ENA**TL-**IO**

Absolute Rotary Encoder with IO-Link

Manual

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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.

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

Absolute rotary encoders with IO-Link interface from the ENA***TL-**IO** product group offer highly accurate detection of the rotation angle of the rotary encoder shaft using a magnetic scanning principle. Multiturn absolute rotary encoders detect the number of revolutions of the rotary encoder shaft. The electronics of the rotary encoder can determine various information such as the direction of rotation, temperature, and position values, etc. This information is transmitted as process data via IO-Link to an IO-Link master and further to a higher control level.

Connect the rotary encoder to an IO-Link network and use it only in this way. Typical applications include positioning tasks and length measurement for areas like conveyor belts, cranes, elevators, and wrapping machines. Read through this manual carefully. Familiarize yourself with the device before installing, mounting, or operating.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and the plant is guaranteed only if the device is operated in accordance with its intended use.

1.5 General Safety Instructions

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

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

It is dangerous for the user to carry out modifications and/or repairs and doing so will void the warranty and exclude the manufacturer from any liability. In the event of any serious errors, stop using the device. Secure the device against unintended operation. To have the device repaired, return it to your local Pepperl+Fuchs representative or your sales center.

Note

Disposal

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

2 Product Description

2.1 Use and Application

Absolute rotary encoders from the ENA**TL-**IO** product group with IO-Link interface offer highly accurate detection of the rotation angle of the rotary encoder shaft using a magnetic scanning principle. Multiturn absolute rotary encoders detect the number of revolutions of the rotary encoder shaft.

Rotary encoders can gather and interpret many types of information, including the direction of shaft rotation, temperature, and position values, etc. This information is transmitted as process data via IO-Link to an IO-Link master and further to a higher control level. The IO-Link interface enables customized parameterization of rotary encoder functions for each application.

Typical applications include positioning tasks and length measurements for areas like conveyor belts, cranes, elevators, and wrapping machines. The ENA***TL-**IO** absolute rotary encoders enable diagnostic information such as warning flags and temperature values to be transmitted to the higher-level control panel. This allows for condition monitoring to take place alongside the process data feedback.

The set parameters can be saved in the IO-Link master to allow easier re-parameterization if a device is exchanged. Starting a signal transmission requires a "wake up" to be performed via the IO-Link master. This starts the digital IO-Link communication.

The ENA***TL-**IO** product group does not support SIO mode. SIO mode (standard IO mode) can be used to perform conventional signal transmission (i.e., on/off signal) between the device and the higher-level control panel.

What Is IO-Link?

IO-Link enables seamless communication and digital data transfer from the control panel level down to the sensor level. The intelligent sensors can be used to their full potential with IO-Link, paving the way for Industry 4.0 in automation technology. The internationally standardized interface provides value at all stages, from plant design and installation through to operation and maintenance. This value is achieved by sustained cost reductions and efficiency improvements.

Standardized device description files ("IODDs") and parameterization via software tools ensure convenient configuration and integration of IO-Link sensors. Intelligent, transparent parameter management increases application flexibility and minimizes downtimes. Parameters can be customized quickly and easily, even for complex production and batch changes. Transparency right through to the sensor gives users access to a comprehensive range of parameterization options and device diagnostics functions, allowing them to perform predictive servicing.

The technology offers particular benefits in service (troubleshooting, servicing, and device exchange), during commissioning (cloning, identification, configuration, and localization), and during operation (job changeover, continuous parameter monitoring, and online diagnostics).

Device Description File (IODD)

The device parameters are different for each device. A standardized description of these parameters can be found in the IO Device Description file (IODD). IODDs can be integrated in a control environment to allow IO-Link devices to be used for IO-Link operation. Both programming and exchanging process data can be performed with a PLC. The IODD can be imported into a range of engineering tools from various system providers for programming and diagnostics, provided these tools support IODD.

Offline Parameterization

For offline parameterization, IO-Link devices are already configured before mounting. To do this, use the Pepperl+Fuchs IO-Link USB master.

We recommend using the "PACTware" software as an FDT frame application and user interface.

The software components required in each case are summarized in the most current version of the "IO-Link Offline Parameterization Tool" software package. The software package and the documentation on its installation and use can be found online at www.pepperl-fuchs.com.

If you use the "IO-Link Offline Parameterization Tool" software package, have active Internet access, and have connected your device via the Pepperl+Fuchs IO-Link USB master, you can integrate the IODD directly into the IO-Link Offline Parameterization Tool via the "IODD DTM Configurator."

The device description file (IODD) required for integration in an IO-Link system and for the parameterization and diagnosis is available online. Visit www.pepperl-fuchs.com and navigate to the relevant product page for the ENA***TL-**IO**.

Online Parameterization

When commissioning machines and plants, you must integrate master and IO-Link devices into the appropriate control environment. Depending on the components used, different software is required

You can configure and parameterize the devices using an IO-Link configuration tool. During operation, you can check the parameters for the IO-Link devices, read, and monitor the status and diagnostic data. IO-Link data is integrated into an application program using function blocks.

2.2 LED Indicators

The device has a green/yellow LED with the following characteristics:

Color	Description
Off	Insufficient supply voltage, incorrect cabling
Green	• Permanently on = supply voltage is OK • Short flashes on and off = IO-Link communication is active
Green	Pulsating flashing = localization function

Table 2.1

Localization Function

To easily locate a device within a plant, you can activate / deactivate the localization function for the LED on the device via IO-Link. Once this function has been activated, the LED will pulsate and flash, so that the device can be easily detected within a plant.

After isolating the device from the voltage supply, the LED will stop flashing as standard.

The flashing function is activated via parameter "0x7F" (localization display) to value 1. It is possible to activate this function via offline parameterization in the **diagnostic** menu, "Service function" function, indication setting set to "Localization Indication."

2.3 Accessories

Note

Various accessories are available. The products listed below represent a useful basic selection. Other accessories can be found online at **www.pepperl-fuchs.com** on the product page for the relevant ENA***TL-**IO**.

Designation	Description
IO-Link Offline Parame-terization Tool	FDT frame application for operating IODDs and DTMs Refer to the product page for the relevant ENA***TL-**IO** at **www.pepperl-fuchs.com**
Pepperl-Fuchs-ENA**TL-xx-IODD	IODD IO device description for programming the absolute rotary encoder Refer to the product page for the relevant ENA***TL-**IO** at **www.pepperl-fuchs.com**
IO-Link-Master02-USB	USB to IO-Link adapter box for controlling an IO-Link sensor directly via a PC
V1-G-0.6M-PUR-V1-G	Cordset, M12 to M12, 4-pin PUR cable for connection between absolute rotary encoder and IO-Link master
V15-G-1M-PUR-V15-G	Cordset, M12 to M12, 5-pin PUR cable for connection between absolute rotary encoder and IO-Link master
ICE1-8IOL-G60L-V1D	IO-Link master: Ethernet IO-Link module with 8 inputs/outputs This IO-Link master is suitable for field applications and has been included here to represent possible additional master modules. You can find the appropriate master module for the relevant application at www.pepperl-fuchs.com. Navigate to the product page to find the correct master module for your absolute rotary encoder.

Table 2.2

3 Installation

3.1 Instructions for Mechanical and Electrical Installation

Note

Further installation-related information on technical data, mechanical data, and available connection lines for the relevant "ENA58TL-*-***-IO-Link" and "ENA36TL-*-***-IO-Link" absolute rotary encoder types can be found in the corresponding datasheet.

Always observe the following instructions to ensure safe operation of the rotary encoder:

Warning!

Work must be performed by trained and qualified personnel only.

Commissioning and operation of this electrical device must be performed by trained and qualified personnel only. This means individuals who are qualified to commission (in accordance with safety engineering), connect to ground, and label devices, systems, and circuits.

Warning!

Perform work only when the system is de-energized!

De-energize your device before performing work on the electrical connections. Short circuits, voltage peaks, and similar events can lead to faults and undefined statuses. This presents a significant risk of personal injury and property damage.

Warning!

Check electrical connections before switching on the plant!

Check all electrical connections before switching on the plant. Incorrect connections present a significant risk of personal injury and property damage. Incorrect connections can lead to malfunctions.

Caution!

Do not remove the rotary encoder housing!

Do not remove the rotary encoder housing under any circumstances, since damage and contamination can occur as a result of taking improper action. It is, however, permitted to remove connector covers.

Caution!

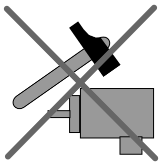
Do not perform any electrical modifications!

It is not permitted to perform electrical modifications on the rotary encoders. If you open or modify the device yourself, you are endangering yourself and others, voiding any warranty, and absolving the manufacturer of any liability.

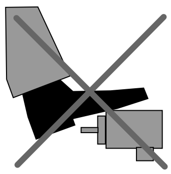
Caution!

Ensure that the data cable and power supply cable are physically separate!

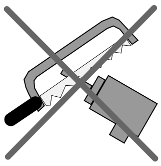
Route the cordset of the rotary encoder so that it is a suitable distance away from power supply cables to avoid faults. Shielded cables must be used to ensure reliable data transfer. A perfect ground connection must be ensured.



Do not allow the rotary encoder to fall or expose it to strong vibrations. The rotary encoder is a precision instrument.



Rotary encoders from Pepperl+Fuchs are rugged; however, they should nevertheless be protected against damage in ambient conditions by taking appropriate protective measures. In particular, the devices must not be installed in a location where they could be misused as a handle or climbing aid.



Do not make any alterations to the drive shaft or the housing of the rotary encoder.

Note

For rotary encoders with solid shaft, use a suitable coupling to connect the shaft to the drive shaft of the part to be measured. The coupling is required to protect the drive shaft on the rotary encoder against excessive levels of force, to compensate for shaft offset, and to reduce the impact of vibrations. Suitable couplings are available as accessories from Pepperl+Fuchs.

3.2 Preparation

Unpacking the Device

1. Check the packaging and contents for damage.

   ↳ In the event of damage, inform the shipping company and notify the supplier.

2. Check the package contents against your order and the shipping documents to ensure that all items are present and correct.

   ↳ Should you have any questions, direct them to Pepperl+Fuchs.

3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

3.3 Electrical Connection

Use a suitable connection cable to connect the rotary encoder to the higher-level control panel, an IO-Link master, or the IO-Link-Master02-USB.

Caution!

No voltage permitted at Pin 2!

The ENAxxTL-...IO-... product group does not support functionality for Pin 2 in terms of a digital input / output. However, there is a real physical connection to the PCB. Application of voltage potential is therefore not permitted. It could cause the device to malfunction.

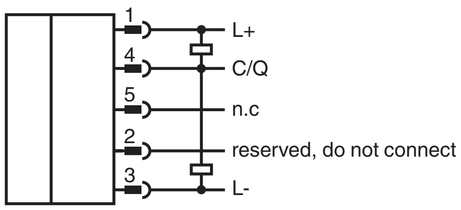
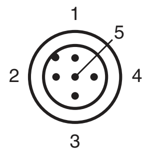
Electrical Connection	Pinout
	

Table 3.1

4 Commissioning

4.1 Commissioning with IO-Link on a Control Panel (Online Parameterization)

Note

The device description file (IODD) required for integration in an IO-Link system and for parameterization and diagnostics is available online. Visit www.pepperl-fuchs.com and navigate to the relevant product page for the ENA***TL-**IO**.

To activate the absolute rotary encoder via IO-Link using a control panel, proceed as follows:

1. Check the connection between the absolute rotary encoder and the IO-Link master.
2. Set the status to "IO-Link" on the corresponding port on the IO-Link master to which the absolute rotary encoder is connected.
3. Once communication has been successfully established, the green operating indicator LED on the absolute rotary encoder will flash briefly in one-second intervals.

↳ The absolute rotary encoder can now either be parameterized using the IO-Link configuration tool or diagnosed using the modulated application. The device sends the binary switching information and the position value as process data.

4.2 Commissioning with IO-Link via FTD Framework Program (Offline Parameterization)

IO-Link Offline Parameterization Tool

An IODD (IO-Link Device Description) file is available to download for parameterization of the absolute rotary encoder via IO-Link and diagnosis. See the product page for the relevant ENA***TL-**IO** absolute rotary encoder online at **www.pepperl-fuchs.com** or use the IODDfinder at https://iodfinder.io-link/com/.

For offline parameterization, IO-Link devices are already configured before mounting. To do this, you can use the Pepperl+Fuchs IO-Link USB master.

The software components required in each case are summarized in the "IO-Link Offline Parameterization Tool" software package in their most current versions. The software package can be found online at www.pepperl-fuchs.com along with the corresponding documentation regarding installation and use.

If you use the "IO-Link Offline Parameterization Tool" software package, have active Internet access, and have connected your device via the Pepperl+Fuchs IO-Link USB master, you can integrate the IODD directly into the IO-Link Offline Parameterization Tool via the "IODD DTM Configurator."

Note

A 5-pin M12 cordset is needed to connect the absolute rotary encoder to the Pepperl+Fuchs IO-Link master. Visit **www.pepperl-fuchs.com** and click on the product page for the relevant absolute rotary encoder to find suitable cordsets.

To activate the absolute rotary encoder via IO-Link using the corresponding IODD, proceed as follows:

1. Make sure that the "IO-Link Offline Parameterization Tool" software package is installed on your computer.
2. Connect the absolute rotary encoder to an IO-Link master via a suitable M12 cordset.
3. Connect the IO-Link master to a USB connection on your PC via a USB cable.
4. Start PACTware.

   ↳ PACTware automatically communicates with the absolute rotary encoder if you are using PACTware from the "IO-Link Offline Parameterization Tool" and automatically found the IODD online.

5 Process Data Structure

The process data of the absolute rotary encoder consists of 96 bits (12 bytes). The following table provides an overview of the order and structure of the process data.

Name	Long Name	Data Type	Length	Bit Offset	Value	Comment
MDC2 - Auxiliary Measurement	Measurement Data Channel 2 - Auxiliary Measurement	Integer	32 bits	64	0 <MV2-max>	
MDC1 -Position	Measurement Data Channel 1 - Position	Integer	32 bits	32	0 <MV1_Pos-max>	
MDC1 - Resolution (STR)	Measurement Data Channel 1 - Singleturn Resolution	UInteger	16 bits	16	1 <MV1_S-calemax>	
Reserved	–	–	6 bits	10	0 = Low	
DSC1.2 -Temperature Warning 2	Diagnosis Signal Channel 1.2 - Temperature Warning 1	Boolean	1 bit	9	0 = Low 1 = High	
DSC1.1 -Temperature Warning 1	Diagnosis Signal Channel 1.1 - Temperature Warning 2	Boolean	1 bit	8	0 = Low 1 = High	
Status - Auxiliary Measurement MDC2	Status - Auxiliary Measurement Data Channel 2	UInteger	4 bits	4	0 = Low 1 = High	Additional measured value. Either deactivated or corresponds to the ambient temperature of the device
Reserved	–	–	1 bit	3	0 = Low	
Status - Count Direction	–	Boolean	1 bit	2	0 = Low 1 = High	0 = Increase 1 = Decrease
SSC2 - Switching Signal 2	Switching Signal Channel 2	Boolean	1 bit	1	0 = Low 1 = High	
SSC1 - Switching Signal 1	Switching Signal Channel 1	Boolean	1 bit	0	0 = Low 1 = High	

Table 5.1

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5.1 Config - ST Resolution

Configuration Singleturn Resolution

Index	Sub	Parameter	Access	Data Type	Length
96 (0x60)	—	Config - ST Resolution	rw	UInteger	16 bits

The "Config - ST Resolution" parameter is used to set the resolution of the rotary encoder. The resolution refers to the singleturn resolution. Consequently, this value is used to set how many equal-sized position steps are output/counted in one revolution.

The following figure illustrates this with an example for singleturn-only device versions.

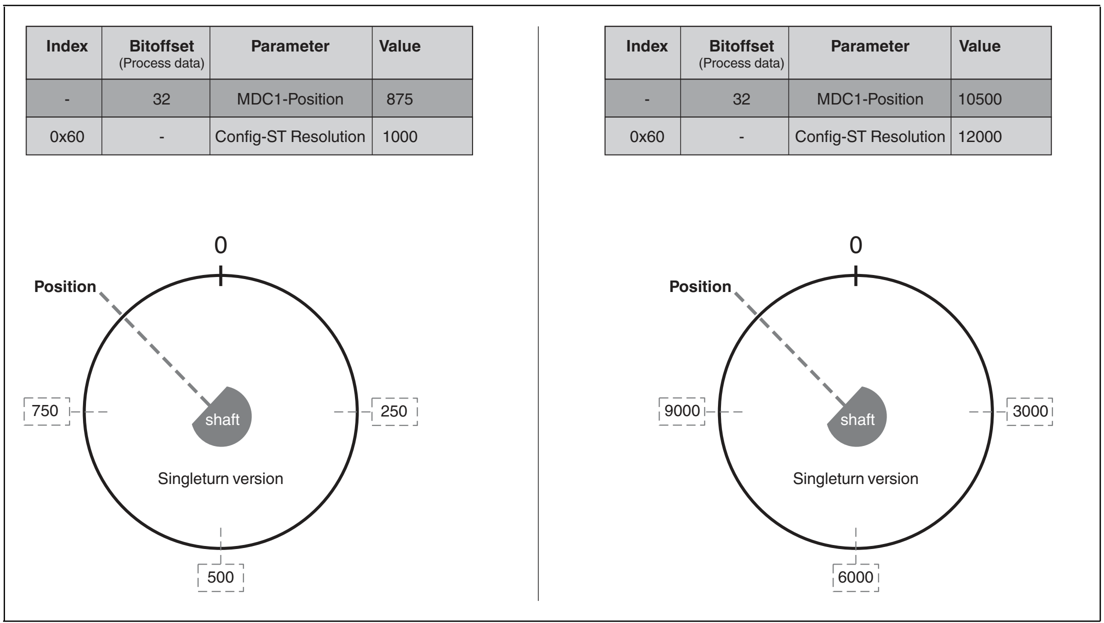

Figure 5.1 Identical shaft position with different singleturn resolutions

A singleturn resolution of 1000 is selected on the left and 12,000 on the right. The physical shaft position is the same on the left and right (see "shaft"). However, the "MDC1 - Position" process data show different data on the left and right. This is explained by the division of a full revolution into 1000 steps in one case and into 12,000 steps in the other.

The figure below illustrates this with an example for multiturn device versions.

Index	Bitoffset (Process data)	Parameter	Value
-	32	MDC1-Position	875
0x60	-	Config-ST Resolution	1000

Index	Bitoffset (Process data)	Parameter	Value
-	32	MDC1-Position	1875
0x60	-	Config-ST Resolution	1000

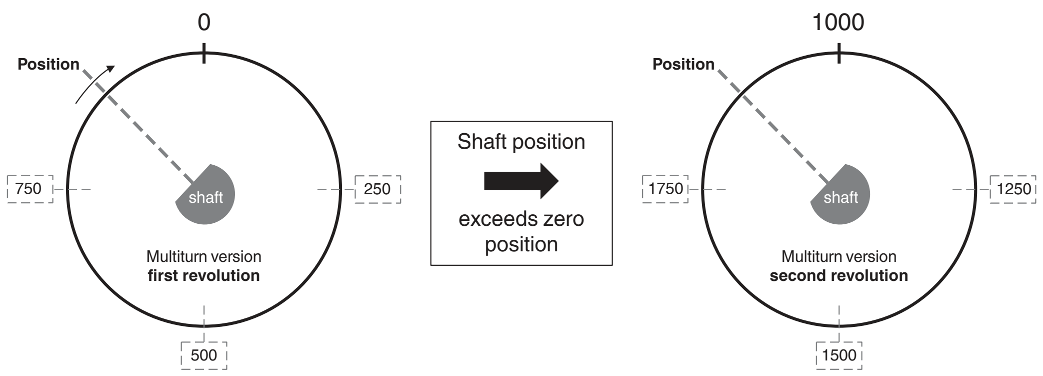

Figure 5.2 Different shaft position for multiturn versions depending on singleturn resolutions

The example also shows that the current shaft position (= MDC1 - Position) and the set singleturn resolution (= Config - ST Resolution = MDC1 - ST Resolution) can be used to determine the corresponding multiturn position (= number of full revolutions completed). If a complete revolution means 1000 steps, a measured value equating to MDC1 - Position = 1875 means that one full revolution and a further 875 steps of the next revolution have been completed.

Refer to information on the "MDC1 - ST Resolution" process data content and the "Config - Position Overflow" parameter.

5.2 MDC1 - Position

Measurement Data Channel 1 - Position

The "MDC1 - Position" process data content returns the current absolute shaft position. If the shaft is rotated when the device is disconnected from the power supply, the new shaft position is updated and immediately available once the device is switched on again.

The number of measuring steps that are counted in one revolution can be set as required.

Refer to information on the "Config - ST Resolution" and "Position Value - Overflow" parameters.

5.3 MDC1 - ST Resolution

Measurement Data Channel 1 - Singleturn Resolution

The "MDC1 - ST Resolution" process data content describes the singleturn resolution and corresponds to the value set as the "Config - ST Resolution" parameter.

This value determines how many measuring steps are counted in **one** full revolution.

Refer to information on the "Config - ST Resolution" parameter.

The cyclical transmission of the set singleturn resolution offers significant added value in condition monitoring applications. The position value from the "MDC1 - Position" process data can be more easily interpreted.

The "MDC1 - ST Resolution" process data can be used to calculate the current multiturn position at any time for all multiturn versions.

The following figure illustrates this with an example for singleturn-only device versions.

Index	Bitoffset (Process data)	Parameter	Value
-	32	MDC1-Position	875
0x60	-	Config-ST Resolution	1000

Index	Bitoffset (Process data)	Parameter	Value
-	32	MDC1-Position	10500
0x60	-	Config-ST Resolution	12000

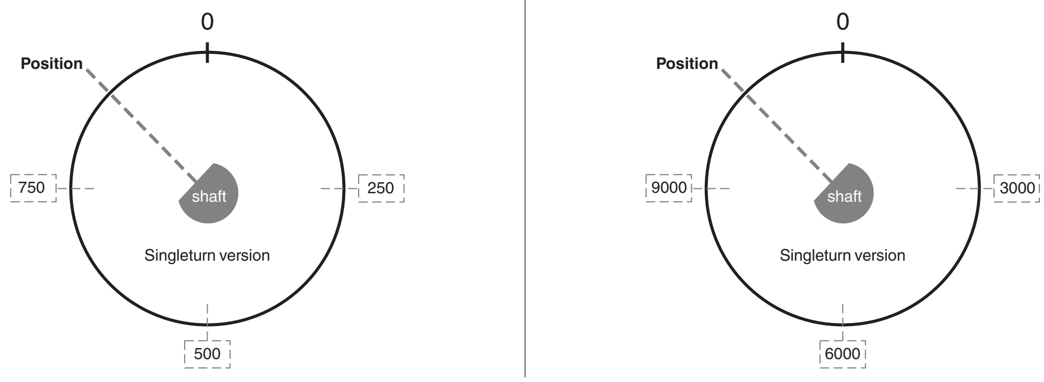

Figure 5.3 Identical shaft position with different singleturn resolutions

A singleturn resolution of 1000 is selected on the left and 12,000 on the right. The physical shaft position is the same on the left and right (see "shaft"). However, the "MDC1 - Position" process data show different data on the left and right. This is explained by the division of a full revolution into 1000 steps in one case and into 12,000 steps in the other.

The figure below illustrates this with an example for multiturn device versions.

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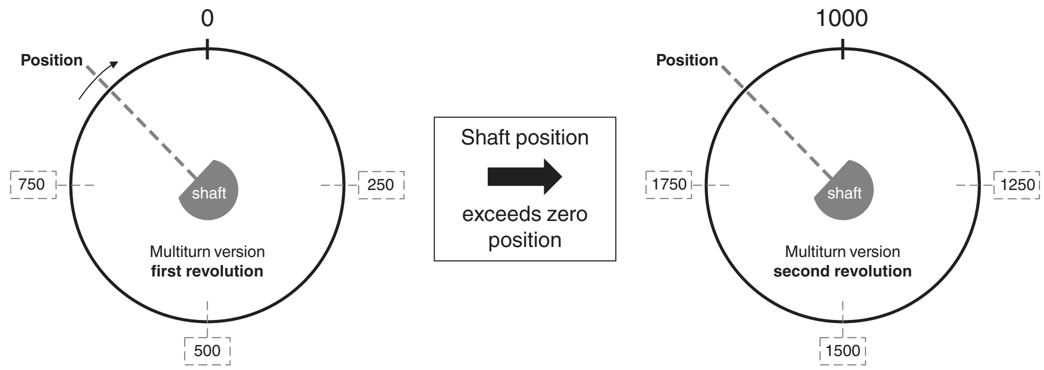

Figure 5.4 Different shaft position for multiturn versions depending on singleturn resolutions

The example also shows that the current shaft position (= MDC1 - Position) and the set singleturn resolution (= Config - ST Resolution = MDC1 - ST Resolution) can be used to determine the corresponding multiturn position (= number of full revolutions completed). If a complete revolution means 1000 steps, a measured value equating to MDC1 - Position = 1875 means that one full revolution and a further 875 steps of the next revolution have been completed.

Refer to information on the "MDC1 - ST Resolution" process data content and the "Config - Position Overflow" parameter.

A Mathematical Generalization for this Relationship

- Singleturn resolution = Config - ST Resolution = number of measuring steps per revolution
- Multiturn position = number of full revolutions already completed
- Modulo corresponds to the remainder function
  - A mod B = remainder of division A / B
  - Where if A is less than or equal to B: A mod B = 0

  For the purposes of simplification, "remainder of division ..." is subsequently abbreviated as simply "remainder."

[Measuring steps per revolution] x [multiturn position] + remainder = [MDC1 - position]

[MDC1 - position] mod [measuring steps per revolution] = remainder of division [MDC1 - position] / [measuring steps per revolution]

([MDC1 - position] - remainder) / [measuring steps per revolution]) = [multiturn position]

If [MDC1 - position] - remainder ≤ [measuring steps per revolution] —〉([MDC1 - position] - remainder) / [measuring steps per revolution] = 0 by definition)

Taking the sample numbers from above, the result is:

- Singleturn resolution = Config - ST Resolution = MDC1- ST Resolution = number of measuring steps per revolution = 1000
- Multiturn position = number of full revolutions already completed = ?

1000 x ? = 1875

1875 mod 1000 = remainder of division 1875 / 1000 —〉 875

(1875 - 875) / 1000 = ? equates to ? = 1

—〉 The rotary encoder has completed one full revolution. It is currently 875 steps into the next revolution.

5.4 SSC1 - Switching Signal 1

Switching Signal Channel 1

The "SSC1 - Switching Signal 1" process data content refers to a signal bit used to detect a position that is critical for the application. It is part of the cyclic signal transmission. The signal bit can toggle between "0" and "1" depending on the status of the absolute rotary encoder or of the application.

The following parameters influence the switching characteristics of the SSC1 process data:

- SSC1 Param. SP1
- SSC1 Param. SP2
- SSC1 Config. Logic
- SSC1 Config. Mode
- SSC1 Config. Hyst

5.5 SSC2 - Switching Signal 2

Switching Signal Channel 2

The process data content "SSC2 - Switching Signal 2" describes a signal bit that is used to detect a position that is critical for the application. It is part of the cyclic signal transmission. The signal bit can toggle between "0" and "1" depending on the status of the absolute rotary encoder or of the application.

The SSC2 process data is functionally redundant to the SSC1 process data. It should be regarded as an independent supplement to this data.

The following parameters influence the switching characteristics of the SSC2 process data:

- SSC2 Param. SP1
- SSC2 Param. SP2
- SSC2 Config. Logic
- SSC2 Config. Mode
- SSC2 Config. Hyst

5.6 Status - Count Direction

The "Status - Count Direction" process data content indicates the current direction of rotation of the shaft. It is transmitted cyclically and you can use the "Config - Rotation Direction" parameter to adjust the settings for the process data.

The "Status - Count Direction" process data content can distinguish between the "increase" and "decrease" values depending on the setting and the current direction of rotation.

5.7 MDC2 - Auxiliary Measurement

Measurement Data Channel 2 - Auxiliary Measurement

The "MDC2 - Auxiliary Measurement" process data content describes another available measured value that can be read out from the device.

For the ENA***TL-**IO** product group, this additional measured value is the ambient temperature of the device. The cyclical transmission of an additional measured value offers significant added value in condition monitoring applications. The content can be set to "deactivated," meaning that the measured value is always 0.

Refer to information on the "Config - Auxiliary Measurement" parameter.

5.8 Status - Auxiliary Measurement MCD2

Measurement Data Channel 2 - Auxiliary Measurement

The process data in "Status - Auxiliary Measurement MDC2" indicates which measured value is transmitted via "MDC2 - Auxiliary Measurement."

The following options are supported:

- "Deactivated" (0) >> measured value is always 0
- "Temperature" (1) >> ambient temperature

This information is beneficial when evaluating process data remotely, and the exact device setting for the rotary encoder is not known or if several devices with different settings are used simultaneously.

For the ENA***TL-**IO** product group, this additional measured value is either disabled or corresponds to the device's outside temperature.

5.9 DSC1.1 - Temperature Warning 1

Diagnosis Signal Channel 1.1 - Temperature Warning 1

The "DSC Temperature Warning 1" data display indicates whether or not a critical upper temperature limit has been exceeded.

Refer to information on the following parameters

- DSC1.1 Param - Temperature: High Limit
- DSC1 Config - Temperature: Mode
- DSC1 Config - Temperature: Logic
- DSC1 Config - Temperature: Hyst

5.10 DSC1.2 — Temperature Warning 2

Diagnosis Signal Channel1.2 — Temperature Warning 2

The "DSC — Temperature Warning 2" process data status indicates whether or not a critical low temperature has been reached.

Compare with information relating to the parameters:

- DSC1.2 Param — Temperature: Low Limit
- DSC1 Config — Temperature: Mode
- DSC1 Config — Temperature: Logic
- DSC1 Config — Temperature: Hyst

6 IO-Link Parameterization

Only the parameters of the ENA***TL-**IO** product group that require explanation are listed below.

Note

A comprehensive overview of all parameters for the respective absolute rotary encoder can be found online at www.pepperl-fuchs.com. Navigate to the relevant product page for the ENA***TL-**IO** and click on the corresponding "IO-Link parameter data sheet" document.

The abbreviations below are used in the following:

ro read only

wo write only

rw read and write

6.1 Config - ST Resolution

Configuration Singleturn Resolution

Index	Sub	Parameter	Access	Data Type	Length
96 (0x60)	—	Config - ST Resolution	rw	UInteger	16 bits

The "Config - ST Resolution" parameter is used to set the resolution of the rotary encoder. The resolution refers to the singleturn resolution. Consequently, this value is used to set how many equal-sized position steps are output/counted in one revolution.

The following figure illustrates this with an example for singleturn-only device versions.

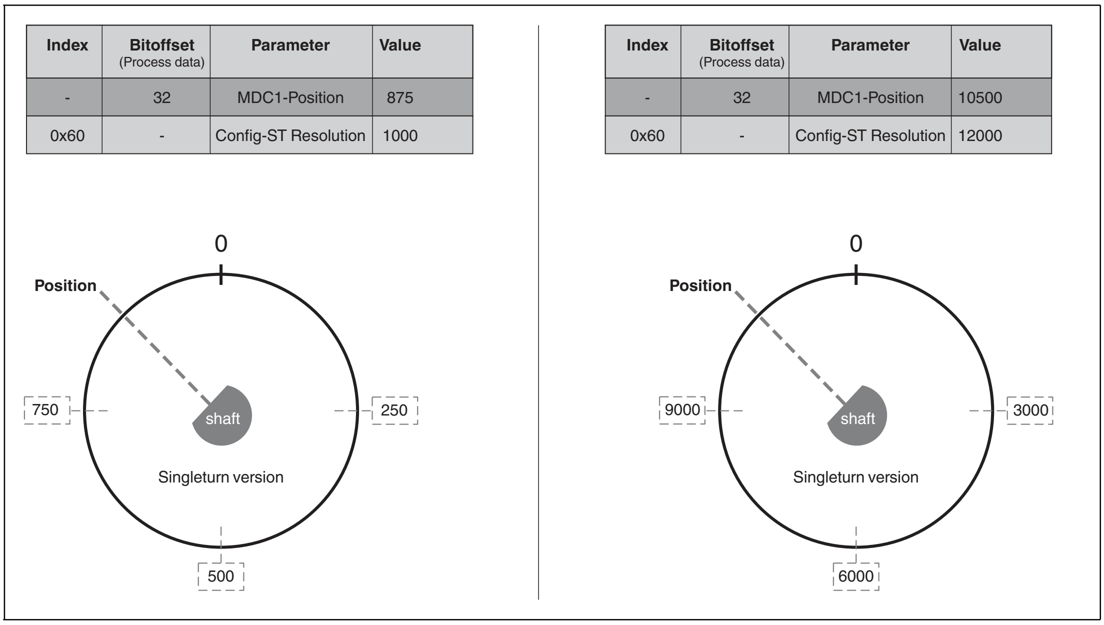

Figure 6.1 Identical shaft position with different singleturn resolutions

A singleturn resolution of 1000 is selected on the left and 12,000 on the right. The physical shaft position is the same on the left and right (see "shaft"). However, the "MDC1 - Position" process data show different data on the left and right. This is explained by the division of a full revolution into 1000 steps in one case and into 12,000 steps in the other.

The figure below illustrates this with an example for multiturn device versions.

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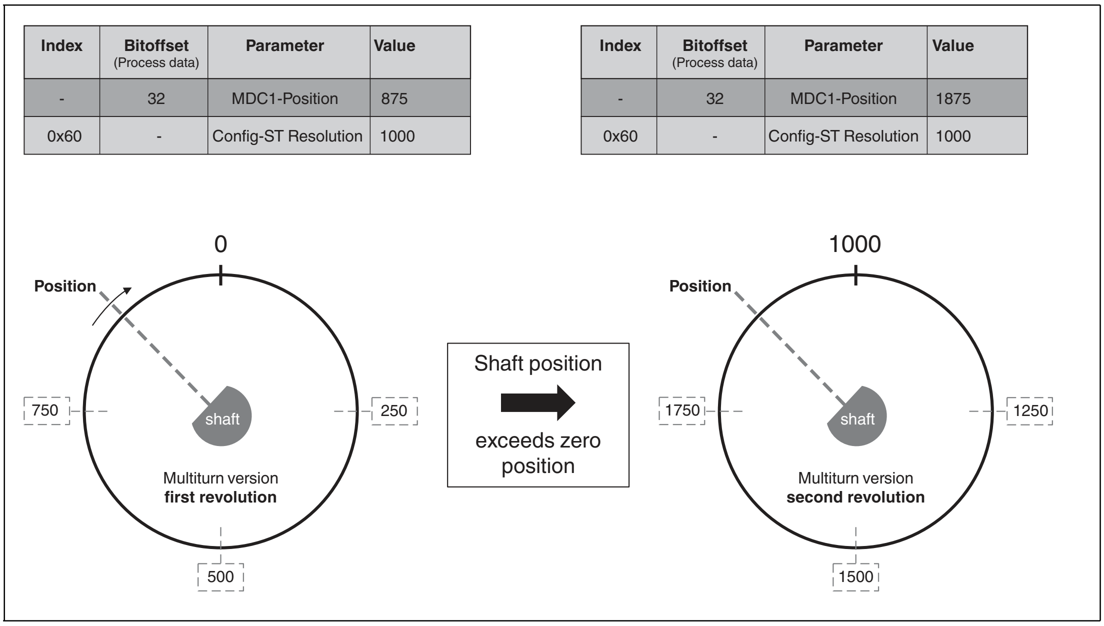

Figure 6.2 Different shaft position for multiturn versions depending on singleturn resolutions

The example also shows that the current shaft position (= MDC1 - Position) and the set singleturn resolution (= Config - ST Resolution = MDC1 - ST Resolution) can be used to determine the corresponding multiturn position (= number of full revolutions completed). If a complete revolution means 1000 steps, a measured value equating to MDC1 - Position = 1875 means that one full revolution and a further 875 steps of the next revolution have been completed.

Refer to information on the "MDC1 - ST Resolution" process data content and the "Config - Position Overflow" parameter.

6.2 SSC1 Param. SP1

Switching Signal Channel 1 Parameter Setpoint 1

Index	Sub	Parameter	Access	Data Type	Length
64 (0x40)	1	SSC1 Param. SP1	rw	Integer	32 bits

The "SSC1 Param. SP1" parameter is used to set a critical limit value for "SSC1."

The permissible value range of the "SSC1 Param. SP1" parameter is independent of "SSC1 Param. SP2."

6.3 SSC1 Param. SP2

Switching Signal Channel 1 Parameter. Setpoint 2

Index	Sub	Parameter	Access	Data Type	Length
64 (0x40)	2	SSC1 Param. SP2	rw	Integer	32 bits

The "SSC1 Param. SP2" parameter is used to set a critical limit value for "SSC1."

The permissible value range of the "SSC1 Param. SP2" parameter is independent of "SSC1 Param. SP1." see chapter 6.2 for a comparison.

The figure below uses an example to illustrate the relationship between SP1 and SP2.

Index	Parameter	Value
0x40 Sub 1	SSC1 Param. SP 1	100
0x40 Sub 2	SSC1 Param. SP 2	900
0x60	Config-ST Resolution	1000

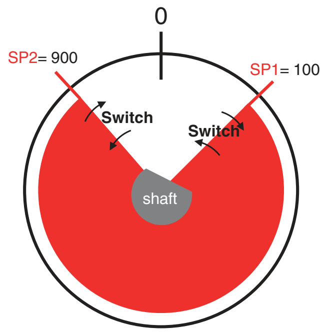

Figure 6.3

The general rule for switch points SP1 and SP2 is that

switch points SP1 and SP2 can be set independently of each other:

- SP1 can be greater than SP2.
- SP1 can be smaller than SP2.
- SP1 can be equal to SP2.

6.4 SSC1 Config. Logic

Switching Signal Channel 1 Configuration Logic

Index	Sub	Parameter	Access	Data Type	Length
65 (0x41)	1	SSC1 Config. Logic	rw	UInteger	8 bits

The "SSC1 Config. Logic" parameter indicates whether the "SSC1" switching signal is transmitted as "High active" or "Low active."

You can use this parameter to specify which range between "SSC1 Param. SP2" and "SSC1 Param. SP1" is transmitted as "High active" or "Low active." The approach used means that if the switch points in the default setting are exceeded or are not reached, this results in a high active signal.

The figure below illustrates this.

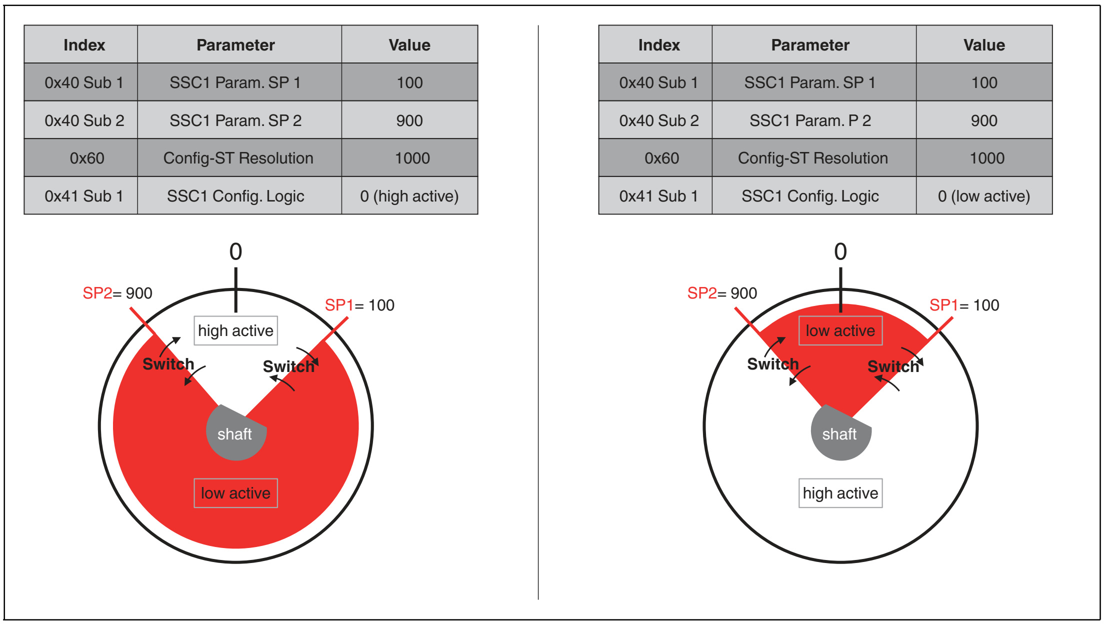

Figure 6.4

6.5 SSC1 Config. Mode

Switching Signal Channel 1 Configuration. Mode

Index	Sub	Parameter	Access	Data Type	Length
65 (0x41)	2	SSC1 Config. Mode	rw	UInteger	8 bits

The "SSC1 Config. Mode" parameter is used to set the evaluation mode for the signal evaluation. The resulting switching signal depends on values selected for SP1 and SP2 for Logic and Mode.

Set one of the following modes:

- Deactivated
- Single Point
- Window
- Two Point

The figures below show the different modes; switching signal "SSC1" is shown as a blue line.

"Deactivated" Mode

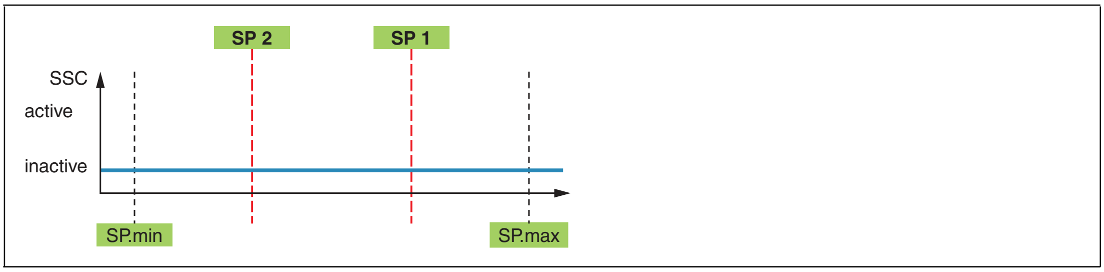

Figure 6.5

Single Point Mode as High Active Signal

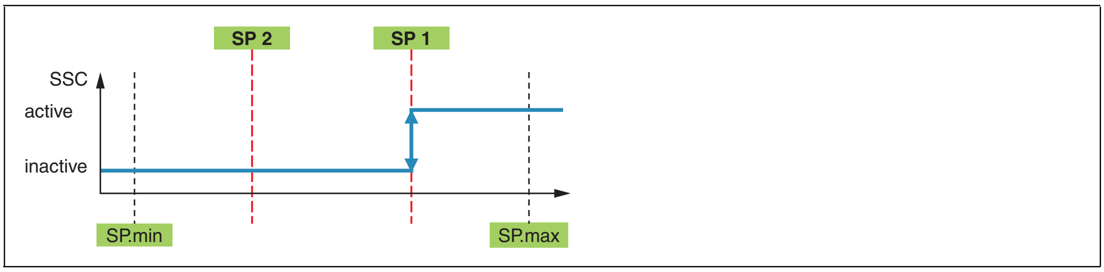

Figure 6.6

Window Mode as High Active Signal

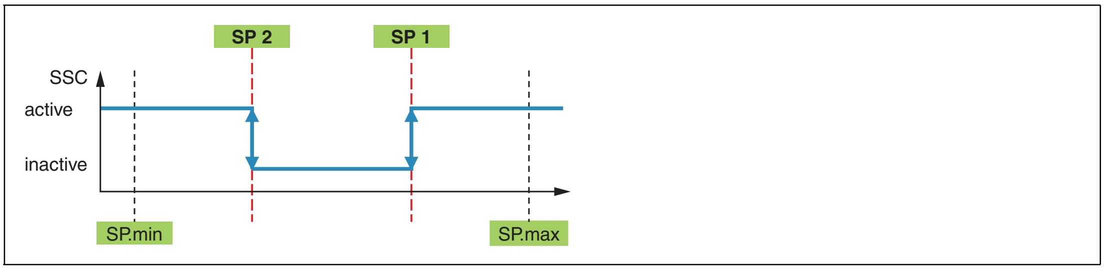

Figure 6.7

Two Point Mode as High Active Signal

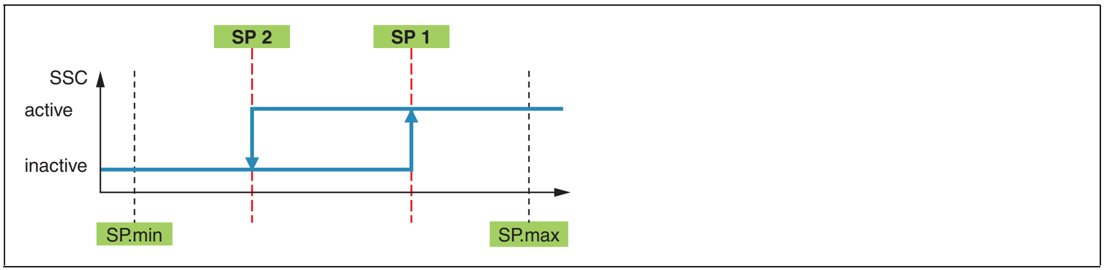

Figure 6.8

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6.6 SSC1 Config. Hyst

Switching Signal Channel 1 Configuration Hysteresis

Index	Sub	Parameter	Access	Data Type	Length
65 (0x41)	3	SSC1 Config. Hyst	rw	Integer	16 bits

The "SSC1 Config. Hysteresis" parameter indicates the extent of a desired delayed effect of the SSC1 bit. This is despite an actual change made to the position value.

If the measured position value continuously toggles around the set critical setpoint "SSC1 Param. SP1," the SSC1 signal bit in the cyclic signal transmission would continuously toggle between "0" and "1." If this effect is not required, use the "SSC1 Config. Hysteresis" parameter to create an interval between the activation (1) and deactivation (0) of the SSC1 bit.

The hysteresis function depends on the mode selected in the "SSC1 Config. Mode" parameter. It is effective for the "Single Point" and "Window" modes only. The effect in each mode is shown in the figures below.

Single Point Mode with Hysteresis as High Active Signal

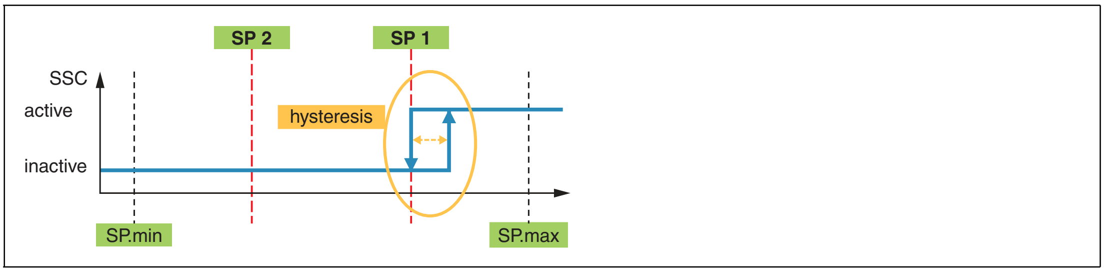

Figure 6.9

Window Mode with Hysteresis as High Active Signal

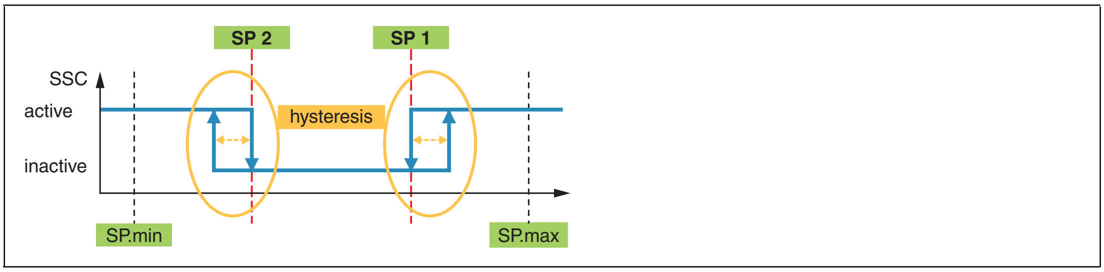

Figure 6.10

As seen in the "Window" mode figure, the hysteresis limit for Window mode has an outward-facing effect. As seen in the "Single Point" figure, this sensing principle is used for Single Point mode.

The example below illustrates this sensing principle, showing a frontal view of the rotary encoder shaft and the corresponding positive direction of rotation set to clockwise.

Bitoffset (Process data)	Parameter	Value
0x40 Sub 3	Switchpoint Hysteresis	300
0x40 Sub 2	SSC1 Param. SP 2	200
0x40 Sub 1	SSC1 Param. SP 1	500
0x60	Config-ST Resolution	1000

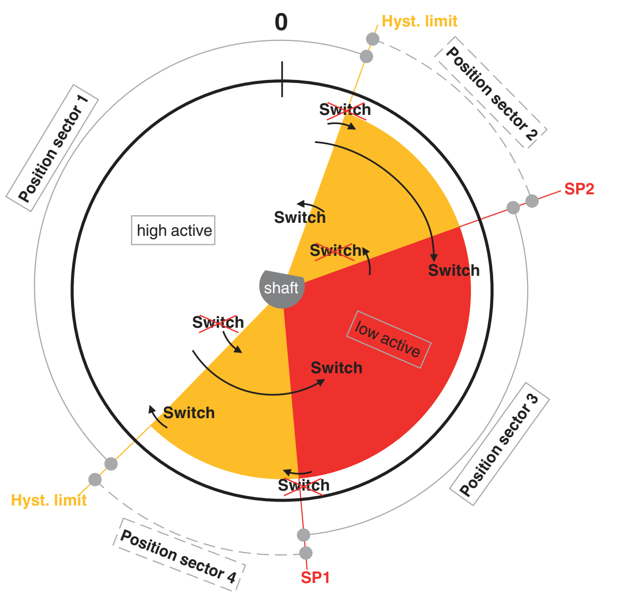

Figure 6.11 Switching point characteristics with hysteresis area larger than the overflow limit

Position sector 1 White section = area outside the hysteresis areas and the setpoints

Position sector 2 Yellow section = hysteresis area of the smaller setpoint

Position sector 3 Red section = area between setpoint 1 and setpoint 2

Position sector 4 Yellow section = hysteresis area of the larger setpoint

The following table shows the respective switching characteristics for each combination. It is necessaryto distinguish between the position sector (see previous figure) that is changed to the next position sector and the status of the switching channel has shortly before the sector change.

MDC1 — Position			Switching Characteristics of SSC1 Switching Signal 1
From "Position Sector"	SSC1 Value	To "Position Sector"	
1	high	2	high –> high
2	high	3	high –> low
2	low	3	low –> low
3	low	4	low –> low
4	low	1	low –> high
4	high	1	high –> high
1	high	4	high –> high
4	high	3	high –> low
4	low	3	low –> low
3	low	2	low –> low
2	low	1	low –> high
2	high	1	high –> high

Table 6.1

If the position sector is changed from sector 4 (SP1 hysteresis area) to sector 3 (= inner window area) and the SSC1 switching channel is about to switch to "high," SSC1 will switch its contents to "low" if sector 4 exceeds sector 3.

You can set the desired measuring range as "high active" or "low active" using the "SSC1 Config Logic" (0x41 Sub 1) parameter.

These switching characteristics apply to the singlepoint mode if the "SSC 1 Config Mode" (0x41 Sub 2) parameter is set to "Single point."

6.7 Config - Auxiliary Measurement

Configuration - Auxiliary Measurement

Index	Sub	Parameter	Access	Data Type	Length
101 (0x65)	–	Config - Auxiliary Measurement	rw	UInteger	8 bits

The "Config - Auxiliary Measurement" parameter is used to set whether an additional measured value is transferred in the cyclical process data word. For the ENA***TL-**IO** product group, this additional measured value is the ambient temperature of the device.

6.8 Config — Rotation Direction

Configuration — Rotation Direction

Index	Sub	Parameter	Access	Data Type	Length
97 (0x61)	–	Config — Rotation Direction	rw	UInteger	8 bits

The "Config — Rotation Direction" parameter defines the positive counting direction when the rotary encoder shaft is rotated. Either "Clockwise" or "Counter clockwise" can be selected as a positive counting direction.

Example: When looking at the rotary encoder shaft, the "Counter clockwise" setting produces a positive counter-clockwise counting direction.

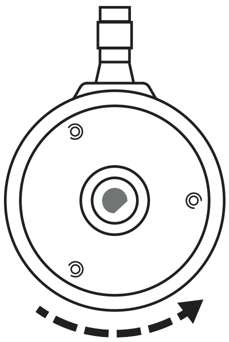

Figure 6.12

6.9 Config - Position Preset

Configuration - Position Preset

Index	Sub	Parameter	Access	Data Type	Length
99 (0x63)		Config - Position Preset	rw	Integer	32 bits

The "Config - Position Preset" parameter is used to offset the zero crossing.

This value can be used to redefine a suitable zero crossing during operation or for a particular installation situation. Even after switching the rotary encoder off and on again (Power cycle) , this value is the valid zero crossing since it is permanently stored in the device. The "Config - Position Preset" parameter can be set to values other than "0."

When the "Position Preset" command (170, 0x63) is triggered, the set value of the "Config - Position Preset" parameter is applied for this current position. All changes to the position are relative to this position value.

6.10 Config - Position Overflow

Configuration - Position Overflow

Index	Sub	Parameter	Access	Data Type	Length
100 (0x64)		Config - Position Overflow	rw	Integer	32 bits

The "Config - Position Overflow" parameter is used to set the highest position value for the current measured position value.

As soon as the "Position Overflow" value is exceeded, the position value reverts to "0" and continues counting up from there. Conversely, as soon as the position value falls below "0," the measured value jumps to the "Position Overflow" value and continues counting down from there. This is used for cyclical applications with a consistent direction of rotation (e.g., winding paper rolls).

The figure below illustrates this.

Index	Parameter	Value
0x64	Config-Position Overflow	2250
0x60	Config-STR Resolution	1000

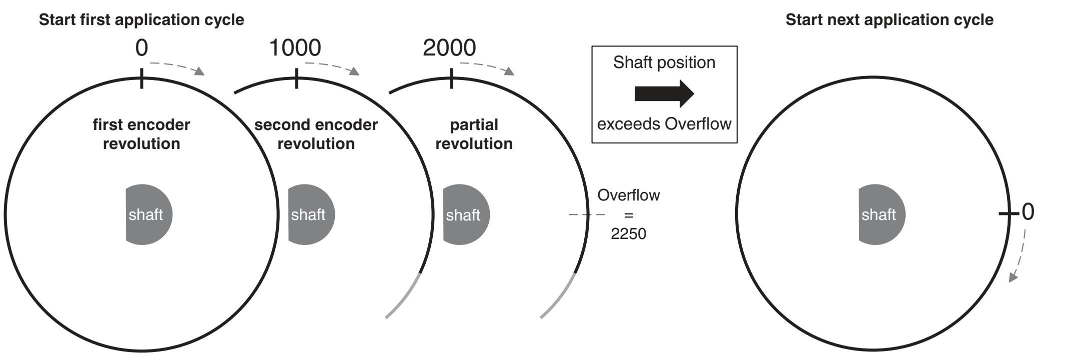

Figure 6.13 Switching point characteristics with overflow function

The maximum permissible multiturn position of the encoder is set using the "Config - Position Overflow" setting. This parameter can therefore also be considered as a total resolution in addition to "Config - ST Resolution." The figure above shows that two full revolutions are possible. The third revolution is counted upward by a further 1/4. Once the overflow value has been exceeded, the position value begins counting again from zero.

A Mathematical Generalization for this Relationship

- Singleturn resolution = Config - ST Resolution = number of measuring steps per revolution
- Maximum possible multiturn position = maximum number of possible full revolutions

(Config - Position Overflow) / (Config - ST Resolution)
—?round off the result = (maximum possible multiturn position)

In addition:

"Config - Position Overflow" must always be greater than or equal to "Config - ST Resolution"

Taking the sample numbers from the illustration above, the result is:

- Singleturn resolution = Config - ST Resolution = MDC1 Resolution = number of measuring steps per revolution = 1000

- Config - Position Overflow maximum number of possible measuring steps over all revolutions = 2250
- Maximum possible multiturn position = maximum number of possible full revolutions = ?

1000 x ? = 2250
2250 / 1000 = 2.25 rounded = 2

Selecting Config - ST Resolution = 1000 and Config - Position Overflow = 2250 means that two full revolutions can be completed before the rotary encoder starts counting again from ZERO, by maintaining an upward counting direction of rotation. The third revolution is started in this example but is only a partial revolution since counting begins again from ZERO from the 2250 position.

6.11 DSC1.1 Param - Temperature. High Limit

Diagnosis Signal Channel 1.1 Parameter - Temperature: High Limit

Index	Sub	Parameter	Access	Data Type	Length
80 (0x50)	1	DSC1.1 Param - Temperature. High Limit	rw	Integer	16 bits

The "DSC1.1 Param - Temperature. High Limit" parameter is used to set the upper temperature limit value and corresponds to the switching threshold of the "DSC1.1 - Temperature Warning 1" switching alarm signal in the process data word.

6.12 DSC1.2 Param - Temperature. Low Limit

Diagnosis Signal Channel 1.1 Parameter - Temperature: Low Limit

Index	Sub	Parameter	Access	Data Type	Length
80 (0x50)	2	DSC1.1 Param - Temperature. Low Limit	rw	Integer	16 bits

The "DSC1.2 Param - Temperature. Low Limit" parameter is used to set the lower temperature limit value and corresponds to the switching threshold of the "DSC1.2 - Temperature Warning 2" switching alarm signal in the process data word. The "DSC1.2 Param - Temperature. Low Limit" parameter can be activated simultaneously to the "DSC1.1 Param - Temperature. High Limit" parameter.

6.13 DSC1 Config — Temperature. Logic

Diagnosis Signal Channel 1.1 Configuration — Temperature: Logic

Index	Sub	Parameter	Access	Data Type	Length
81 (0x51)	1	DSC1 Config — Temperature. Logic	rw	UInteger	8 bits

The "DSC1 Config — Temperature. Logic" parameter describes whether the "DSC1.1 Param — Temperature.High Limit" and "DSC1.2 Param — Temperature. Low Limit" signal bits are transmitted as "High active" or "Low active."

6.14 DSC1 Config - Temperature. Mode

Diagnosis Signal Channel 1.1 Configuration - Temperature: Mode

Index	Sub	Parameter	Access	Data Type	Length
81 (0x51)	2	DSC1 Config - Temperature. Mode	rw	UInteger	8 bits

The "DSC1 Config - Temperature. Mode" parameter describes whether only the "DSC1.1 Param - Temperature. High Limit" signal bit or additionally the "DSC1.2 Param - Temperature. Low Limit" signal bit is activated in the process data word.

6.15 DSC1 Config - Temperature. Hyst

Diagnosis Signal Channel 1 Configuration - Temperature Hysteresis

Index	Sub	Parameter	Access	Data Type	Length
81 (0x51)	3	DSC1 Config: Temperature. Hyst	rw	Integer	16 bits

The "DSC1 Config: Temperature. Hyst" parameter is used to set the required delayed effect of the "DSC1.1 Param - Temperature. High Limit" and "DSC1.2 Param - Temperature. Low Limit" signal bits despite a real change in the temperature value. This is used if the continuous switching of the signal bits should be suppressed when the real temperature value toggles around the set threshold value.

The figure below shows the respective effect of the set hysteresis as an example for the " High Limit Active" and "High and Low Limit Active" modes.

Hysteresis in "High Limit Active" mode as active high signal

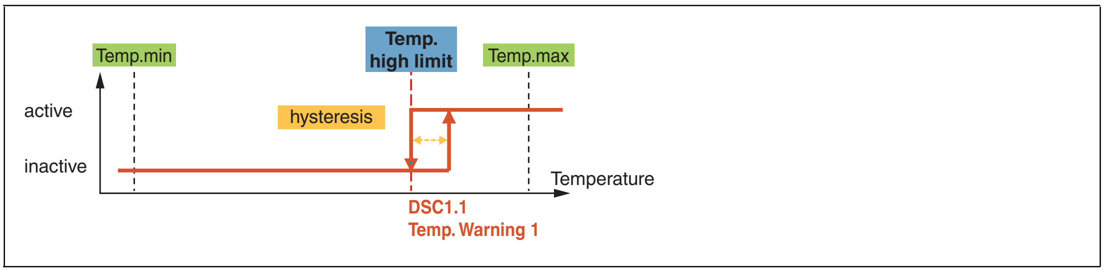

Figure 6.14

Hysteresis in "High and Low Limit Active" mode as active high signal

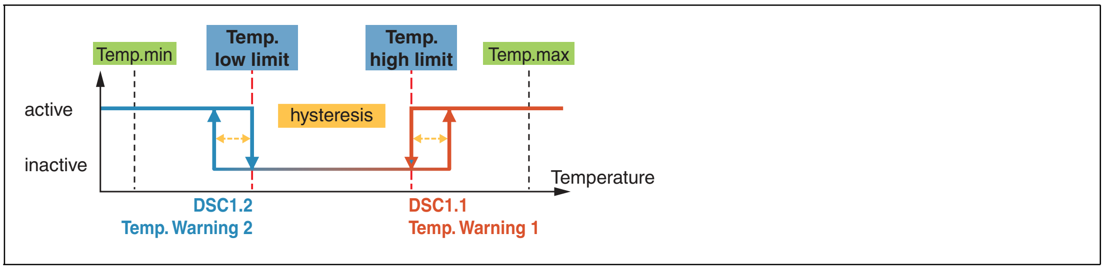

Figure 6.15

7 Switching Signal Characteristics

The following sections use examples to describe the switching signal characteristics of the rotary encoder for the "SSC1 - Switching Signal 1" process data. The switching signal characteristics for the "SSC2 - Switching Signal 2" process data work in the same way. You can set and use both switching signal channels independently of each other.

7.1 Window Mode with SP1 and SP2

The parameters of SP1 (setpoint 1) and SP2 (setpoint 2) can be set differently, to accommodate different application types. The figure below illustrates this.

Index	Parameter	Value
0x40 Sub 1	SSC1 Param. SP 1	100
0x40 Sub 2	SSC1 Param. SP 2	900
0x60	Config-ST Resolution	1000

Index	Parameter	Value
0x40 Sub 1	SSC1 Param. SP 1	900
0x40 Sub 2	SSC1 Param. SP 2	100
0x60	Config-ST Resolution	1000

Index	Parameter	Value
0x40 Sub 1	SSC1 Param. SP1	100
0x40 Sub 2	SSC1 Param. SP 2	100
0x60	Config-ST Resolution	1000

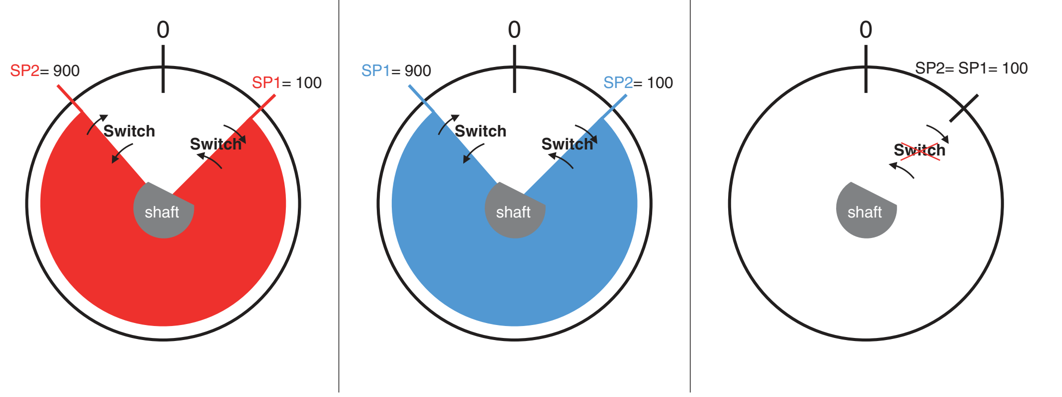

Figure 7.1

The SP1 (setpoint 1) and SP2 (setpoint 2) switch points can be used as the upper or lower switching threshold for the associated switching signal channel, depending on the assigned value. The switch point with the higher value is referred to as the upper switching limit; the switch point with the lower value is referred to as the lower switching limit. The colored value range between the lower and upper switching limit is known as the window range.

SP1 (setpoint 1) and SP2 (setpoint 2) can be configured with the same assigned value and loaded into the device. However, since the upper and lower switching limits have the same value, the switching signal channel does not indicate any change if this value is exceeded or is not reached.

The "SSC 1 Config. Logic" parameter (0x41 Sub 1) can be used to set the required switching characteristics to "High active" or "Low active."

The general rule for switch points SP1 and SP2 is

Switch points SP1 and SP2 can be set independently of one another.

- SP1 can be greater than SP2
- SP1 can be smaller than SP2
- SP1 can be equal to SP2

7.2 Position Overflow with SP1 and SP2

You can set the SP1 (setpoint 1) and SP2 (setpoint 2) switch point values to be higher than the value for the "Config — Position Overflow" parameter (0x64). This setting is accepted by the rotary encoder as a permissible parameterization status. However, the "Config — Position Overflow" parameter automatically acts as a switching threshold when the measured value is exceeded during operation. This is due to the functional behavior of this parameter. If rotation with a positive counting direction is maintained and the "Config — Position Overflow" limit is exceeded, the measured position value (MDC1 — Position) is automatically set to "0" at this shaft position. The measured position value will continue to increase. Therefore, the switch point with a higher value than the "Config — Position Overflow" parameter is effectively never reached.

The figure below illustrates this.

Index	Parameter	Value
0x64	Config-Position Overflow	1850
0x40 Sub 2	SSC1 Param. SP 2	1400
0x40 Sub 1	SSC1 Param. SP 1	1950
0x60	Config-ST Resolution	1000

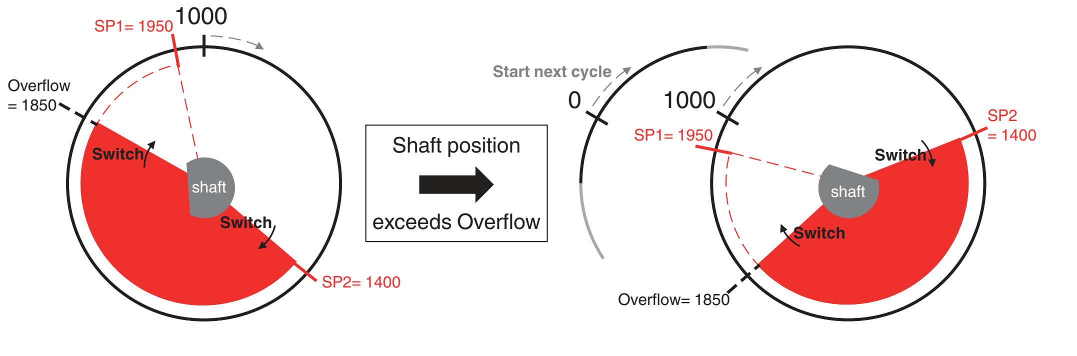

Figure 7.2 Switching characteristics with overflow function

In this example, the selected SP1 of 1950 is higher than the "Position Overflow" set at 1850. The SSC1 (Switching Signal Channel 1) process data changes its status when the position measurement is exceeded at 1850 and never at 1950. The measuring range between 1850 and 1950, which can never be reached during live operation, is shown here using dashed lines.

The "SSC 1 Config. Logic" parameter (0x41 Sub 1) can be used to set the required measuring range to "high active" or "low active."

This characteristic applies to single point mode if the "SSC 1 Config. Mode" parameter (0x41 Sub 2) is set to "Single Point."

The general rule for switch points SP1 and SP2 is:

If SP1 or SP2 is greater than or equal to "Position Overflow," the "Config — Position Overflow" position acts as the switch point.

7.3 Hysteresis with SP1 and SP2 (Smaller than Zero Point)

You can set a uniform hysteresis area for each of the switch points SP1 (setpoint 1) and SP2 (setpoint 2). Keep in mind that the window mode hysteresis limit has an outward-facing effect.

The rotary encoder accepts a hysteresis area smaller than the zero point as a permissible configuration status. However, it should be noted that the zero point automatically works as a switching threshold when the measured value is not met during operation.

The figure below illustrates this.

Index	Parameter	Value
0x41 Sub 3	SSC1 Config. Hyst	300
0x40 Sub 2	SSC1 Param. SP 2	200
0x40 Sub 1	SSC1 Param. SP 1	500
0x60	Config-ST Resolution	1000

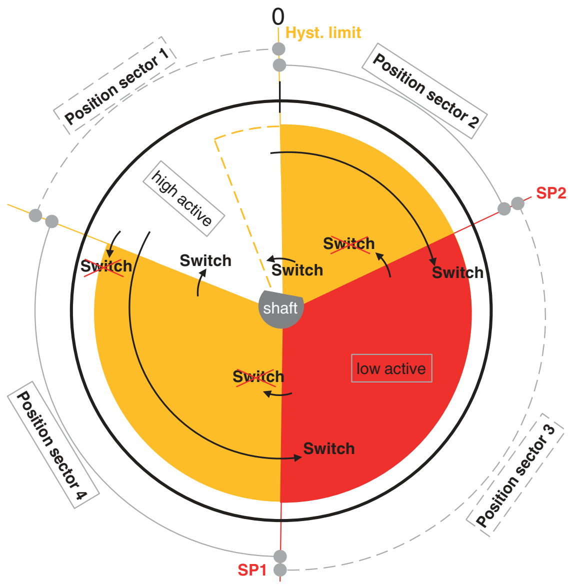

Figure 7.3 Switching point characteristics with hysteresis area smaller than the zero point

Position sector 1 White section = area outside the hysteresis areas and the setpoints

Position sector 2 Yellow section = hysteresis area of the smaller setpoint

Position sector 3 Red section = area between setpoint 1 and setpoint 2

Position sector 4 Yellow section = hysteresis area of the smaller setpoint

The window mode between the switch points SP2 and SP1 is shown in red. The respective hysteresis area for each switch point is yellow. The ineffective hysteresis area smaller than the zero point is illustrated by the dashed lines. Depending on the current direction of rotation and the current status of the switching channel, there is either a change or no change in the switching channel if the limits are exceeded.

The following table shows the respective switching characteristics for each combination. It is necessaryto distinguish between the position sector (see previous figure) that is changed to the next position sector and the status of the switching channel has shortly before the sector change.

MDC1 — Position			Switching Characteristics of SSC1 Switching Signal 1
From "Position Sector"	SSC1 Value	To "Position Sector"	
1	high	2	high –> high
2	high	3	high –> low
2	low	3	low –> low
3	low	4	low –> low
4	low	1	low –> high
4	high	1	high –> high
1	high	4	high –> high
4	high	3	high –> low
4	low	3	low –> low
3	low	2	low –> low
2	low	1	low –> high
2	high	1	high –> high

Table 7.1

If the position sector is changed from sector 4 (SP1 hysteresis area) to sector 3 (= inner window area) and the SSC1 switching channel is about to switch to "high," SSC1 will switch its contents to "low" if sector 4 exceeds sector 3.

You can set the desired measuring range as "high active" or "low active" using the "SSC1 Config Logic" (0x41 Sub 1) parameter.

These switching characteristics apply to the singlepoint mode if the "SSC 1 Config Mode" (0x41 Sub 2) parameter is set to "Single point."

The general rule is

If the SPn-Hyst is smaller than zero for a decreasing measured value (position), the switch point is at zero.

7.4 Hysteresis with SP1 and SP2 (Larger than Overflow)

You can set a uniform hysteresis area for each of the switch points SP1 (Setpoint 1) and SP2 (Setpoint 2).

Keep in mind that the window mode hysteresis limit has an outward-facing effect.

The rotary encoder accepts a hysteresis area larger than a set parameter "Config Position Overflow" (0x64) as a permissible configuration status. However, it should be noted that the "Config - Position Overflow" parameter automatically works as a switching threshold when the measured value is exceeded during operation.

The figure below illustrates this.

Index	Parameter	Value
0x64	Config-Position Overflow	1600
0x41 Sub 3	SSC1 Config. Hyst	250
0x40 Sub 1	SSC1 Param. SP 2	1300
0x40 Sub 2	SSC1 Param. SP 1	1500
0x60	Config-ST Resolution	1000

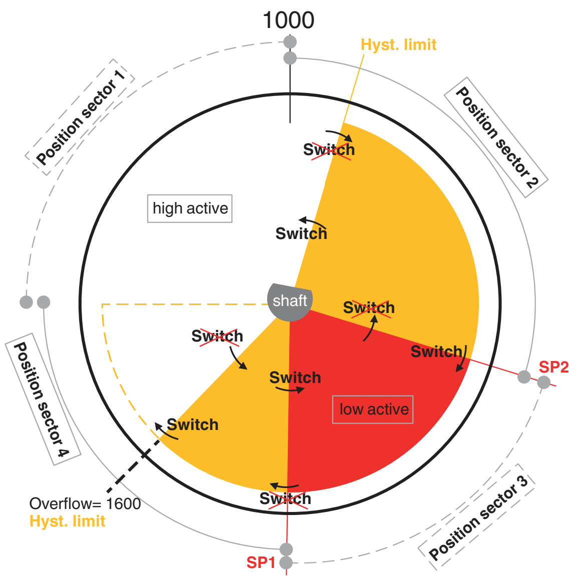

Figure 7.4 Switching point characteristics with hysteresis area larger than the overflow limit

Position sector 1 White section = area outside the hysteresis areas and the setpoints

Position sector 2 Yellow section = hysteresis area of the smaller setpoint

Position sector 3 Red section = area between setpoint 1 and setpoint 2

Position sector 4 Yellow section = hysteresis area of the larger setpoint

The measuring range between the upper hysteresis limit and the overflow position is illustrated by the dashed lines. The SSC1 (Switching Signal Channel 1) process data changes its status when the position measurement is exceeded at 1600 and never greater than 1750. The measuring range between 1600 and 1750, which can never be reached during live operation, is shown here using dashed lines.

The following table shows the respective switching characteristics for each combination. It is necessaryto distinguish between the position sector (see previous figure) that is changed to the next position sector and the status of the switching channel has shortly before the sector change.

MDC1 — Position			
From "Position Sector"	**SSC1 Value**	**To "Position Sector"**	**Switching Characteristics of SSC1 Switching Signal 1**
1	high	2	high –> high
2	high	3	high –> low
2	low	3	low –> low
3	low	4	low –> low
4	low	1	low –> high
4	high	1	high –> high
1	high	4	high –> high
4	high	3	high –> low
4	low	3	low –> low
3	low	2	low –> low
2	low	1	low –> high
2	high	1	high –> high

Table 7.2

If the position sector is changed from sector 4 (SP1 hysteresis area) to sector 3 (= inner window area) and the SSC1 switching channel is about to switch to "high," SSC1 will switch its contents to "low" if sector 4 exceeds sector 3.

You can set the desired measuring range as "high active" or "low active" using the "SSC1 Config Logic" (0x41 Sub 1) parameter.

These switching characteristics apply to the singlepoint mode if the "SSC 1 Config Mode" (0x41 Sub 2) parameter is set to "Single point."

The general rule is

If the SPn-Hyst is larger than the "Config Position Overflow" parameter for an increasing measured value (Position), the switch point is at the position "Config Position Overflow."

2020-09

8 Troubleshooting

8.1 What to Do in Case of a Fault

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

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

Checklist

Fault	Cause	Remedy
LED not lit up	No voltage supply	Verify that the absence of the voltage supply is not the result of a local factor, such as installation work or maintenance work. Switch on the voltage supply.
	The plug on the connection cable is not correctly connected to the device plug on the rotary encoder.	Connect the plug to the sensor and tighten the union nut by hand.
	Wiring fault in the splitter or switch cabinet	Check the wiring carefully and repair any faults with the wiring.
	Connection cable to the rotary encoder is damaged.	Replace the damaged connection cable.
No IO-Link connection to the rotary encoder	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 the rotary encoder	No voltage supply	Verify that the absence of the voltage supply is not the result of a local factor, such as installation work or maintenance work. Switch on the voltage supply.

9 Repair and Servicing

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
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