

Operating Manual

Pressure transmitter with IO-Link interface

DCT 123, DCT 133, DCT 143, DCT 163,
DCT 533, DCT 533P, DCT 543, DCT 553P, DCT 563



DCT 533

**READ THOROUGHLY BEFORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE**

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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.**

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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

	- Type and source of danger - Measures to avoid the danger
Warning word	
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 pressure transmitters DCT XX3 with-IO-Link interface have been developed for pressure measuring applications depending on the particular model. Depending on the particular device and mechanical connection, they are suitable for a wide range of applications. The pressure transmitter is intended for installation in a machine or system, which is equipped with a digital interface (IO-Link).

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. - BD SENSORS is not liable for damage caused by improper or incorrect use.
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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

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 - 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 DCT XX3
- for DIN 3852: O-Ring (pre-mounted)
- this operating manual

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 safety.

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 supply.

2. Product identification

The device can be identified by means of the manufacturing label with ordering code. The most important data can be gathered therefrom.

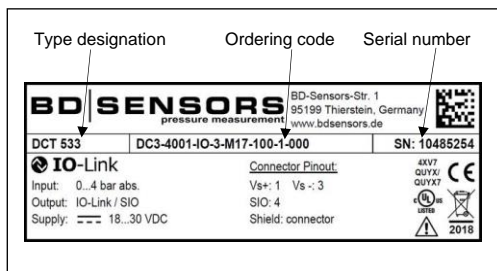


Fig. 1: Example of manufacturing label

NOTE - The manufacturing label must not be removed!

3. Mounting

3.1 Mounting and safety instructions

	Danger of death from airborne parts, leaking fluid, electric shock - Always mount the device in a depressurized and de-energized condition!
	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 and and clarify the material compatibility.

NOTE - The measuring point must be designed in such a way 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 at very small pressure ranges and devices with a pressure port made of plastic.

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. Dust and dirt must be removed from the edge of the screwed joint of the electrical connection.

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 / in a humid environment and for cleaning:

- 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, 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. In the most unfavourable case, direct solar radiation leads to the exceeding of the permissible operating temperature, which can then damage the device or affect its ability to function correctly. If the internal pressure in the device rises, this could also cause temporary measurement errors.
- 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 tank.

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
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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)

3.4 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 groove.
- ✓ The sealing face of the mating component has a flawless surface. (Rz: 3.2)

- 1 Screw the device into the corresponding thread by hand.
- 2 Devices equipped with a knurled ring: only tighten by hand
- 3 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 Nm
 - G3/4": approx. 15 Nm
 - G1": 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)

- 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

3.6 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

3.7 Mounting steps for dairy pipe connections

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

- ✓ 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
- 1 Centre the dairy pipe connection in the counterpart.
 - 2 Screw the cup nut onto the mounting part.
 - 3 Then tighten it using a hook wrench.

3.8 Mounting steps for Clamp and Varivent® connections

- ✓ 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
- 1 Place the seal onto the corresponding mounting part.
 - 2 Centre the clamp connection or Varivent® connection above the counterpart with seal.
 - 3 Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.

3.9 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 of death from electric shock - Always mount the device in a depressurized and de-energized condition!
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- ✓ 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 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 air 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

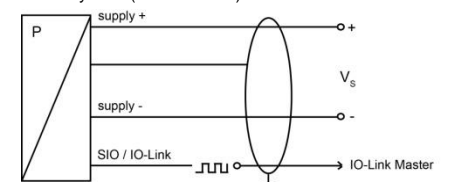
Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration:

Electrical connections	M12x1 (4-pin) metal	Binder 723 (5-pin)	cable colours (IEC 60757)
Supply +	1	1	WH (white)
Supply -	3	3	BN (brown)
SIO / IO-Link +	4	4	GN (green)
Shielding	housing	housing	GNYE (green-green)

Wiring diagram:

3-wire system (SIO / IO-Link)



5. Commissioning

	Danger of death from airborne parts, leaking fluid, electric shock - Operate the device only within the specification! (according to data sheet)
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- ✓ The device has been installed properly.
- ✓ The device does not have any visible defect.

6. IO-Link interface

6.1 General device information

Baud rate	COM 2 (38.4 kbaud)
Input process data length	2 bytes
Minimum cycle time	5 msec
IO-Link version	V 1.1
SIO mode	yes

6.2 SIO mode (standard IO mode)

In this mode the transmitter operates like a normal pressure transmitter with standard output signals. The digital output is always on Pin 4 of the M12 connector plug or with cable via the green wire.

6.3 IO-Link mode (communication mode)

The pressure transmitter switches to the IO-Link communication mode, when it operates under an IO-Link master. IO-Link communication is only possible over Pin 4 of the M12 connector plug or with cable via the green wire.

6.4 Process data

The process data length of the sensor is 16 bits. The switching state (BCD1) as well as the current measured values are transmitted. The 14 bits of the measured value are scaled according to the measuring range.

15 bit	14..2	1	0
Signed bit	Measured value	0	BDC1 / Output 1

6.5 Error codes

Error code	Description
0x8011	Index not available
0x8012	Subindex not available
0x8023	Access denied
0x8030	Parameter value out of range
0x8033	Parameter length overrun
0x8034	Parameter length underrun

6.6 Event codes

	Event codes for IO-Link 1.1	Event codes for IO-Link 1.0	Device status	Type
No malfunction	0x0000	0x0000	0	Notification
General malfunction Unknown error	0x1000	0x1000	4	Error
Process variable range overrun Process data uncertain	0x8C10	0x8C10	2	Warning
Process variable range underrun Process data uncertain	0x8C30	0x8C10	2	Warning

