | 1 | 1 |
| Supply – | 2 | 2 |
| Signal + (for 3-wire) | 3 | 3 |
| Shield | 4 | 4 |

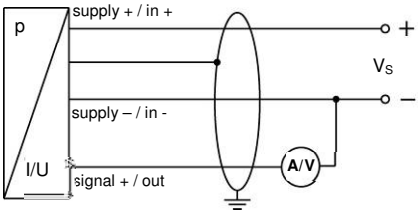
| Electrical connection | Bajonett MIL-C-26482 (10-6) | |
|---|---|---|
| | 2-wire | 3-wire |
| Supply + | A | A |
| Supply – | B | D |
| Signal + (for 3-wire) | - | B |
| Shield | pressure port | |

*Wiring diagrams:*

2-wire-system (current)




3-wire-system (current/supply)




! For devices with cable gland as well as cable socket, you have to make sure that the external diameter of the used cable is within the allowed clamping range. Moreover you have to ensure that it lies in the cable gland firmly and cleftlessly!

! For the installation of a device with cable outlet 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

! Please note for devices with ISO 4400 or Buccaneer plug, that the cable socket has to be mounted properly to ensure the ingress protection mentioned in the data sheet. Please check if 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.

! On devices with field housings, the terminal clamps are situated under the metal cap. To install the device electrically, the cap must be screwed off. Before the cover 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.

! Prevent the damage or removal of the PTFE filter which is fixed over the end of the air tube on devices with cable outlet and integrated air tube.

☞ For the electrical connection a shielded and twisted multicore cable is recommended.

⚠ If a transition is desired from a transmitter cable with gauge tube to a cable without gauge tube, we recommend our terminal box KL 1 or KL 2.

**5. Initial start-up**

⚠ WARNING! Before start-up, the user has to check for proper installation and for any visible defects.

⚠ WARNING! The device can be started and operated by authorized personnel only, who have read and understood the operating manual!

⚠ WARNING! The device has to be used within the technical specifications, only! (compare the data in the data sheet)

⚠ The transmitter shall be supplied by Limited Energy Source (per UL 61010) or NEC Class 2 Power Source.

⚠ Devices with an accuracy of 0.1 % FSO have micro-controlled electronics for processing and improving the signal. Principally, the processing takes more time as for analogue sensors, which have only an amplifier. Due to this longer response time, the output signal follows the measured value discontinuously. For nearly stable measured values, this characteristic is secondary. Please compare the specification of the response time in the data sheet.

⚠ Intelligent 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. Placing out of service**

⚠ WARNING! Disassemble the device only in current and pressure less condition! Check before disassembly, if it is necessary to drained off the media before dismantling!

⚠ WARNING! Depending on the medium, it may cause danger for the user. Comply therefore with adequate precautions for purification.

**7. Maintenance**

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.

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.

! 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.

**8. Service / Repair**

**8.1 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.

**8.2 Return**

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 **www.bdsensors.com**. Should you dispatch a device without a declaration of decontamination and if there are any doubts in our service department regarding the used medium, repair will not be started until an acceptable declaration is sent.

⚠ **If the device came in contact with hazardous substances, certain precautions have to be complied with for purification!**

**9. Disposal**

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!

⚠ WARNING! Depending on the used medium, deposit on the device may cause danger for the user and the environment. Comply with adequate precautions for purification and dispose of it properly.

**10. Warranty conditions**

The warranty conditions are subject to the legal warranty period of 24 months from the date of delivery. In case of improper use, modifications of or damages to the device, we do not accept warranty claims. Damaged diaphragms will also not be accepted. Furthermore, defects due to normal wear are not subject to warranty services.

**11. 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.