Operating Manual

Electronic OEM Pressure Switch Pneumatics
with IO-Link Interface

iS 4

CE

IO-Link

RoHS   REACH

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

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.com* or request it by e-mail or phone: 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 electrical signal.

Depending on mechanical connection, the **pressure switch iS 4** is suitable for a wide range of applications. The pressure switch is intended for installation in a machine or system.

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 compressed air and non-aggressive gases, 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.com

⚠ **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:
- iS 4
- this operating manual

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.
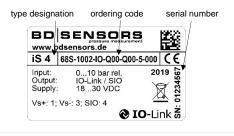

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iS 4 | 68S-1002-IO-Q00-Q00-5-000 | CE
Input: 0...10 bar rel.   2019
Output: IO-Link / SIO
Supply: 18...30 VDC
Vs+: 1; Vs-: 3; SIO: 4
SN: 01234567
IO-Link

Fig. 1: 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 a 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 specified tightening torques must not be exceeded!

NOTE - Install the device in such a way, that the gauge reference (little hole in the housing) 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.

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 device. There are specially protected devices 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!

- 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.

3.2 Mounting steps for Internal thread G1/8"

✓ A suitable seal (e. g. Teflon strip, flat gasket or O-ring) for the medium and the pressure to be measured is used on the screwed end of the counterpart.

✓ The surface of the taking part is perfectly smooth and clean.

1   Screw the counterpart (e.g. screw connection, quick coupling) by hand into the pressure switch.

2   Tighten the counterpart with a wrench (max. torque 3 Nm).

3.3 Installation steps for internal thread M5

✓ The O-ring is undamaged and seated in the designated groove. (O-ring is not included in the scope of delivery)

✓ The surface of the taking part is perfectly smooth and clean.

1   Screw the counterpart (e.g. screw connection, quick coupling) by hand into the pressure switch.

2   Tighten the counterpart with a wrench (max. torque 1 Nm).

3.4 Installation steps for flange mounting (only possible with internal thread M5)

✓ The O-ring is undamaged and seated in the designated groove. (O-ring is not included in the scope of delivery)

✓ The surface of the taking part is perfectly smooth and clean.

1   There are 4 threads (M3) for flange mounting.

2   Install the device with 2 or 4 screws on the intended flange. When using low pressure ranges and usual conditions for the application are given, 2 screws will suffice.

3   Tighten the screws; the surfaces of pressure switch and counterpart must bear on each other.

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 - For the electrical connection a shielded and twisted multicore cable is recommended.
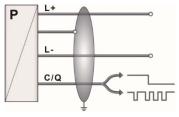
4.2 Electrical installation

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		M8x1 / metal (4-pin)
(L+)	Supply +	1
(L-)	Supply –	3
C/Q	IO-Link (COMx) / SIO	4
	Shield	housing

Wiring diagram:

SIO / IO-Link (COMx)-system

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. IO-Link interface

6.1 General device information

Baud rate	COM 2 (38.4 kbit/s)
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 device operates like a normal pressure device with standard output signals. The digital output is always on Pin 4 of the connector plug.

6.3 IO-Link mode (communication mode)

The device 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 connector plug.

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

6.7 Parameter data

The parameter data of the pressure switch correspond to the Smart Sensor Profile. The data can be found in the product data sheet or parameter overview (see item 13.).

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.

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

9.1 Recalibration

During the life-time of a device, 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 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 or request them:

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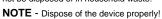
10. Disposal

⚠ **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.com.

Additionally, the operational safety is confirmed by the CE sign on the manufacturing label.

13. Parameter overview

IO-Link interface		

1. General device information

		4. Process data			
Baud rate	COM2 (38.4 kbit/s)	The process data length of the sensor is 16 bits. The switch 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.			
Input process data length	2 byte				
Minimum cycle time	5 ms				
IO-Link version	V 1.1	15 bit	14 … 2	1	0
SIO mode	yes	Signed Bit	measurement	0	BDC1 / output 1

2. SIO mode (standard IO mode)

	5. Error message	
In this mode the sensor operates like a normal pressure sensor with standard output signals. The digital output is always on Pin 4 of the connector plug.	**Error Codes**	**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

3. IO-Link mode (communication mode)

6. Event codes

The pressure sensor switches into IO-Link communication mode when operating under an IO-Link master. IO-Link communication is only possible via Pin connector.		**Event-Codes IO-Link 1.1**	**Event-Codes IO-Link 1.0**	**Device status**	**Type**
	No malfunction	0x0000	0x0000	0	Notification
	General malfunction-unknown error	0x1000	0x1000	4	Error
	Process variable range over-run - Process Data uncertain	0x8C10	0x8C10	2	Warning
	Process variable range under-run. Process Data uncertain	0x8C30	0x8C10	2	Warning

7. Parameter data (The parameter data for the pressure sensor correspond to the Smart Sensor profile.)

Index hex	Subindex hex	Object name	Single Value	Default	Comment
0x02	0x00	System Commands	0x81 = delete Min-/Max-Wert 0x82 = res 0xA0 = Set0		The action is executed by writing in the subindex
0x03	0x00	Data Storage Index	0x01: Upload Start 0x02: Upload End 0x03: Download Start 0x04: Download End 0x05: Datastorage Break		
0x0C	0x00	Device Access Lock	0x00: Unlocked 0x01: IO-Link Lock 0x02: Datastorage Lock 0x04: Parameterization Lock 0x08: User Interface Lock 0x03: IO-Link Lock + Datastorage Lock 0x05: IO-Link Lock + Parameterization Lock 0x09: IO-Link Lock + User Interface Lock 0x06: Datastorage Lock + Parameterization Lock 0x0A: Datastorage Lock + User Interface Lock 0x07: Datastorage Lock + IO-Link Lock + Parameterization Lock 0x0B: Datastorage Lock + IO-Link Lock + User Interface Lock	0x00: Unlocked	
0x24	0x00	Device Status	0x00 Device is operating properly 0x02 Out-of-Specification 0x04 Failure		
0x3D	0x02	Switch Point mode	0x80: Hysteresis NO 0x81: Hysteresis NC 0x82: Window NO 0x83: Window NC	0x80: HNo	

Index hex	Subindex hex	Object name	Access	Length	Value Range	Gradient	Unit	Default
0x3C	0x01	SetPoint 1 = SP	R/W	2 Byte	Process Data			100%
0x3C	0x02	SetPoint 2 = rP	R/W	2 Byte	Process Data			0%
0xD0	0x00	Delay Switching Time	R/W	2 Byte	0 ... 500	0.1	sec	0
0xD1	0x00	Delay Back Switching Time	R/W	2 Byte	0 ... 500	0.1	sec	0
0xD5	0x00	Min Pressure Value	R	2 Byte	Process Data			
0xD6	0x00	Max Pressure Value	R	2 Byte	Process Data			
0xD7	0x00	Measure damping	R/W	2 Byte	0…1000 in 10 ms steps	1	ms	0

Notes:

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