



## Operating Manual



Hydrostatic Probe LMK 457, LMK 458 and LMK 458H



LMK 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

- The hydrostatic probes LMK 457 and LMK 458 have been designed especially for shipbuilding and offshore applications with rough environmental and operation conditions. The probes are suitable for level measurement of fluids or pasty media (no solids and frozen media) in open tanks, containers, or reservoirs. As medium all fluids can be used which are compatible with the materials of housing, sealing and cable. Based on a rugged and reliable capacitive ceramic sensor the probe is qualified for measuring small filling heights with high accuracy. Typical areas of use are ballast tanks, fuel and oil tanks as well as service and waste water tanks. The probes as standard complies with the requirements of Germanischer Lloyd (GL) and Det Norske Veritas (DNV). 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!
- The hydrostatic probe has to be used according to the area of application specified above! 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:

- hydrostatic probe
- 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.

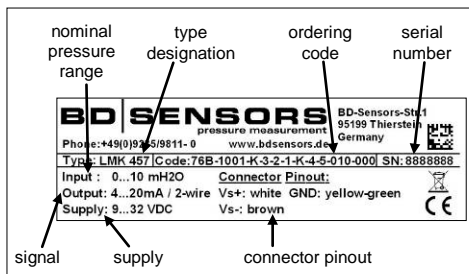


Fig. 1 manufacturing label

- ! 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 possibly protective cap directly before starting assembly. The possibly delivered protective cap has to be stored! Place this 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!
- ! When placing the probe into operation or after maintenance work, the probe has to be submerged slowly into the medium! A rough immersion into the medium can damage or destroy the diaphragm.
- ! For installations outdoor and in damp areas following these instructions:
  - Choose an assembly position, which allows the flow-off of splashed water and condensation.
  - 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.

- 🔧 Take note for screw-in and flange transmitter 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 damage.
- 🔧 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 installing the device outdoor and there is any danger of lightning or overpressure we suggest putting a overpressure protection unit between the supply/switch cabinet and the device to prevent damage.

## 3.2 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.

## 3.3 Installation steps for probe

- Install the device according to your demands.
- 🔧 Usually, the probe is delivered without mounting accessories. But BD SENSORS offers different accessories on request e.g. mounting clamp, terminal clamp or mounting flange.
- 🔧 Do not use freely suspended probes with an FEP cable if effects due to highly charging processes are expected.

## 3.4 Installation steps for flange transmitter

- Please ensure that the mounting thread is clean and free of damage.
- Check to ensure that the O-ring fits properly in the groove.
- Screw in the mounting thread of the transmitter in the transmitter flange, by hand.
- Next, tighten it by an open-end wrench. (approx. 25 Nm)
- Install the flange according to your demands.
- 🔧 If a new transmitter flange is needed, it can be ordered from BD SENSORS.

## 3.5 Installation steps for screw-in transmitter

- Please ensure that the mounting thread is clean and free of damage.
- Check to ensure that the O-ring fits properly in the groove.
- Ensure that the sealing surface of the taking part e.g. welding socket is perfectly smooth and clean.
- Screw the device in the corresponding thread by hand.
- Next, tighten it by an open-end wrench. (approx. 25 Nm)

## 3.6 Removing the protection cap (for probe)

For the protection of the diaphragm, some of the probes have a plugged-on protection cap. If the device shall be used in high-viscosity media such as sludge, a removal of the cap before start-up is necessary. Thus, the sensor becomes flush and the medium will attain quickly to the diaphragm.

- 🔧 If it is necessary for your application to remove the protection cap, this has to be done with utmost care. To prevent a damage of the diaphragm, please follow the instructions below.

## Removal by hand

- Hold the probe in a way that the protection cap points upwards.
- Hold the probe with one hand on the sensor section (1).
- Remove the protection cap (2) with the other hand.

## Removal with a tool (recommended)

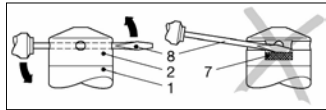


Fig. 2 removal of protection cap

- Hold the probe in a way that the protection cap points upwards.
- Slide a small tool such as a screwdriver (8) straight through two opposite drill holes in the protective cap (2).
- Lever it off by moving up the handle of the screwdriver.

⚠ Make sure that the sensor (7) under the protection cap will not be damaged!

## 4. Electrical Installation

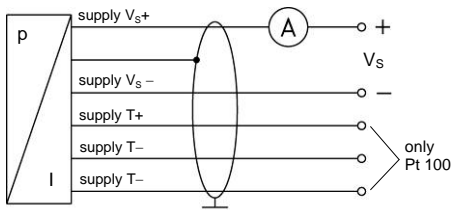
⚠ **WARNING!** Install the device only when depressurized and currentless!

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	cable colours (DIN 47100)
Supply +	wh (white)
Supply -	bn (brown)
optionally (only Pt 100):	
Supply T+	ye (yellow)
Supply T-	gy (grey)
Supply T-	pk (pink)
Shield	ye/gn (yellow / green)

Wiring diagram:



! A minimum static bending radius has to be complied with. For static installation use the 10-fold cable diameter, for dynamic applications use the 20-fold diameter.

! 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; if a cable extension is necessary, also a shielded cable has to be used.

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

⚠ 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.

## 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 "Service/Repair" below.

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

## 8. Service / Repair

### 8.1 Recalibration

During the life-time of a probe, 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](http://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 according to the European Directives 2002/96/EG and 2003/108/EG (on waste electrical and electronic equipment) Waste of electrical and electronic equipment may not be disposed by domestic refuse!



⚠ **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.

## 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.

## 12. 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!