

MANUAL

# Reduction Factor 1 Sensors with IO-Link



With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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# 1 Introduction

## 1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



### **Note!**

For full information on the product, refer to the further documentation on the Internet at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

## 1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.



## 1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

### Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



#### ***Danger!***

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



#### ***Warning!***

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



#### ***Caution!***

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### Informative Symbols



#### ***Note!***

This symbol brings important information to your attention.



#### **Action**

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

## 1.4 Intended Use

Reduction factor 1 sensors detect different metals with the same operating distance. The integrated IO-Link interface enables clear identification of the sensor, individual configuration of the parameters and the operating modes, and diagnosis of the sensor status.

Only use recommended original accessories.

## 1.5 General safety instructions

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

Installation and commissioning of all devices may only be performed by trained and qualified personnel.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.



### **Note!**

#### **Disposal**

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

## 1.6 Declaration of conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.



### **Note!**

A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, D-68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.



## 2 Product Description

### 2.1 Use and Application

Reduction factor 1 sensors reliably detect different metals with the same operating distance. The integrated IO-Link interface enables clear identification of the sensor and diagnosis of the sensor status. The interface enables optimal configuration of the parameters and operating modes specifically for the intended application.

You can use the "Switchpoint Logic" parameter to set the switching function of the sensor at the output to normally-open or normally-closed.

In some applications, the output signal must be present for an extended period to ensure reliable processing. You can use the "Pulse Extension" parameter to extend the switching signal in defined increments.

You can use the "Switchpoint Mode" parameter to choose between conventional detection of an object from the operating distance  $S_n$  using "switch point mode" and detection of an object within a defined area using "window mode."

With reduction factor 1 sensors, it is possible to select either the operating distance  $S_n$  (switch point 2, SP2) or the "near operating distance" (switch point 1, SP1) as the threshold value for object detection. Whereas in "switch point mode" only one of the two distances is evaluated, in "window mode" the sensor signals the presence of an object between the operating distance  $S_n$  (switch point 2, SP2) and the "near operating distance" (switch point 1, SP1).

The optional "Stability Alarm" function can be used when adjusting the sensor in your machine/plant and to monitor operation; it provides reliable additional information to assist with object detection. An LED and the process data indicate to the user that the "stability alarm" has been activated.

In "switch point mode," the stability alarm signals the detection of an object in the area between the assured operating distance and the operating distance  $S_n$ . Influences such as temperature drift mean that reliable object detection cannot be guaranteed in this area, unlike with the assured operating distance  $S_a$ .

In "window mode," the stability alarm signals the detection of an object below the window between the operating distance  $S_n$  and the near operating distance. It is therefore possible to make qualified statements about whether an object is above the switching window, within the switching window, or below the switching window.

### 2.2 IO-Link

#### What is IO-Link?

IO-Link is a new dimension in the communication of and with sensors. The ability to make the intelligence that is already integrated in each and every sensor fully available to users opens up new possibilities for automation. Use of IO-Link produces positive effects for all factory automation applications. The technology offers particular benefits with regard to servicing (troubleshooting, maintenance, and device replacement), during the commissioning process (cloning, identification, configuration, and localization) and during operation (job changeover, continuous parameter monitoring, and online diagnostics). Reducing the variety of interfaces offers users considerable potential for savings. This variety of interfaces often results from having analog sensor inputs and the complex installation associated with them.

#### Device description file (IODD)

You can find the IO-Link device description file (IODD) necessary for connecting to an IO-Link system, and for parameterization and diagnosis, online at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com) on the product page for the relevant sensor.

## 2.3 LED Indicators

Reduction factor 1 sensors have status indicator LEDs (yellow), and some models also have operating voltage indicator LEDs (green). Details of which LEDs are assigned to a product variant can be found in the respective datasheet.

The LEDs light up as follows, depending on their function:

- On
- Off
- Flashing (approximately 4 Hz)

### LED Display Behavior

LED	Color	Description
Operating voltage indicator	Green	<ul style="list-style-type: none"> <li>■ On = supply voltage available</li> <li>■ Off = no supply voltage</li> </ul>
Status indicator	Yellow	<p>Depending on the switch point mode that has been set and the distance of an object (damping element) from the sensor, the LED indicates the status as follows:</p> <ul style="list-style-type: none"> <li>■ On = switching output has switched because an object is closer than the switch point or is in the switching window.</li> <li>■ Off = switching output has not switched.</li> </ul> <p>The LED behavior outlined below is only displayed if the "Stability Alarm" parameter is enabled:</p> <ul style="list-style-type: none"> <li>■ Flashing (approximately 4 Hz) = the stability alarm has been triggered.</li> <li>■ Switch point mode: The sensor detects an object in the area between the assured operating distance and the operating distance <math>S_n</math>.</li> <li>■ Window mode: The sensor detects an object below the switching window between the operating distance <math>S_n</math> and the near operating distance.</li> </ul>

## 2.4 Accessories

### 2.4.1 Parameterization Aids

The following parameterization aids are available:

Designation	Description
PACTware	FDT frame application for operating IODDs and DTMs.
Pepperl-Fuchs-xxx...IODDx.x	IO Device Description (IODD)—device description for operating the sensor, integrated in the system environment. See the product page for the relevant sensor at <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a> .
IODD Interpreter DTM	Software for integrating IODDs into an FDT frame application (e.g., PACTware).
IO-Link-Master02-USB	USB to IO-Link adapter box for controlling an IO-Link sensor via a PC.
IO-Link-Master02-USB DTM	Device type manager—software for operating the IO-Link-Master02 USB via FDT.
Pepperl+Fuchs PACTware IO-Link Connection Wizard	Software tool for automatically launching the PACTware software installed on your PC and for automatically connecting PACTware to the sensor.



## 2.4.2 Additional Accessories



**Note!**

Details of additional accessories for the sensor, such as connection cables or holders, can be found in the datasheet for the relevant sensor.

This datasheet is available to download from the Pepperl+Fuchs website at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## 3 Installation

### 3.1 Safety Information



**Caution!**

Risk of short circuit

Carrying out work while the system is energized may result in damage to the device.

- Always disconnect the supply voltage before carrying out work on the device.
- Only connect the device to the supply voltage once all work has been completed.

### 3.2 Preparation



#### Unpacking the unit

1. Check that all package contents are present and undamaged.
  - ↳ If anything is damaged, inform the shipper and contact the supplier.
2. Check that all items are present and correct based on your order and the shipping documents.
  - ↳ If you have any questions, please contact Pepperl+Fuchs.
3. Keep the original packing material in case you need to store or ship the unit at a later time.

### 3.3 Mounting

- A flush mount is possible in metallic and nonmetallic environments.
- The installation conditions for all models are described in the document entitled "Installation Conditions for Inductive Sensors."



**Note!**

"Installation Conditions for Inductive Sensors" can be downloaded from the "Documents" section of the relevant product detail page on the Pepperl+Fuchs website, at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

### 3.4 Connection



#### Connecting the Supply Voltage

To supply voltage to the sensor, proceed as follows:

1. Connect a connection cable to the sensor.
2. If it is necessary due to the type of connection, secure the connection cable to the sensor so that it cannot be inadvertently disconnected.
3. Connect the supply voltage to the cable provided.
  - ↳ The sensor is ready for operation.



#### Control via IO-Link

To prepare the sensor for control via IO-Link, proceed as follows:

1. Connect the sensor to an IO-Link master. Use a four-core sensor cable for the connection.
2. If it is necessary due to the type of connection, secure the connection cable to the sensor so that it cannot be inadvertently disconnected.
  - ↳ The sensor is now prepared for IO-Link communication.

Sensor	Electrical Connection	Pinout
Sensor with V1 plug		
Sensor with open cable		
Sensor with terminals		

Table 3.1



**Note!**

The list of electrical connections above represents just some of the products in our range of reduction factor 1 sensors with IO-Link. The list is not exhaustive. Please refer to the datasheet for the connection diagram for your sensor. This datasheet is available to download from the Pepperl+Fuchs website at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## 4 Commissioning

### 4.1 Commissioning without IO-Link



#### **Note!**

The reduction factor 1 sensors with IO-Link can be operated as conventional inductive sensors without an IO-Link connection. In this case, the sensor will use the default factory settings. Changes to the configuration can only be made by parameterizing via IO-Link.



Switch on the supply voltage.  
If the sensor has an operating voltage indicator, the indicator will light up in green.

↳ The sensor will now function using the factory preset parameters. The switch state of the sensor is given as a level at output Q, and is also indicated by the yellow status indicator LED.

### 4.2 Commissioning with IO-Link on a Control System



To activate the sensor via IO-Link using a control system, proceed as follows:

1. Check the connection between the sensor and the IO-Link master.
2. Set the status to "IO-Link" on the corresponding port on the IO-Link master to which the sensor is connected.

↳ The sensor can be parameterized or diagnosed using the modulated application. It sends the binary switching information as process data.

### 4.3 Commissioning with IO-Link Using PACTware and IODD



#### **Note!**

A four-pin M12 cordset is necessary for connecting the sensor to the Pepperl+Fuchs IO-Link master. You can find suitable connection cables by visiting [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com) and clicking on the product page for the relevant sensor.

An IODD (IO-Link Device Description) file is available to download for parameterization of the sensor via IO-Link. See the product page for the relevant sensor at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

This manual describes how to perform parameterization using the "PACTware" FDT frame application into which the relevant IODD is loaded. In principle you can use other appropriate FDT frame applications.

To integrate the IODD into PACTware, the IODD must first be converted into a Quasi-DTM using the "IODD Interpreter DTM" software. The IODD must be recorded in the PACTware device catalog. The "IODD Interpreter DTM" can be downloaded from [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

The "Pepperl+Fuchs PACTware Connection Wizard" is available to help you launch and connect the sensor easily. The wizard takes you through all the necessary steps for opening a PACTware project. All of the required software components must first be installed on the PC. Alternatively you can launch PACTware directly and add or start devices such as the IO-Link master and the sensor, the IODD, and the connection setup step by step.



#### Prerequisites for Commissioning

Proceed as follows to communicate with the sensor via IO-Link using the "PACTware" software and the associated IODD:

1. Make sure that PACTware and the DTM for the IO-Link master and the required IODD device description for the sensor are installed.
2. Connect the sensor to an IO-Link master via a suitable M12 cordset.
3. Connect the IO-Link master to a USB port on your PC via a USB cable.

## Setting Up Sensor Communication Using PACTware via the "Pepperl+Fuchs PACTware Connection Wizard"

In addition to the aforementioned software components, the "Pepperl+Fuchs PACTware Connection Wizard" must be installed on the PC. The sensor and IO-Link master must also be connected to the PC.

Double-click the "Pepperl+Fuchs PACTware Connection Wizard" icon.

↳ PACTware and the associated DTM/IODD are loaded and the connection to the sensor is automatically established.

## Setting Up Sensor Communication Using PACTware (Step by Step)

1. Launch PACTware by double-clicking the PACTware icon.

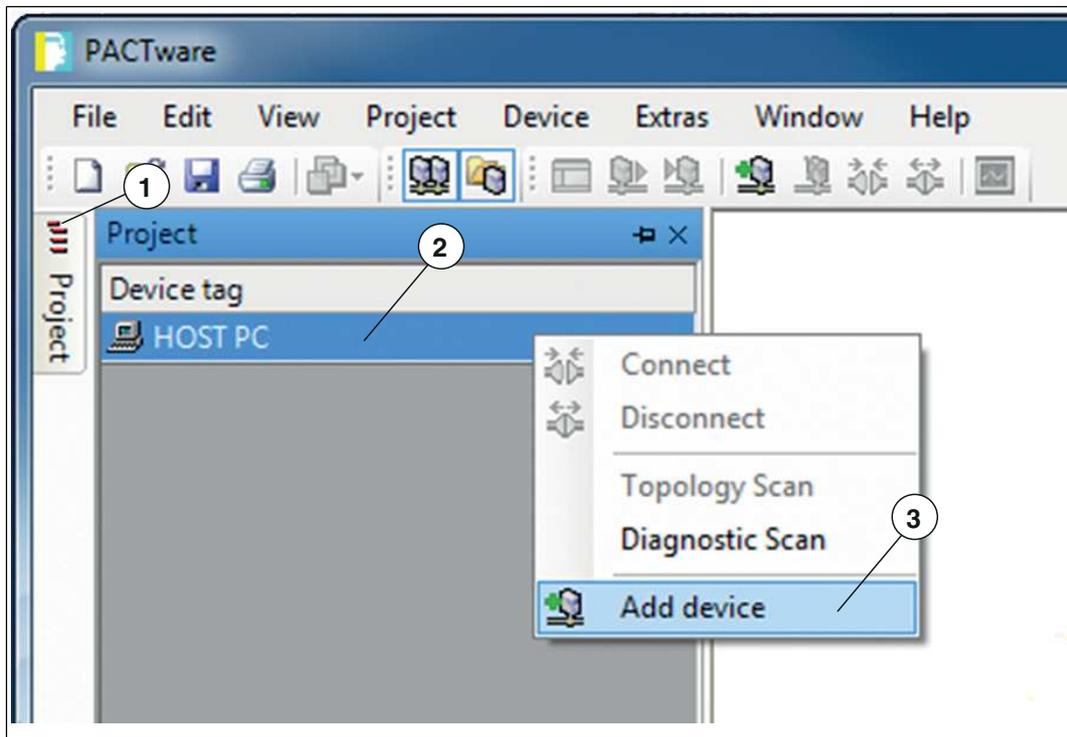


Figure 4.1

2. Click **Project** (1) at the top left.
3. Click **Host PC** (2), then click the right mouse button and select **Add device** (3).  
↳ A window for selecting the device is displayed.
4. Check "IO-Link USB master..." in the window and click **OK** to confirm.  
↳ The IO-Link USB master is installed in the project as a device.

- Click the project under **IO-Link USB master...** (4), then click the right mouse button and select **Add device** from the menu that opens. Next, you must integrate the IODD for the required sensor into the project.

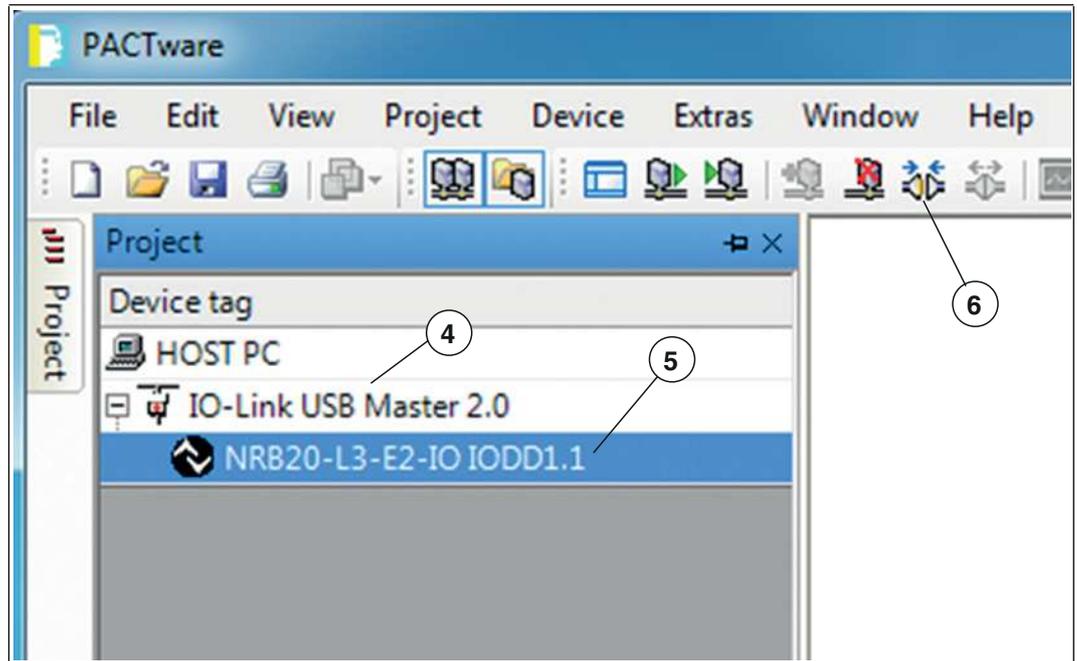


Figure 4.2

↳ The device selection window is displayed again with all available DTMs and IODDs.



**Note!**

To integrate the IODD into PACTware, the IODD must first be converted into a Quasi-DTM using the "IODD Interpreter DTM" software and be recorded in the PACTware device catalog.

- Select the required IODD and press OK to confirm.

↳ The IODD is installed in the project (5); "NRB20-L3-E2-IO-IODD1.1" is shown here as an example.

- Double-click on the IODD in the project (5); "NRB20-L3-E2-IO-IODD1.1" is shown here as an example.

↳ The selected IODD interface is displayed.

- Click the icon for setting up the connection (6).

↳ The data connection to the sensor is established. Status information "connected" will be displayed in the bottom left of the menu if connection is successful.

## 5 IO-Link parameterization

### 5.1 Overview

The sensor parameters are different for each device. A standardized description of these parameters can be found in the IO Device Description (IODD). The IODD can be imported into various engineering tools from different system providers, providing they support IODD. The sensor can then be parameterized or diagnosed using the relevant tool (e.g., PACTware) and a user interface generated from the IODD.



**Note!**

The following screenshots from the IODD provide examples within the context of the PACTware frame program for all reduction factor 1 sensors with IO-Link; the example is based on the NRB20-L3-E2-IO-V1 sensor.



**Note!**

The buttons under individual menu items in PACTware can be used to read/write data from the sensor or to enable a cyclic update of dynamic variables. These features allow corresponding values to be read from the sensor cyclically and written to the sensor in the event of parameter changes. These buttons are shown in the image below. Hover over the buttons with the mouse to view the description of the buttons.



Figure 5.1

## 5.2 Identification Menu Item

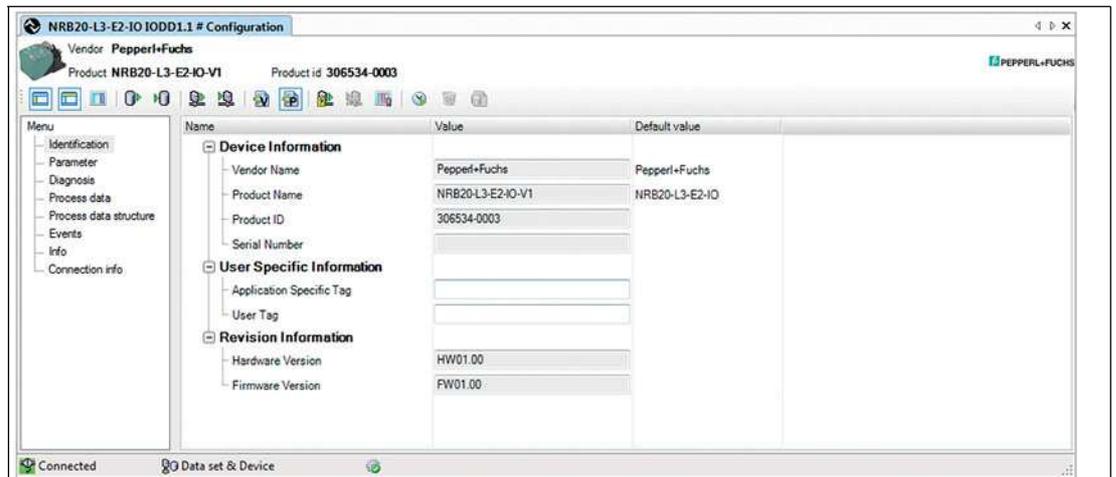


Figure 5.2

The **Identification** menu item is divided into three sections:

- **Device Information:** Displays hard-coded manufacturer and device information. These are read-only fields.
- **User Specific Information:** These fields can be edited freely by the user, e.g., to distinguish between several sensors of the same type within a network. Text information (string) can be entered in the "Application Specific Tag" field and "User Tag" fields.
- **Revision Information:** Displays the firmware and hardware versions. Please have this information ready when contacting our Service Center. These are read-only fields.

## 5.3 Parameters Menu Item



Figure 5.3

The **Parameters** menu item can be used to configure the sensor for the specific application.

## "Switchpoint Mode" Parameter

You can use the "Switchpoint Mode" parameter to choose whether to operate the sensor in switch point mode or window mode. In switch point mode, you can set a sensor threshold value to specify the distance at which an object is detected and at which the sensor activates its switching output. Two predefined threshold values are available. The threshold values are the details given in the relevant datasheet for the "Operating distance  $S_n$ " and the "Near operating distance." To suppress unstable statuses, the switch points are assigned a switch point hysteresis.

- Switch point 2 = setpoint SP2, operating distance  $S_n$
- Switch point 1 = setpoint SP1, near operating distance

In window mode, the sensor detects whether there is an object between the "Operating distance  $S_n$ " and the "Near operating distance."



### Note!

The maximum switching frequency is reduced in window mode. Take this into consideration for your application.

The diagram below illustrates the switching characteristics of the sensor for the various switch point mode settings.

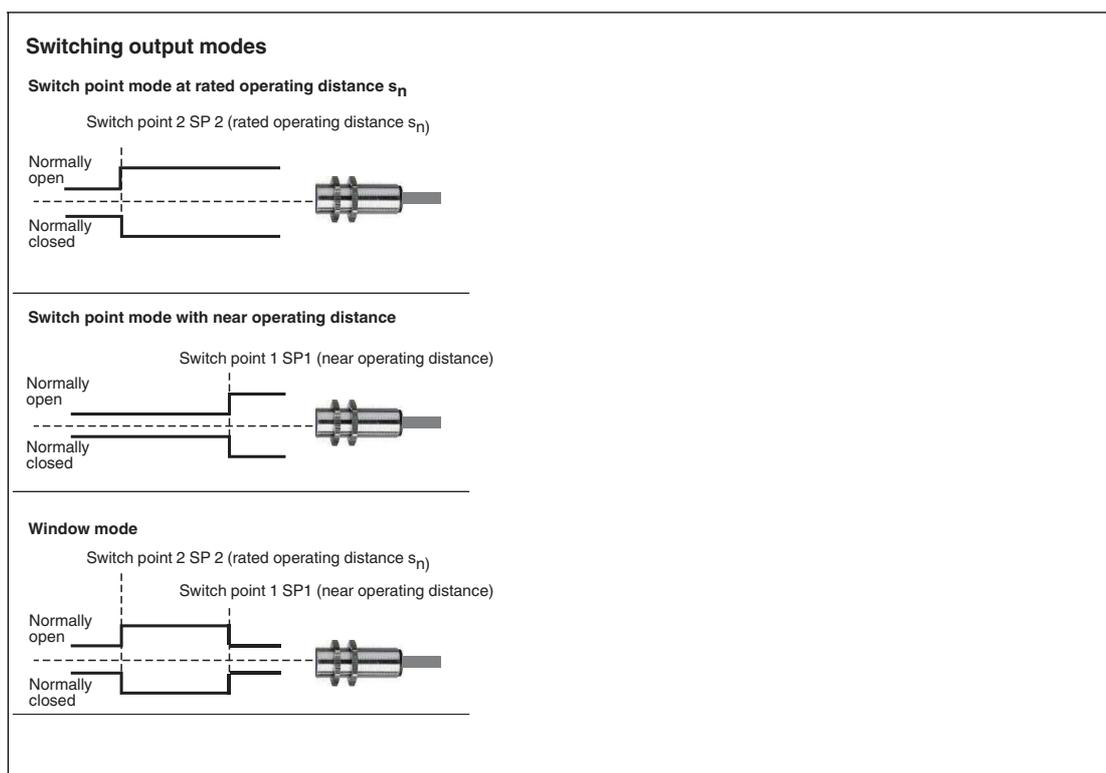


Figure 5.4

## "Switchpoint Logic" Parameter

You can use the "Switchpoint Logic" parameter to set the switching function of the sensor at the output to normally-open or normally-closed. This parameter can therefore be used to invert the switching signal.

- Normally-open = high active
- Normally-closed = low active

## "Pulse Extension" Parameter



### Note!

The pulse extension setting impacts the maximum object detection switching frequency that can be evaluated by the higher-level control system of the sensor. You must take this into account when designing your application.

You can use the "Pulse Extension" parameter to extend the high level of the switching signal at the output/process data during object detection to a specific time. This can be useful if the higher-level control system requires more time for signal processing than the sensor requires for object detection in the sensing range. Uses of this feature include reliable detection of objects that are present for a very short time (normally-open operation) or objects that are absent for a very short time (normally-closed operation).

Depending on the switch point logic that is set, the following principle applies to the switching signal:

- Switch point logic = high active (normally-open operation): Object detection is indicated by a high level. The duration of the high level is extended to the minimum time that has been set.
- Switch point logic = low active (normally-closed operation): Object detection is indicated by a low level, but the high level is extended to the minimum time that has been set.

You can choose from the following pulse lengths for object detection:

- Disabled = switching signal/process data directly follows the sensing range of the sensor.
- Automatic = switching signal/process data is extended to the IO-Link cycle time determined with the relevant IO-Link master.
- 10 ms = switching signal/process data is extended to 10 ms.
- 100 ms = switching signal/process data is extended to 100 ms.
- 1000 ms = switching signal/process data is extended to 1 s.

The signal diagram below illustrates the pulse extension principle during normally-open and normally-closed operation.

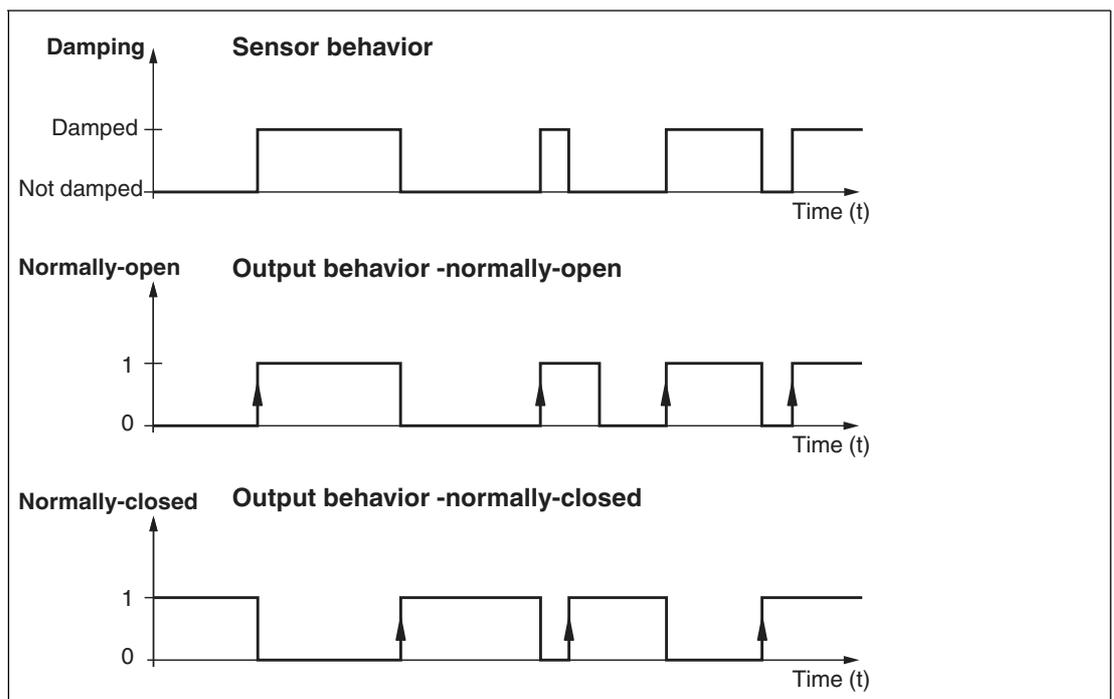


Figure 5.5

## "Stability Alarm" Parameter

The optional "Stability Alarm" function can be used when adjusting the sensor in your machine/plant and to monitor operation; it provides reliable additional information to assist with object detection. A flashing LED and the DSC (Diagnosis Signal Channel) bit in the process data indicate to the user that the "stability alarm" has been activated. The polarity of the bit can be set to either "high active" or "low active."

In "switch point mode," the stability alarm signals the detection of an object in the area between the assured operating distance  $S_a$  and the operating distance  $S_n$ . Influences such as temperature drift mean that reliable object detection cannot be guaranteed in this area, unlike with the assured operating distance  $S_a$ .

In "window mode," the stability alarm signals the detection of an object below the window between the operating distance  $S_n$  and the near operating distance. It is therefore possible to make qualified statements about whether an object is above the switching window, within the switching window, or below the switching window.



### Note!

Regardless of whether or not it has been activated via the corresponding parameter, the "stability alarm" function is only active if "Setpoint SP2 (operating distance  $S_n$ )" or "window mode" has been set in switch point mode. The maximum switching frequency is reduced if "Stability Alarm" is active.

The diagram below illustrates the relationships between switch point mode/window mode and the stability alarm.

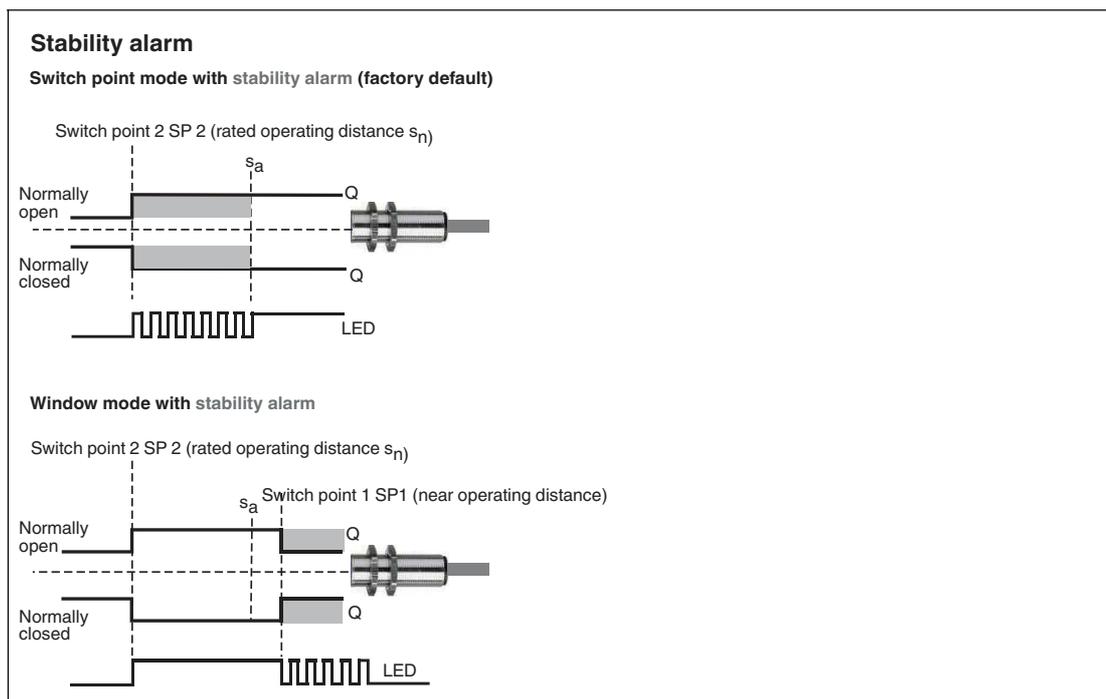


Figure 5.6

## "Device Access Locks" Section

In the **Device Access Locks** section, you can interrupt the data storage mechanism according to IO-Link protocol. When the "data storage lock" is enabled, changes to the sensor parameters are no longer automatically forwarded to the master. This allows you to test the settings on the sensor without changing the values in the "Data Storage" of the master. If the sensor is disconnected from the voltage or is replaced, the master writes the original values from "Data Storage" to the sensor again. This restores the original parameterization.

## 5.4 Diagnosis Menu Item

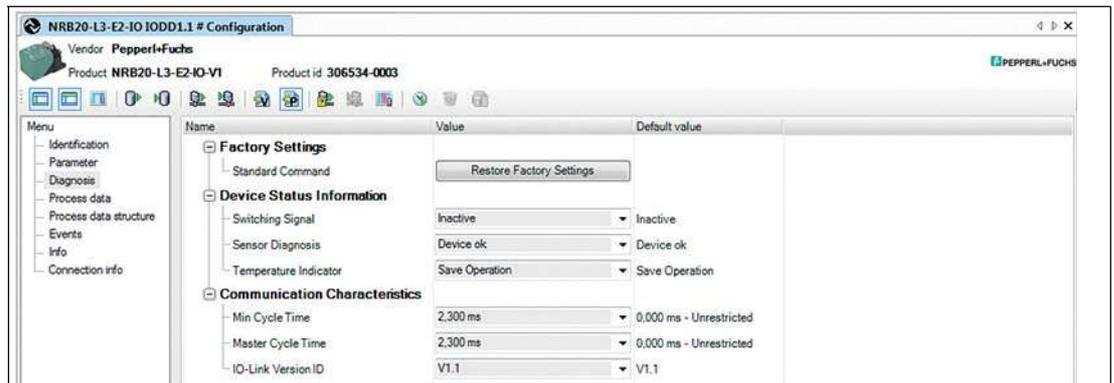


Figure 5.7

The **Diagnosis** menu item is divided into three sections.

- **Factory Settings:** Activating the **Restore Factory Settings** switch resets the sensor to the default settings. All previous parameter changes are lost as a result of this.
- **Device Status Information:** The device status information fields contain information about the current operating status of the sensor. These are read-only fields.
  - Switching Signal: "Active" if the sensor has detected an object and "Inactive" if this is not the case.
  - Sensor Diagnosis: "Device is OK" indicates that the sensor is working properly. "Stability alarm active" indicates that the stability alarm has been triggered.
  - Temperature Indicator: This field uses three levels to indicate the evaluated internal sensor temperature.
    - Normal operation: The sensor is within the specified temperature range.
    - Critical high temperature: The measured internal sensor temperature is approaching the maximum permissible temperature.
    - Overtemperature: The measured internal sensor temperature is above the permissible sensor temperature.
- **Communication Characteristics:** Indicates the minimum cycle time, master cycle time, and IO-Link version ID. These are read-only fields.

## 5.5 Process Data Menu Item



Figure 5.8

The **Process Data** menu item displays the status (active/inactive) of the switching signal (SSC—Switching Signal Channel) and the stability alarm (DSC—Diagnosis Signal Channel). These are read-only fields.

## 5.6 Process Data Structure Menu Item

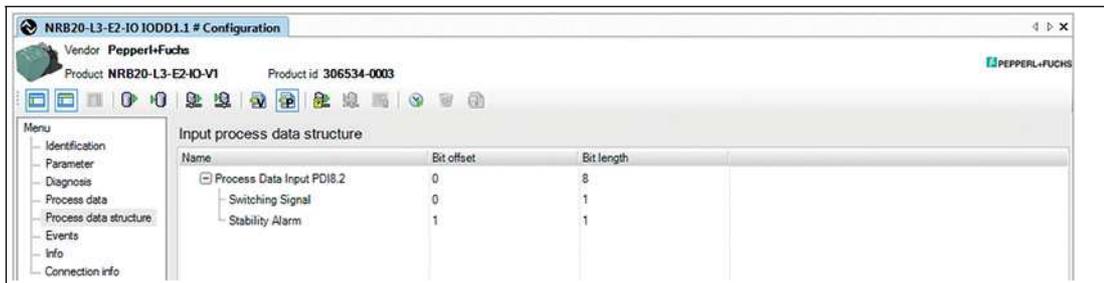


Figure 5.9

The **Process Data Structure** menu item displays the bit assignment of the binary switching signal and the stability alarm. These are read-only fields.

## 5.7 Events Menu Item

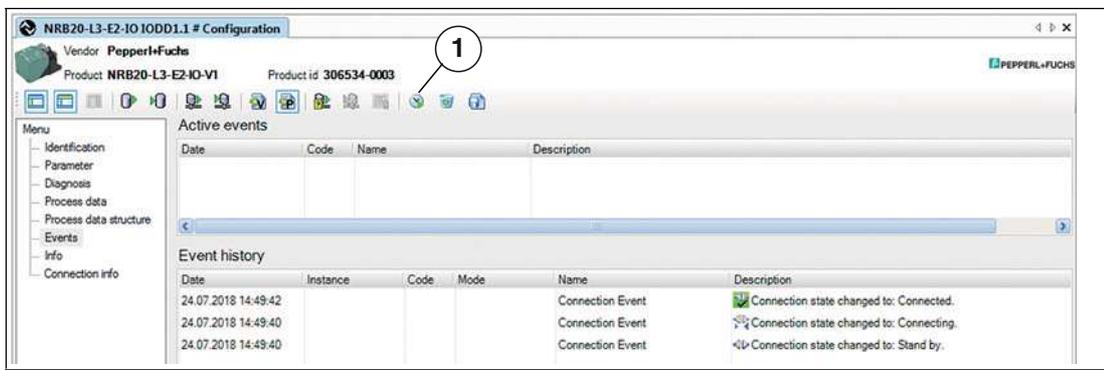


Figure 5.10

The **Events** menu item displays all current and past events when the "Activate Event Monitor" (1) check box is clicked. These are read-only fields.

## 5.8 Info Menu Item



Figure 5.11

The **Info** menu item shows the DTM/Interpreter version.

### 5.9 Connection Info Menu Item

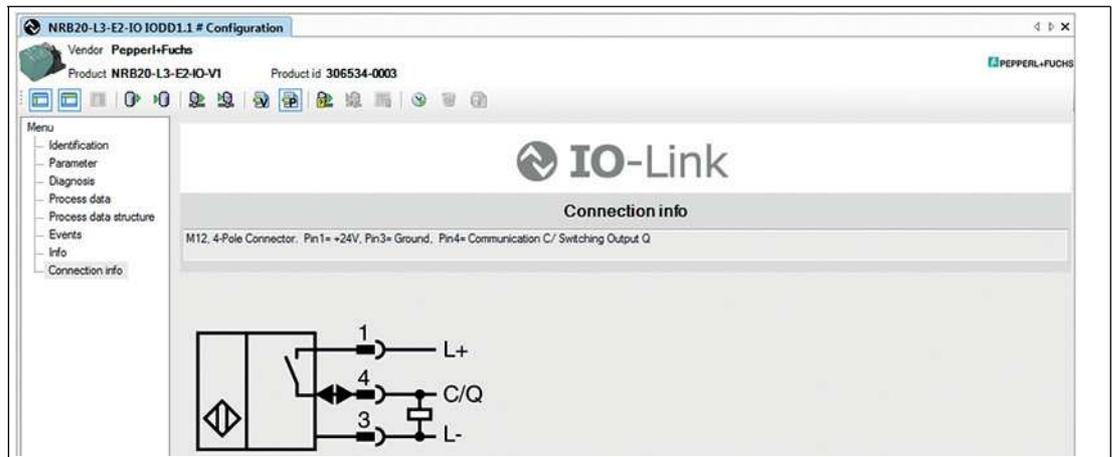


Figure 5.12

The **Connection Info** menu item displays the electrical connection of the sensor.



## 6 Maintenance and Repair

### 6.1 Maintenance

The sensor's transmission properties are stable over long periods. For this reason, regular adjustments to, and maintenance on the sensor itself, are not necessary. Nevertheless check in the course of normal maintenance intervals that the sensor, the actuator and the connector are securely attached. Also check that the connecting cable is intact and correctly routed.

### 6.2 Resetting the Output Functions to the Factory Setting

The sensor can be reset via IO-Link only.

## 7 Troubleshooting

### 7.1 What to Do in Case of a Fault

In case of a fault, use the following checklist to determine whether a fault with the sensor can be remedied.

If none of the information provided in the checklist solves the problem, you can contact Pepperl+Fuchs via your sales office with any queries. Have the model number and firmware version of the sensor ready if possible.

#### Checklist

Error	Cause	Remedy
Status indicator LED or operating voltage indicator LED (if present) does not light up when sensor is covered/uncovered	The power supply is switched off.	Check whether there is a reason why the power supply is switched off (installation or maintenance work, etc.). Switch on the power supply if necessary.
	The plug is not connected to the connector on the sensor.	Connect the plug to the sensor and tighten the lock nut by hand.
	Faulty wiring in the splitter or switch cabinet.	Check the wiring carefully and repair any faults with the wiring.
	Supply cable to the sensor is damaged.	Replace the damaged cable.
No IO-Link connection to device	The C/Q communication port on the sensor is not connected to the IO-Link master.	Make sure the C/Q communication port is connected to the IO-Link master.
No IO-Link connection to device	No power supply.	Check whether there is a reason for the absence of the power supply (installation or maintenance work, etc.). Switch on the power supply.
Damping element not detected	Sensor is too far away from the item to be detected.	Check the mounting and, if necessary, adjust the sensor to the right distance.

## 8 Appendix

### 8.1 Process Data Structure

#### Input Process Data

7	6	5	4	3	2	1	0
0		0	0	0	0	Stability alarm	Switching signal
reserv	reserv	reserv	reserv	reserv	reserv	DSC	SSC

Table 8.1

#### Function

DSC	Diagnosis Signal Channel: stability alarm
SSC	Switching Signal Channel: switching signal

Table 8.2

#### Configuration of the Parameters for Values

Stability alarm	Index 0x40 Subindex 4		
Setting	0 = High Active	1 = Low Active	255 = Deactivated

Table 8.3

Switchpoint Logic	Index 0x40 Subindex 2	
Setting	0 = High Active	1 = Low Active

Table 8.4

#### Values

SSC switching signal		
When the switch point logic is activated	0 = High Active	1 = Low Active
Object has damped sensor	1	0
Sensor is not damped by object	0	1

Table 8.5

DSC stability alarm		
When the stability alarm is activated	0 = High Active	1 = Low Active
Stability alarm has been triggered	1	0
Stability alarm has not been triggered	0	1

Table 8.6

## 8.2 Telegram Types

### 8.2.1 IO-Link Communication and ID Parameters

Direct Parameter Page 1—Index 0x00							
Sub	Address (hex)	Name	Type	Data type	Attribute	Value	Comment
<b>Communication Control</b>							
1	0x00	Master Command	R/W	uint8	Volatile		Written by master
2	0x01	Master Cycle Time	R/W	uint8	Volatile		Written by master
3	0x02	Min. Cycle Time	R	uint8	Constant	0x17	2.3 ms
4	0x03	M-sequence Capability	R	uint8	Constant	0x21	ISDU support
5	0x04	Revision ID	R	uint8	Constant	0x11	IO-Link version 1.1
6	0x05	Process Data In	R	uint8	Constant	0x42	Two-bit PDIn, SIO support
7	0x06	Process Data Out	R	uint8	Constant	0x00	N/A
<b>Identification Parameters</b>							
8	0x07	IO-Link Vendor ID 1 (MSB)	R	uint8	Constant	0x00	Pepperl+Fuchs
9	0x08	IO-Link Vendor ID 2 (LSB)	R	uint8	Constant	0x01	
10	0x09	Device ID 1 (MSB)	R	uint8	Constant	0x20	Device-specific ID—see corresponding datasheet
11	0x0A	Device ID 2	R	uint8	Constant	xx	
12	0x0B	Device ID 3 (LSB)	R	uint8	Constant	xx	
13	0x0C	Function ID 1 (MSB)	R/W	uint8	Static	0x00	Not used
14	0x0D	Function ID 2 (LSB)	R/W	uint8	Static	0x00	

Table 8.7

### 8.2.2 IO-Link Standard Parameters

#### System Command (Index 0x02)

Value (hex)	Function
0x82	Restore factory settings

Table 8.8

#### Identification Parameters

Index (hex)	Name	Type	Data type
0x10	Vendor Name	R	char [18]
0x12	Product Name	R	char [max 32]
0x13	Product ID	R	char [11]
0x15	Serial Number	R	char [14]
0x16	Hardware Revision	R	char [7]
0x17	Firmware Revision	R	char [7]
0x18	Application Specific Name	R/W	char [max 32]
0xC0	User Tag	R/W	char [max 32]

Table 8.9

### 8.2.3 IO-Link Device Parameters

Index (hex)	Sub	Name	Type	Data type	Value	Default
<b>Sensor Configuration</b> (data storage = yes) Access only to the complete array (subindex 0)						
0x40	1	Switchpoint Mode	R/W	uint8	0: Setpoint SP1, Near Operating Distance 1: Setpoint SP2, Operating Distance S <sub>n</sub> 2: Window Mode	1
	2	Switchpoint Logic	R/W	uint8	0: High Active 1: Low Active	0
	3	Pulse Extension	R/W	uint8	0: Disabled 1: Automatic 2: 10 ms 3: 100 ms 4: 1000 ms	0
	4	Stability Alarm	R/W	uint8	0: High Active 1: Low Active 255: Deactivated	0
	5	Reserved	R/W	uint8	0	0
	6		R/W	uint8 [3]	0 0 0	0 0 0
<b>Sensor Status</b> (data storage = no) Access only to the complete array (subindex 0)						
0x41	1	Reserved	R	uint16	0	0
	2	Switching Signal	R	uint8	0: Inactive 1: Active	0
	3	Diagnosis	R	uint8	0: Device OK 20: Stability alarm active	0
	4	Temperature Indicator	R	uint8	0: Normal operation 1: Critical high temperature 2: Overtemperature	0
	5	Reserved	R	uint8 [3]	0 0 0	0 0 0
<b>Device Access Locks</b> (data storage = yes)						
0x0C		Data Storage Lock (Bit 1)	R/W	bool	0: False (data storage activated) 1: True (data storage locked)	0
User Specific Information (data storage = yes)						
0x18		Application Specific Tag	R/W	char [max 32]	Your automation, our passion (can be modified by user)	
0xC0		User Tag	R/W	char [max 32]	R1 IO-Link series (can be modified by user)	

Table 8.10

## 8.2.4 Error Codes

In case of a fault, the sensor transmits the error codes detailed in the following table. The error code consists of two bytes. The byte with the higher value, in this case 0x80, represents the IO-Link device as the emitter. The byte with the lower value represents the actual error.

Error	Error code	Comment
Device application error	0x8000	Device application error—the required service is not operated by the sensor
Unavailable index	0x8011	R/W access to unavailable parameter index
Unavailable subindex	0x8012	R/W access to unavailable parameter subindex
Service temporarily unavailable	0x8020	No read/write access to parameter due to the device status
Access denied	0x8023	Attempt to write to "read-only" address
Invalid value range, parameter	0x8030	For all R/W parameters outside of the valid value range
Parameter value too large	0x8031	For all R/W parameters above the valid value range
Parameter value too small	0x8032	For all R/W parameters beneath the valid value range
Parameter length is too large	0x8033	Too much data has been transmitted for the parameter (more bytes)
Parameter length is too small	0x8034	Too little data has been transmitted for the parameter (too few bytes)
Function unavailable	0x8035	Unsupported system command (see Table 8.7)

Table 8.11

# FACTORY AUTOMATION – SENSING YOUR NEEDS



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