



## Operating Manual

Pressure Transmitter for Shipbuilding and Offshore Applications

DMK 456, DMK 457, DMK 458 and DMP 457



DMP 457



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The addresses of our distribution partners are listed on our homepage [www.bdsensors.com](http://www.bdsensors.com). It is possible to download data sheets, operating manuals, ordering codes and certificates, as well.

## 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.

This operating manual is copyrighted. The contents of this operating manual reflect the version available at the time of printing. It has been issued to our best knowledge. BD SENSORS is not liable for any incorrect statements and their effects.

– 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

- Pressure transmitters DMK 456, DMK 457, DMK 458 and DMP 457 have been designed for typical applications in shipbuilding and offshore constructions. They are suitable for measuring tasks with fluids and gases. Typical applications of DMK 456 and DMK 458 are pressure monitoring for loading and discharge processes as well as level measurement for ballast and product storage tanks. Preferred areas of usage for DMK 457 are gears, compressors, boilers, pneumatic controls, elevators, oxygen applications and e.g. level measurement into ballast tanks, etc. With mechanical versions G1/2" open port or G1/2" flush DIN 3852 the DMK 457 is especially suited for viscous, pasty or contaminated media due to the easily reachable ceramic diaphragm. Preferred areas of usage for DMP 457 are diesel engines, gears, compressors, pumps, boilers, hydraulic and pneumatic controls as well as elevators. The pressure transmitters DMK 456, DMK 457, DMK 458 and DMP 457 are certificated by Det Norske Veritas • Germanischer Lloyd (DNV+GL) as standard. The certificates are available for download on our homepage: <http://www.bdsensors.com/products/download/certificates>

- 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
- mounting instructions

## 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.

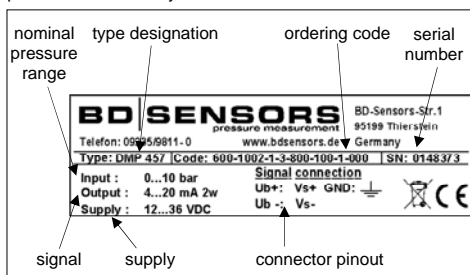


Fig. 1 manufacturing label

**!** 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 or in moist surroundings, the following points have to be observed:

- 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 device with cable gland or cable outlet, 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. Through this, the operability of the device can be affected or damaged. If the internal pressure increases due to solar irradiation, temporary measurement errors may occur.

**!** 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 stress occurs at the pressure port, since this may cause a shifting of the characteristic curve or to the damage. This is especially important for very small pressure ranges.

**📖** 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.

### 3.2 Mounting and safety instructions oxygen

**⚠** DANGER! Explosion hazard, with devices for oxygen applications, when used improperly. To ensure a usage without danger, the following points must be adhered to:

- Make sure, your device has been ordered and delivered as a special version for oxygen applications. You can check the manufacturing label (see figure 1). If the ordering code ends with "007", then the device is suitable for oxygen applications.

- At time of delivery the device is packed into a plastic bag in order to prevent it from impurity. Please observe the indication label "Device for oxygen, unpack only directly before assembling". Also, avoid any skin contacts during unpacking and assembly, in order to prevent greasy residues on the device.

- During installation, the respective explosion protection regulations have to be met. Check, if ATEX-approval is necessary for this type (oxygen) device. (the delivered device has no ATEX-approval)

- Note the entire design requirements meet the standard demand of BAM (DIN 19247).

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

### 3.3 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.

### 3.4 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. (Rz3.2)
- Screw the device into the corresponding thread by hand.
- Tighten it with a wrench (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).
- **The indicated tightening torques must not be exceeded!**

### 3.5 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. (Rz6.3)
- 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!**

### 3.6 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!**

### 3.7 Installation steps for connecting flanges

- Use a suitable seal corresponding to the medium and the 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 environments only!

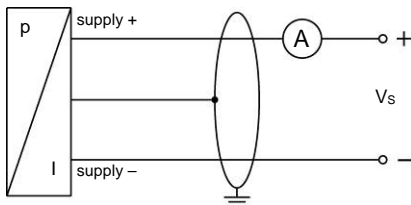
Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration:

Electrical connection	ISO 4400	M12x1 (4-pin)
Supply +	1	1
Supply -	2	2
Shield	ground pin	4

Electrical connection	field housing	cable colours (DIN 47100)
Supply +	IN +	wh (white)
Supply -	IN -	bn (brown)
Shield	⏏	gn/ye (yellow / green)

Wiring diagram:



! 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 cleflessly!

! 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 plug and cable socket, that the 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 has to be used.

⚠ Devices with TPE-cable:

- application in water with a temperature >70°C destroys the cable
- applications at media temperatures >70°C have to be clarified with BD|SENSORS in advance

## 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)!

## 6. Placing out of service

⚠ WARNING! When dismantling the device, it must always be done in the depressurized and currentless condition! Check also if the medium has to be drained off before dismantling!

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

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

## 7. Maintenance

In principle, this device is maintenance-free. If desired, the housing of the device can be cleaned when switched off using a damp cloth and non-aggressive cleaning solutions.

With certain media, however, the diaphragm may be polluted or coated with deposit. It is recommended to define corresponding service intervals for control. After placing the device out of service correctly, the diaphragm can usually be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the diaphragm is calcified, it is recommended to send the device to BD SENSORS for decalcification. Please read therefore the chapter "Repair" below.

! An incorrect cleaning can cause irreparable damages on diaphragm. Never use spiky objects or pressured air for cleaning the diaphragm.

## 8. Error handling

Malfunction	Possible cause	Error detection / corrective
no output signal	wrong connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective amperemeter (signal input)	inspect the amperemeter (fine-wire fuse) or the analogue input of the PLC
analogue output signal too low	load resistance too high	verify the value of the load resistance
	supply voltage too low	verify the output voltage of the power supply
	defective energy supply	inspect the power supply and the applied supply voltage at the device
small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge; incorrect cleaning can cause irreparable damages on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible, it is recommended to send the device to BD SENSORS for decalcification or cleaning
large shift of output signal	diaphragm is damaged (caused by overpressure or manually)	check the diaphragm; if it is damaged, please send the device to BD SENSORS for repair
wrong or no output signal	manually, thermal or chemically damaged cable	check the cable; a possible consequence of a damaged cable is pitting corrosion on the stainless steel housing; if you determine this please return the device to BD SENSORS for repair

If you detect an error, please try to eliminate it by using this table or send the device to our service address for repair.

! Improper action and opening can damage the device. Therefore repairs on the device may only be executed by the manufacturer!

## 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

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](http://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!

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

## 10. 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 measuring 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.

## 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.