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

Operating Manual

Pressure Transmitter
for Shipbuilding and Offshore Applications

DMK 456, DMK 457, DMK 458 und DMP 457

DMK 457

READ THOROUGHLY BEFORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE

ID: BA_DMU_Schiff_E | Version: 03.2021.0

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 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.

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 observed.

1.1 Symbols Used

Warning word	- Type and source of danger - Measures to avoid the danger

Warning word	Meaning
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 three requirements:

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

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

1.3 Intended use

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

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

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

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

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

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

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

1.4 Limitation of liability and warranty

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

1.5 Safe handling

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

NOTE - Do not throw or drop the device!

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

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

1.6 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
- for mechanical pressure ports DIN 3852: O-ring (pre-mounted)
- 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.

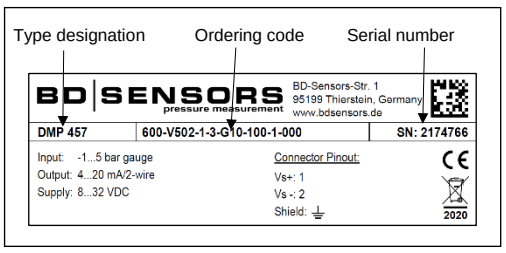


Fig. 1: Example of manufacturing label

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!
DANGER	**Danger of death from improper installation** - Installation must be performed only by appropriately qualified persons who have read and understood the user manual.

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

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

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

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

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

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 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 curve.
- Mount the device such that it is protected from direct solar radiation. 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.

3.2 Conditions for oxygen applications

DANGER	**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 recommended.

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

3.3 Mounting steps for connections according to DIN 3852

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

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

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

1 Screw the device into the corresponding thread by hand.

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

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		

3.4 Mounting steps for connections according to EN 837

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

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

1 Screw the device into the corresponding thread by hand.

2 Then tighten it using an open-end wrench. 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.

3.5 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

3.6 Mounting steps for flange connections

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

1 Put the seal between connecting flange and counter flange

2 Install the device with 4 resp. 8 screws (depending on flange version) on the counter flange.

4. Electrical connection

4.1 Connection and safety instructions

DANGER	**Danger of death from electric shock** - Always mount the device in a depressurized and de-energized condition!

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

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

NOTE - for devices 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 -	code G00:	Ø 10 … 14 mm
	code G01:	Ø 4.5 … 11 mm
	code G10:	Ø 4 … 6 mm
field housing	code 880:	Ø 5 … 14 mm

- Ensure that the cable lies in the cable gland firmly and cleftlessly!

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

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

NOTE - 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:
static installation: 10-fold cable diameter
dynamic application: 20-fold cable diameter

- In case of devices with cable outlet and integrated ventilation tube, the PTFE filter located at the cable end on the 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 aggressive gases, in order to prevent any damage.

4.2 Electrical installation

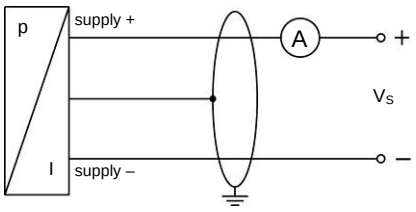
Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration:

Electrical connection	ISO 4400	M12x1 (4-wire)
Supply + Supply –	1 2	1 2
Shield	ground contact ⏚	4

Electrical connection	field housing	cable colours (IEC 60757)
Supply + Supply –	VS + VS –	WH (white) BN (brown)
Shield	GND	GNYE (green- yellow)

Wiring diagram:



5. Commissioning

DANGER	**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)

6. Maintenance

DANGER	**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.

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

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

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

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

7. Troubleshooting

DANGER	**Danger of death from airborne parts, leaking fluids, electric shock** - 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.

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

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

Fault: slight shift of the output signal	
Possible cause	**Fault detection / remedy**
Diaphragm of senor is severely contaminated, calcified or crusted	Checking of diaphragm; if necessary, send the device to BD|SENSORS for cleaning

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

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

8. Removal from service

DANGER	**Danger of death from airborne parts, leaking fluids, electric shock** - Disassemble the device in a depressurized and de-energized condition!
WARNING	**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

WARNING	**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 them:

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

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

10. Disposal

WARNING	**Danger of injury from aggressive media or pollutants** - 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: