Operating Manual

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

DMK 331, DMK 331 P. DMK 351, DMK 351 P. DMK 387, DMP 311. DMR 331, DMR 331 P, DMR 351, DMR 351 P, DMR 387, DMP 311, DMP 330, DMP 320P, DMP 321, DMP 331, DMP 331, DMP 331, DMP 331, DMP 331, DMP 331, DMP 335, DMP 339P, DMP 339P, DMP 339P, DMP 335, DMP 335, DMP 335, DMP 335, DMP 335, DMP 335, DMP 343, LMR 351, LMR 351, LMR 351, LMR 351, LMR 361, LMR











∕3\

READ THOROUGHLY BEFORE USING THE DEVICE KEEP FOR FUTURE REFERENCE

ID: BA_DMU-ES-OEM_E | Version: 02.2021.0

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

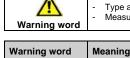
All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information

Complementary to this operating manual the current data sheet has to be adhered to.

Download this by accessing www.bdsensors.de or request it: info@bdsensors.de | phone: +49 (0) 92 35 / 98 11 0

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

1.1 Symbols Used



Type and source of danger asures to avoid the danger

DANGER	Imminent danger! Non-compliance will result in death or serious injury.	
WARNING	Possible danger!Non-compliance may result in death or serious injury.	
CAUTION	 Hazardous situation! 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

- 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 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

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

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.

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

Danger through incorrect use Only use the device in permissible



- media and in accordance with its intended use.
- Do not use the device as a ladder or climbing aid.
- The device must not be altered or modified in any way.
- BDISENSORS is not liable for damage caused by improper or incorrect use

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

GmbH - All rights reser

BDISENSORS

© 2021

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

 $\ensuremath{\mathbf{NOTE}}$ - 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 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)
- mounting instructions or operating manual
- for SIL2 version: 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

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

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.

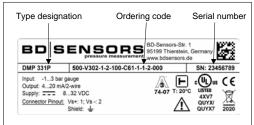


Fig. 1: Example of manufacturing label

NOTE - The manufacturing label must not be removed!

3. Mounting

3.1 Mounting and safety instructions

DANGER	Danger of death from airborne parts leaking fluid, electric shock Always mount the device in a depressurized and de-energized condition!
٨	Danger of death from improper installation

<u>∠!\</u> **DANGER**

Installation must be performed only by appropriately qualified persons w have read and understood the operating manual.

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

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

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

 $\ensuremath{\text{NOTE}}$ - 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.

 $\ensuremath{\mathbf{NOTE}}$ - The permissible tightening torque depends on the conditions on site (material and geometry of the mounting point). The specified tightening torques for the pressure transmitte 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 or cable gland, the outgoing cable must be routed downwards. If the cable needs to be routed upwards, this must be done in an initially downward
- 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
- 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 and / or EHEDG certificate

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

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 and / or EHEDG standard(s)
- 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 oxygen applications



Danger of death from explosion

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

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
- The sealing face of the mating component has a flawless surface. (Rz 3.2)
- Screw the device into the corresponding thread by hand. Devices equipped with a knurled ring: only tighten by hand
- Devices with a spanner flat must be tightened using an open-end wrench. Permissible tightening torques for pressure transmitter:
 - wrench flat made of steel: G1/4": approx. 5 Nm G1/2": approx. 10 Nn
 - approx. 10 Nm G3/4": approx. 15 Nm approx. 20 Nm
- G1 1/2": approx. 25 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. (Rz 6.3)
- Screw the device into the corresponding thread by hand.

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 – note the permitted pressure according to EN 837:

G1/4" EN 837	p _N ≤ 600 bar	Counterpart has to be of steel according to
G1/2" EN 837	p _N ≤ 1000 bar	DIN 17440 with strength R_p 0.2 \geq 190 N/mm ²
G1/4" EN 837	p _N > 600 bar, p _N ≤ 1000 bar	Counterpart has to be of steel according to
G1/2" EN 837	$p_N > 1000 \text{ bar},$ $p_N \le 1600 \text{ bar}$	DIN 17440 with strength R_p 0.2 \geq 260 N/mm ²

3.6 Mounting steps for NPT connections

- Suitable fluid-compatible sealing material, e.g. PTFE tape, is
- Screw the device into the corresponding thread by hand
- 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

3.7 Mounting steps for G1" cone connection

Screw the device into the mating thread by hand (seal produced metallically)

Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:

> p_N < 10 bar: 30 Nm $p_N \ge 10 \text{ bar: } 60 \text{ Nm}$

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.

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



Danger of injury

- Due to wrong installation

- 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°)

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

3.10 Mounting steps for dairy pipe connections

- The O-ring is undamaged and seated in the designated
- Chapter "3.2" has been noticed.

EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:

- ASEPTO-STAR k-flex upgrade seal by Kieselmann GmbH Centre the dairy pipe connection in the counterpart.
- Screw the cup nut onto the mounting part.
- Then tighten it using a hook wrench.

3.11 Mounting steps for Clamp and Varivent®

- A suitable seal for the measured fluid and the pressure to be measured is available.
- Chapter "3.2" has been noticed.

EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:

for Clamp connections:

T-ring seal from Combifit International B.V. for Varivent® connections: EPDM-O-ring which is FDA-listed

- Place the seal onto the corresponding mounting part. Centre the clamp connection or Varivent® connection above the counterpart with seal.
- semi-ring or retractable ring clamp) according to the supplier's instructions. 3.12 Mounting steps for flange connections

Then fit the device with a suitable fastening element (e. g.

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

- 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 connection

4.1 Connection and safety instructions Danger of death from electric shock



 Always mount the device in a depressurized and de-energized

insulation) NOTE - For the electrical connection a shielded and twisted

condition!

The supply corresponds to protection class III (protective

multicore cable is recommended 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

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.

 $\ensuremath{\text{NOTE}}$ - On devices with $\ensuremath{\text{field housing}}$, 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 devices with cable outlet

When routing the cable, following bending radiuses have to

be complied with: cable without ventilation tube:

static installation: 8-fold cable diameter dynamic application: 12-fold cable diameter cable with ventilation tube:

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 ventilation 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

10-fold cable diameter

aggressive gases, in order to prevent any damage. NOTE - 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.

4.2 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 connection	150 4400	Binder 723 (5-pin)
Supply +	1	3
Supply –	2	4
Signal + (for 3-wire)	3	1
Shield	ground pin 🕒	5
		·

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

NOTE - The communication interface RS232 may not be connected directly to the PC. A suitable adapter is available as an accessory

Electrical connection	M12x1 m	etal (4-pin)
Code	M10 / M20	M13 (17.620G)
Supply +	1	1
Supply –	2	3
Signal + (for 3-wire))	3	2
Shield	4	plug housing

Electrical connection	Micro	
Code	C10	CB0 (17.620G)
Supply +	1	1
Supply –	2	3
Signal + (for 3-wire)	3	2
Shield	ground pin 😩	ground pin 😩

Electrical connection	field housing	cable colours (IEC 60757)
Supply + Supply –	IN + IN -	WH (white) BN (brown)
Signal + (for 3-wire)	** *	GN (green)
Shield		GNYE (green-yellow)

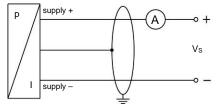
Electrical connection	Buccaneer (4-pin)	TRIM TRIO® (4-pin)
Supply +	1	1
Supply –	2	2
Signal + (for 3-wire)	3	3
Shield	4	4

Electrical connection	Bayonet MIL-C-26482 (10-6)	
Electrical confilection	2-wire	3-wire
Supply +	Α	Α
Supply –	В	D
Signal + (for 3-wire)		В
Shield	pressur	e port

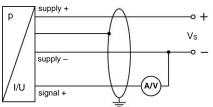
NOTE – The pin configuration for different electrical connections can be found on the manufacturing label.

Wiring diagrams:

2-wire-system (current)



3-wire-system (current/voltage)



5. Commissioning



Danger of death from airborne parts, leaking fluid, electric shock

 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)

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 of death from airborne parts, leaking fluids, electric shock

 Always service the device in a depressurized and de-energized condition!



WARNING

Danger of injury from aggressive fluids or pollutants

Depending on the measured medium, this may constitute a danger to the operator.
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. During the cleaning processes, note the compatibility of the cleaning media used in combination with the media-wetted materials of the pressure measuring devices. Permissible concentrations and temperatures must be observed. Verification/ validation by the user is essential.

Deposits or contamination may occur on the diaphragm/ pressure port in case of certain media. Depending on kind and quality of the process, suitable cyclical maintenance intervals must be specified by the operator. As part of this, regular checks must be carried out regarding corrosion, damage of diaphragm/seal(s) and signal shift. A periodical replacement of the seal(s) may be necessary.

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 of death from airborne parts, leaking fluids, electric shock

If malfunctions cannot be resolved, put the device out of service (proceed according to chapter 8 up to 10)

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

manufiction, if possible.		
Fault: no output signal		
Possible cause	Fault detection / remedy	
Connected incorrectly	Checking of connections	
Conductor/wire breakage	Checking of <u>all</u> 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	Checking of diaphragm; if	
severely contaminated,	necessary, send the device to	
calcified or crusted	BDISENSORS for cleaning	

Fault: large shift of the output signal	
Fault detection / remedy	
Checking of diaphragm; when	
damaged, send the device to	
BD SENSORS for repair	

overpressure or mechanically)	BDISENSORS for repair
Fault: wrong or no output signa	1
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 of death from airborne parts, leaking fluids, electric shock

 Disassemble the device in a depressurized and de-energized condition!



Danger of injury from aggressive media or pollutants

- Depending on the measured medium, this may constitute a danger to the operator.
- 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.de
- 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



Danger of injury from aggressive media or pollutants

- Depending on the measured medium, this may constitute a danger to the operator.
- 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.de or request

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



Danger of injury from aggressive media or pollutants

- Depending on the measured medium, this may constitute a danger to the operator.
- 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.de.

Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

Notes: