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Operating Manual

Stainless Steel Probe DCL
with RS485 Modbus RTU Interface

DCL 531, DCL 531i, DCL 551, DCL 571

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READ THOROUGHLY BEFORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE

ID: BA_DCL_MODBUS_E | version: 09.2025.0

1. General and safety-related information on this operating manual

This operating manual enables safe and proper handling of the product. It is a part of the device and 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 the data sheet 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 **stainless steel probes DCL** are only suitable for continuous hydrostatic level and level measurement.

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!

Suitable measuring media are liquids which are compatible with the media wetted materials described in the data sheet.

The specifications listed in the current data sheet are binding and must absolutely be complied with. If you do not have the data sheet to hand, please request it 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, alteration of or damage to the device as well as incorrect installation of signal connections or ground potential connections 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 - 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:

- stainless steel probe
- this operating manual

2. Product identification

The identification label with order code is used to identify the device. The most important data can be taken from this.

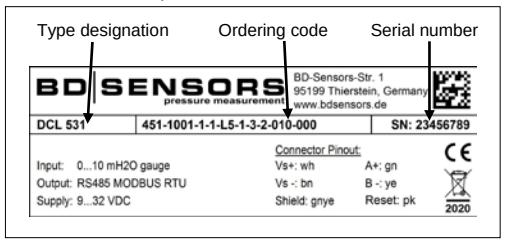


Fig. 1 Example of manufacturing label

NOTE - The manufacturing label must not be removed!

3. Mounting

3.1 Mounting- and safety instruction

⚠ **DANGER**	**Danger of death from airborne parts, leaking fluid, electric shock** - Improper installation may result in electric shock! - Always mount the device in a depressurized and de-energized condition!

As standard, the probe is supplied without fastening material. Clamp fixing and anchor clamp are available as accessories, for different mounting variants.

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

NOTE - Install the probe such that any rubbing or bumping of the sensor head (sensor element), e.g. against a container wall, is excluded. Observe the operating conditions such as, for example, flow conditions. This applies in particular to probes equipped with cable outlet and to devices with tube extensions of a length over 2.8 m.

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 - Always immerse the device slowly into the fluid to be measured! If the probe strikes the liquid surface, the diaphragm could be damaged or destroyed.

NOTE - Fasten the probe properly according to your requirements.

NOTE - Free-hanging probes with FEP cables should not be used if effects of highly charging processes can be expected.

3.2 Removal of protective cap (if necessary)

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.

Removal by hand

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

Removal with a tool (recommended)

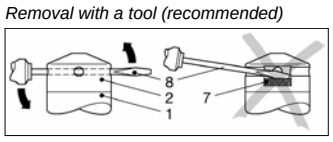


Fig.2 Removal of protection cap

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

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

4. Electrical installation

4.1 Connection and safety instructions

⚠ **DANGER**	**Danger of death from airborne parts, leaking fluid, electric shock** - Improper installation may result in electric shock! - Always mount the device in a depressurized and de-energized condition!

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

NOTE - When routing the cable, the following minimum bend radii must be observed:

Cable without air hose:
fixed installation: 8-fold cable diameter
flexible use: 12-fold cable diameter

Cable with air hose:
fixed installation: 10-fold cable diameter
flexible use: 20-fold cable diameter

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

NOTE - In case of integrated ventilation hose, the PTFE filter located at the cable end on the relative pressure hose 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.

NOTE - If a transition is desired from a cable with relative pressure hose to a cable without relative pressure hose, we recommend using the terminal box KL 1 or KL 2.

4.2 Electrical installation

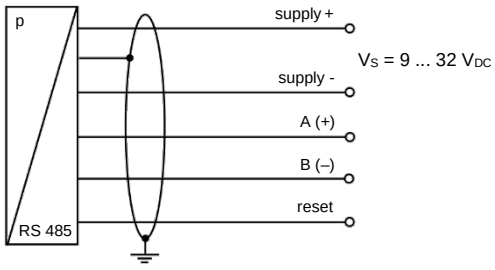
Connect the device electrically according to the information specified on the manufacturing label, the following table, and the wiring diagram.

Pin configuration:

Electrical connections	Cable colours (IEC 60757)
Supply +	WH (white)
Supply –	BN (brown)
A +	GN (green)
B –	YE (yellow)
Reset	PK (pink)
Shield	GNYE (green/yellow)

Wiring diagram:

RS 485 / Modbus RTU with reset function



NOTE - With shielded cables, the cable shield must be connected to earth potential. Use the appropriate grounding clamps for this. Pay attention to a low-impedance connection. Avoid potential differences (earth potential) between measuring and connection points, because this can lead to a defect in the probe. To avoid this, use a suitable connection technology or suitable equipotential bonding.

5. Commissioning

✓ 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. Modbus RTU communication

6.1 Configuration of Modbus RTU

✓ Delay time (start-up time) of 500 msec has been considered.

Concerns only DCL xx1 i

Factory setting	1	1	1
address	1 … 247		
Baud rate			
4800		0	
9600		1	
19200		2	
38400		3	
Parity			
none			0
odd			1
even			2

6.2 Explicit register description

Map of Input registers (read only, function #4 - Read Input Registers)		
Address	**Register**	**Data type**
0x0000	Serial Number	UInt32
0x0001		
0x0002	Date of last calibration	Date
0x0003		
0x0004	Upper range of pressure channel	Float, IEEE754
0x0005		
0x0006	Lower range of pressure channel	Float, IEEE754
0x0007		
0x0008	Actual pressure	Float, IEEE754
0x0009		
0x000A	Maximal Pressure	Float, IEEE754
0x000B		
0x000C	Minimal Pressure	Float, IEEE754
0x000D		
0x000E	Upper range of temperature channel	Float, IEEE754
0x000F		
0x0010	Lower range of temperature channel	Float, IEEE754
0x0011		
0x0012	Actual temperature	Float, IEEE754
0x0013		
0x0014	Maximal temperature	Float, IEEE754
0x0015		
0x0016	Minimal temperature	Float, IEEE754
0x0017		
0x001C	Firmware version	
0x001D	PCB type	

Map of Holding registers (read, write, fce #3 - Read Holding Registers , fce #6 - Write Single Register)		
Address	**Register**	**Data type**
0x0000	Unit of pressure channel	Uint16
0x0001	Unit of temperature channel	Uint16
0x0002	Device address	Uint16
0x0003	Baud rate	Uint16
0x0004	Parity	Uint16

Pressure unit	
Code (Uint16)	**Unit**
0x0003	mmH_2O
0x0004	mmHG
0x0005	psi
0x0006	bar
0x0007	mbar
0x0008	g/cm^2
0x0009	kg/cm^2
0x000A	Pa
0x000B	kPa
0x000C	torr
0x000D	atm
0x000E	mH_2O
0x000F	MPa

Temperature unit	
Code (Uint16)	**Unit**
0x0000	°C
0x0001	°K
0x0002	°F

Baud Rate	
Code (Uint16)	**Baud Rate [Bd]**
0x0004	4800
0x0005	9600
0x0006	19200
0x0007	38400

Parity	
Code (Uint16)	**Parity**
0x0000	none
0x0001	odd
0x0002	even

6.3 Reset function

The reset function of the device is a service function that is not used in regular operation (bus operation). The reset function is used to reset the device to the factory settings, which is extremely helpful, especially with the bus address. In normal operation, no signal may be connected with the reset input.

Activation of the reset function:

To reset the device to the factory settings, the reset input must be connected to 24 V at the same time as the positive supply voltage input. The bus signals A + B can be connected or not connected at this time.

After connecting 24 V once, the reset was carried out internally and the reset input must be disconnected again.

7. 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.

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.

8. 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 9 up to 11)

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: incorrect signal behaviour	
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
Diaphragm of senor is severely contaminated or damaged	Checking of diaphragm; if necessary, 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 stainless-steel housing as a result of damage on cable; when damaged, send the device to BD|SENSORS for repair

9. 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.

10. Service / repair

Information on service / repair:

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

10.1 Recalibration

The offset value or range value may shift during the life of the device. In this case, a deviating signal value in relation to the set lower or upper measuring range value is output. If one of these two phenomena occurs after extended use, a recalibration in the factory is recommended.

10.2 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.

For every return shipment, whether for recalibration, decalcification, alteration or repair, the device must be cleaned thoroughly and packed in a break-proof manner. A return declaration with a detailed fault description must be added to the defective device. If your device has come into contact with pollutants, a declaration of decontamination is additionally required.

Appropriate templates can be found on our homepage. Download these by accessing www.bdsensors.de or request them by e-mail or phone:

- info@bdsensors.de
- service 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!

11. 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!

12. 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.

13. 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: