ENCODER PRODUCTS COMPANY

TECHNICAL REFERENCE MANUAL

IO-Link

Protocol Encoders

IO-Link

1-800-366-5412 | 1-208-263-8541 | *encoder.com* | sales@encoder.com

Encoder Products Company
464276 Highway 95 South
Sagle, Idaho 83860
USA

Phone: +1 (208) 263-8541
Fax: +1 (208) 263-0541
Email (Sales): **sales@encoder.com**
Email (Tech Support): **support@encoder.com**
Website: **encoder.com**

Warranty waiver, right of amendment, copyright:

Encoder Products Company accepts no liability or warranty for the correctness of this manual, or for any direct or indirect damage that may arise from it. In the pursuit of constant innovation and cooperation with customers, we reserve the right to amend technical data or content at any time.

This manual is copyrighted, and it may not be modified, added to, reproduced or shared with third parties without prior written consent.

Comments:

Should you have any corrections, notes or requests for changes, please send them to us. Send your comments to: **support@encoder.com**

Table of Contents

1. Introduction . . . 7
   - 1.1 About this manual . . . 7
     - 1.1.1 Explanation of symbols . . . 7
     - 1.1.2 What you won't find in the manual . . . 8
   - 1.2 Products Supported . . . 8
   - 1.3 Service description . . . 8
   - 1.4 Scope of delivery . . . 9
2. Safety Instructions . . . 10
   - 2.1 General information . . . 10
   - 2.2 Intended use . . . 10
   - 2.3 Safe working . . . 10
   - 2.4 Waste disposal . . . 10
3. Device Description . . . 11
   - 3.1 General . . . 11
   - 3.2 IO-Link . . . 11
   - 3.3 Encoder - Basics . . . 12
     - 3.3.1 Single Turn - ST . . . 12
     - 3.3.2 Multi-turn - MT . . . 12
     - 3.3.3 Direction of rotation . . . 12
     - 3.3.4 Preset . . . 12
     - 3.3.5 Scaling . . . 13
   - 3.4 IO-Link encoder connection assignments . . . 14
     - 3.4.1 AMJ / RMJ - M12 Connector . . . 14
   - 3.5 LEDs and signalling . . . 15
4. IO-Link . . . 16
   - 4.1 Overview of functions . . . 16
   - 4.2 IO device description . . . 16
   - 4.3 Standard parameters . . . 17
     - 4.3.1 Standard parameter identification . . . 17
     - 4.3.2 Standard parameter system commands . . . 18
     - 4.3.3 Standard parameter events . . . 19
   - 4.4 Process data . . . 20
     - 4.4.1 Smart Sensor Profile 4.2.1 . . . 20
     - 4.4.2 Smart Sensor Profile 4.2.2 . . . 21
     - 4.4.3 64-Bit Profile . . . 22

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.5 Configuration and diagnostic parameters 23
4.6 Switching Signal Channel (CAM) 29
4.6.1 Single Point 29
4.6.2 Window mode 30
4.6.3 Two-point mode 30
5. Technical Support 31

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

Index of Figures

Figure 3.1: EPC IO-Link Encoders 11
Figure 4.1: Single Point mode 1 29
Figure 4.2: Single Point mode 2 29
Figure 4.3: Window mode 30
Figure 4.4: Two point mode increasing 30
Figure 4.5: Two point mode decreasing 30

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

Index of Tables

Table 3.1: Pin-assignment . . . 14
Table 3.2: LED signaling . . . 15
Table 4.1: Functions . . . 16
Table 4.2: IODDs . . . 16
Table 4.3: Identification parameters . . . 17
Table 4.4: System commands . . . 18
Table 4.5: Standard parameter events . . . 19
Table 4.6: Process data SSP 4.2.1 . . . 20
Table 4.7: Process data SSP 4.2.2 . . . 21
Table 4.8: Process data 64-Bit . . . 22
Table 4.9: Configuration and diagnostic parameters . . . 23

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

1. INTRODUCTION

1.1 About This Manual

This technical manual describes the configuration and installation options for Encoder Products Company (EPC) absolute rotary encoders with the IO-Link interface. It is a supplement to the other public EPC documents, such as the data sheets, installation instructions, supplementary sheets, catalog and flyers.

Read the manual before commissioning. First check that you have the latest version of the manual and the correct version of the IODD file.

When reading, pay particular attention to the information, important notes and warnings marked with the corresponding symbols (see 1.1.1)

This manual is intended for people with technical knowledge of sensors, IO-Link interfaces and automation elements. If you have no experience with this topic, first seek the help of experienced persons.

Please keep the information supplied with our product in a safe place so that you can obtain further information if necessary.

	• **The contents of this manual are arranged in a practice-oriented manner.** • **All the information in the following chapters is required for optimum use of the device and should be read carefully.**

1.1.1 Explanation of symbols

	• **The INFO symbol is next to a section that is particularly informative or important for using the device.**
	• **The IMPORTANT symbol is placed next to a text passage in which a procedure for solving a specific problem is described.**
	• **The WARNING symbol is located next to a text passage that must be observed in particular to ensure proper use and to protect against hazards.**

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

1.1.2 What you won't find in the manual

- Basics of automation technology
- System planning
- Risk (availability, security)
- Shielding concepts
- Reflections
- Repeater
- Network design
- Bus cycle time
- FMA - Management services
- Transmission services
- Telegram types

1.2 Products Supported

This manual is for the following encoders from Encoder Products Company as listed below:

Absolute encoders with Shaft or Hollow Bore:

- A25SB (2.5" Shafted Bus Encoder with IO-Link)
- A36SB (36mm Shafted Bus Encoder with IO-Link)
- A36HB (36mm Hollow Bore Bus Encoder with IO-Link)
- A58SB (58mm Shafted Bus Encoder with IO-Link)
- A58HB (58mm Hollow Bore Bus Encoder with IO-Link)

- **You can find the complete line of EPC IO-Link products on our website: encoder.com**

1.3 Service Description

A rotary encoder is a sensor for detecting angular positions (single turn) and rotations (multiturn). The measurement data and the variables derived from it are processed by the encoder and provided as electrical output signals for the downstream peripherals.

The EPC IO-Link encoders use energy harvesting magnetic technology for single turn and multi-turn operation. This makes the EPC encoders maintenance-free and environmentally friendly.

The rotary encoders with the article identifiers as described in section 1.2 communicate via the IO-Link interface.

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

1.4 Scope of Delivery

The items included with the encoder depends on the type of model and your order. Before commissioning, you should check that the correct items have been received.

EPC encoders with IO-Link include the following within the package:

- EPC encoder with IO-Link protocol

- **The corresponding IODD file, Technical Reference Manual, and the corresponding datasheets are available for download on the Internet: encoder.com**

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

2. SAFETY INSTRUCTIONS

2.1 General Information

- **The installation instructions, manual and data sheet must be observed when commissioning the encoder.**
- **Failure to observe safety instructions can lead to malfunctions, property damage and personal injury!**
- **The machine manufacturer's operating instructions must be observed.**

2.2 Intended Use

Rotary encoders are components for installation in machines. Before commissioning (operation as intended), it must be established that the machine as a whole complies with the EMC and Machinery Directives.

The rotary encoder is a sensor for detecting angular positions and rotations and is only to be used for this purpose! EPC rotary encoders are manufactured and sold for industrial use in non-safety-relevant areas.

- **The rotary encoder must not be operated outside the specified limit parameters (see associated data sheet).**

2.3 Safe Working

The encoder may only be installed and fitted by a qualified technician.

National and international regulations must be observed when installing electrical systems.

If the encoder is not commissioned correctly, it may malfunction or fail.

- **All electrical connections must be checked before commissioning.**
- **Suitable safety measures must be taken to ensure that no persons are injured in the event of failure or malfunction and that no damage is caused to the system or operating equipment.**

2.4 Waste Disposal

Devices that are no longer required or are defective must be disposed of properly by the user in accordance with country-specific laws. It should be noted that this is special electronic waste and disposal with normal household waste is not permitted.

The manufacturer is not obliged to take back the product. If you have any questions about proper disposal, please contact a disposal company in your area.

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

3. DEVICE DESCRIPTION

3.1 General

There are different mechanical variants for the EPC series with IO-Link. The decisive factor here is the type of flange shape and the type of shaft (solid or hollow shaft). The size is determined by the diameter of the flange, e.g. 36 mm or 58mm. The following illustration shows examples of the EPC encoders with IO-Link.

Figure 3.1: EPC IO-Link Encoders

The solid or hollow end shaft is connected to the rotating part whose angular position or speed is to be measured. Connector outlets form the interface for connection to the IO-Link network. The status LEDs in the cover signal various states of the encoder during use. They support the configuration of the encoder or troubleshooting in the field. The flange holes or the supplied spring plates are used for mounting on the machine or in the application.

3.2 IO-Link

IO-Link is an industrial communication protocol for connecting sensors and actuators with automation systems. It was developed by the IO-Link community and is managed as an international standard (IEC 61131-9). IO-Link enables bidirectional communication and transmits both process data and device parameters.

IO-Link uses a point-to-point connection and can be integrated into various network topologies. It supports simple cabling via standard industrial cables and offers diagnostic functions as well as the option of automatic device parameterization.

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

3.3 Encoder - Basics

The following sections describe the basic functions of an absolute rotary encoder.

In contrast to incremental encoders, absolute encoders output their position value as a digital number via a fieldbus, for example. A distinction is made between single turn and multiturn encoders.

In addition to the simple output of the position value, most rotary encoders allow a certain degree of parameterization, such as selecting the positive direction of rotation, setting the position value to a reference value at a defined physical position and scaling the position value to any resolution and a limited measuring range. In this way, the development effort in the control program is reduced and the computing capacity of the controller is relieved.

3.3.1 Single Turn - ST

Measuring the angle from 0° to 360° using a shaft is the minimum function of a rotary encoder. The sensor technology is based on the optical or magnetic scanning of a measuring scale on the encoder shaft.

The EPC IO-Link encoders work with magnetic technology, which guarantees the highest possible accuracy and resolution.

3.3.2 Multi-turn - MT

A multi-turn encoder enables the number of revolutions to be recorded. This is realized via a turns counter. Magnetic technology is used in the EPC encoders to ensure that the relevant information is retained even in a non-powered state. Buffer batteries and gearboxes, which require a comparatively large installation space and corresponding maintenance effort are not required.

3.3.3 Direction of rotation

The positive direction of rotation can be reversed by a simple two's complement (invert each bit and add "1") of the position value.

3.3.4 Preset

A desired position value can be assigned to the rotary encoder for a specific physical position. This must be within the measuring range so that the position value is correlated with a physical reference position. To do this, the difference between the current position value and the desired value is calculated. This is saved in a non-volatile memory and added to the position value as an offset.

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

3.3.5 Scaling

The scaling parameters can be used to adjust the position value to exactly match the physical quantity to be measured. The scalable parameters are "Measuring units per revolution (MUPR)" and "Total measuring range in measuring units (TMR)".

The scaling parameter "Measuring units per revolution (MUPR)" - increments per revolution - specifies the resolution of the position value per revolution (also: ST resolution). The value corresponds to 360°. This means that if a value of 3600 Cts is parameterized, the rotary encoder outputs the position in 0.1° increments (see equation (2)).

$$\mathrm{MUPR} = \mathrm{ST} = 3600\,\mathrm{Cts} \tag{1}$$

$$\text{Angular steps} = \frac{\text{Angle of one revolution}}{\mathrm{MUPR}} = \frac{360^\circ}{3600\ \mathrm{Cts}} = 0.1^\circ / \mathrm{Cts} \tag{2}$$

The scaling parameter "Total measuring range in measuring units (TMR)" - maximum total measuring range of the position value (single turn and multiturn multiplied) - specifies the total resolution of the rotary encoder. If the position value reaches

TMR - 1, it jumps back to 0 and vice versa.

As a rule, the TMR parameter is selected so that it is an integer multiple of the "Measuring units per revolution (MUPR)" (see equation (4)), so that the zero point is always at the same position on the encoder shaft.

$$\mathrm{TMR} = 36000\,\mathrm{Cts} \tag{3}$$

$$\mathrm{MT} = \frac{\mathrm{TMR}}{\mathrm{MUPR}} = \frac{36000\ \mathrm{Cts}}{3600\ \mathrm{Cts}} = 10 \tag{4}$$

In exceptional cases, it is adequate that TMR is not an integer multiple of MUPR. For example, if a transmission ratio in a system ensures that the desired measured variable moves 10% faster than the encoder shaft in relation to the encoder shaft.

Then a setting of MUPR = 3960 Cts and TMR = 36000 Cts would ensure that the faster but not directly measurable shaft can be measured with a resolution of 0.1° and over a range of 10 revolutions. Normally, the number of revolutions would be calculated by dividing the position value by MUPR. In this case, however, it must be divided by 3600 Cts, as the result would otherwise be the number of revolutions of the encoder shaft and not that of the faster shaft of the system.

- **Please note that measurement errors occur if the result of this formula is a decimal number.**

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

3.4 IO-Link Encoder Connection Assignments

3.4.1 AMJ / RMJ - M12 Connector

The character sequence AMJ (axial) / RMJ (radial) in the order code indicates a rotary encoder with M12 5-pin connector. The pin assignment of the connector can be found in Table 3.1. For IO-Link pin-5 is not used or connected.

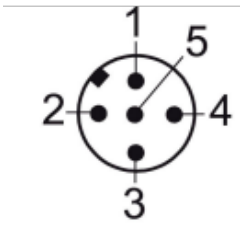
Pin-assignment	
AMJ / RMJ	
	
Plug (Ref.)	M12x1
L+	1
L-	3
C/Q	4
I	2
N/C	5

Table 3.1: Pin-assignment

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

3.5 LEDs and Signaling

A status LED in the housing indicates various statuses of the rotary encoder and supports diagnostics and troubleshooting in the field (see Table 3.2)

Status LED	Meaning	Cause
○	No voltage	
●	Ready for operation	The appliance has been fully commissioned.
✹	Pre-/Operational	The device has been fully commissioned and is in preoperational or operational mode.
✹	Event (Level: Warning)	The device has been fully commissioned, and an event has been triggered (e.g. Operating Temperature Upper Threshold Exceeded)
✹	Ping	The device has been fully commissioned, and the device discovery function has been activated. See4.3.2 in 0xAF
●	Event (Level: Error)	The device has detected a serious error. (Please contact support)

Table 3.2: LED signalling

Explanation of the symbols and asterisks:

○ LED off / ● ● LED on / / ✹ ✹ ✹ ✹ / LED flashes

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4. IO-LINK

4.1 Overview of Functions

Our IO-Link encoders support the functions shown in Table 4.1:

Functions	Meaning
Specification	V1.1.4
Baud rate	COM3 (230.4kBit/s)
Profile	**SSP 4.2.1:** Measuring and Switching Sensor, high resolution, 1 channel **SSP 4.2.2:** Measuring and Switching Sensor, high resolution, 2 channel **64-Bit Profile**

Table 4.1: Functions

4.2 IO Device Description

The available IODDs for the corresponding profiles are listed in Table 4.2:

IODD Files	Meaning
EPC-Encoder_User_SSP421-XXXXXXXX-IODDX.X.xm	If profile 4.2.1 is set in the device, this IODD must be used
EPC-Encoder_User_SSP422-XXXXXXXX-IODDX.X.xml	If profile 4.2.2 is set in the device, this IODD must be used
EPC-Encoder_User_64BIT-XXXXXXXX-IODDX.X.xml	If the 64-bit profile is set in the device, this IODD must be used

Table 4.2: IODDs

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.3 Standard Parameters

4.3.1 Standard parameter identification

Parameter	Index	Subindex
Vendor Name	0x10	0
Vendor Text	0x11	0
Product Name	0x12	0
Product ID	0x13	0
Product Text	0x14	0
Serial Number	0x15	0
HW Revision	0x16	0
FW Revision	0x17	0
Application specific tag	0x18	0
Function Tag	0x19	0
Location Tag	0x20	0

Table 4.3: Identification parameters

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.3.2 Standard Parameter System Commands

System Commands	Name	Definition
0x01	ParamUploadStart	Start parameter upload
0x02	ParamUploadStop	Stop parameter upload
0x03	ParamDownloadStart	Start parameter download
0x04	ParamDownloadStop	Stop parameter download
0x05	ParamDownloadStore	Finalize parameterization and start Data Storage
0x06	ParamBreak	Cancel all Param commands
0x40	Teach Apply	Verifies the Teach points and applies them to the configuration
0x41	SP1 Single Value Teach	Saves the currently measured position as Setpoint 1
0x42	SP2 Single Value Teach	Saves the currently measured position as Setpoint 2
0x43	SP1 Two Value Teach TP1	Saves the currently measured position as Teachpoint 1 for Setpoint 1
0x44	SP1 Two Value Teach TP2	Saves the currently measured position as Teachpoint 2 for Setpoint 1
0x45	SP2 Two Value Teach TP1	Saves the currently measured position as Teachpoint 1 for Setpoint 2
0x46	SP2 Two Value Teach TP2	Saves the currently measured position as Teachpoint 2 for Setpoint 2
0x4E	Teach Reset	Deletes settings, SP1 and SP2 value of the currently selected SSC
0x4F	Teach Cancel	Cancels the current Teach procedure
0x80	Device reset	A warm start is performed, and the device is set to initial mode. Communication is interrupted by the device and restored by the master
0x81	Application reset	The device parameters are set to the default values. Identification parameters remain unaffected. An upload to the master's data storage is carried out if this is activated
0x82	Restore factory settings	All device parameters are reset to the default settings. The values stored in the data storage can be downloaded after the power reset
0x83	Back-to-box	All device parameters are reset to the default settings and communication is suspended until the next power reset. Note: If you carry out this reset, the device should be disconnected from the master after it has been carried out
0xA0	Reset Maintenance	Resets all maintenance parameters like remanent errors, min/max temperature since startup, ...
0xAF	Ping	LED changes to Device Discovery Blink pattern. See 3.5
0xE0	Teach In Zero Point	Updates position value to the value that is stored in index 0x00C2 (Measurement Preset)

Table 4.4: System commands

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.3.3 Standard parameter events

Event Id	Event	Type	Description
0x4000	IOLD_EVENT_TEMPERATURE_ FAULT_OVERLOAD	Error	Actual operating temperature is above maximum value or below minimum value
0x4210	IOLD_EVENT_DEVICE_ TEMPERATURE_OVERRUN	Warning	This warning is generated if the actual operating temperature is above the maximum operating temperature specification decremented by 10°C.
0x4220	IOLD_EVENT_DEVICE_ TEMPERATURE_UNDERRUN	Warning	This warning is generated if the actual operating temperature is below the minimum operating temperature specification incremented by 10°C.
0x5000	IOLD_EVENT_DEVICE_ HARDWARE_FAULT	Error/Alarm, not recoverable	Hardware error occurred; device must be exchanged
0x6000	IOLD_EVENT_DEVICE_ SOFTWARE_FAULT	Error/Alarm, not recoverable	Software error occurred; device must be exchanged
0x8D18	IOLD_EVENT_SIGNAL_ COUNTER_MULTICHANNEL_ REACH_LIMIT	Notification	One of the Switching counter channels reached its limit – check status
0x8D19	IOLD_EVENT_SIGNAL_ COUNTER_MULTICHANNEL_ OVERFLOW	Warning	One counter stopped because it overflowed the maximum value - check status of switching counters
0x8CFF	IOLD_EVENT_LOW_SIGNAL_ QUALITY	Error, recoverable	Magnetic field is too weak or too strong, check environment
0x8D10	IOLD_EVENT_CUSTOMER_ TEMPERATURE_MAX_ TRESHOLD_OVERRUN	Warning	This warning is generated if the actual operating temperature is above the maximum operating temperature defined by the customer
0x8D20	IOLD_EVENT_CUSTOMER_ TEMPERATURE_MIN_ TRESHOLD_UNDERRUN	Warning	This warning is generated if the actual operating temperature is below the minimum operating temperature defined by the customer
0x1848	IOLD_EVENT_SINGLETURN_ MAGNETIC_FIELD_TOO_STRONG	Error	Magnetic field is too strong for sensor, environmental magnetic field may be impacting measurement
0x1849	IOLD_EVENT_SINGLETURN_ MAGNETIC_FIELD_TOO_WEAK	Error	Magnetic field is too weak for sensor, magnet may be broken
0x184A	CALIBRATION_ERROR	Error	Calibration of the device has failed. The device must be replaced
0x184B	ST_MT_SYNCRONIZATION_ FAILED	Warning	ST/MT synchronization failed
0x8D0A	IOLD_EVENT_SHORTCIRCUIT_ PIN_4	Error	ShortCircuit
0x8D0B	IOLD_EVENT_SHORTCIRCUIT_ PIN_2	Error	ShortCircuit
0x8D14	IOLD_EVENT_OVERLOAD_PIN_4	Warning	Overload

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

0x8D15	IOLD_EVENT_OVERLOAD_PIN_2	Warning	Overload
0x8D0C	IOLD_EVENT_WRONG_LOAD_ CABLE_BREACH_ANALOG_ CURRENT_OUTPUT_PIN_4	Warning	WireBreak
0x8D0D	IOLD_EVENT_WRONG_LOAD_ CABLE_BREACH_ANALOG_ CURRENT_OUTPUT_PIN_2	Warning	WireBreak
0x5110	IOLD_EVENT_PRIMARY_ SUPPLY_VOLTAGE_OVERRUN	Warning	Overvoltage

Table 4.5: Standard parameter events

4.4 Process data

4.4.1 Smart Sensor Profile 4.2.1

Description	Byte	7(MSB)	6	5	4	3	2	1	0(LSB)
Position Value	5		Max						
Position Value	4								
Position Value	3								
Position Value	2								0
Scale	1								
Device Status	0	System error	Res	Res	Signal quality bad	Res	Res	SSC1.2 State	SSC1.1 State

Table 4.6: Process data SSP 4.2.1

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.4.2 Smart Sensor Profile 4.2.2

Description	Byte	7(MSB)	6	5	4	3	2	1	0(LSB)
Position Value	11		Max						
Position Value	10								
Position Value	9								
Position Value	8								0
Position Scale	7								
Device Status	6	System error	Res	Res	Signal quality bad	Res	Res	SSC1.2 State	SSC1.1 State
Velocity Value	5	Max							
Velocity Value	4								
Velocity Value	3								
Velocity Value	2								0
Velocity Scale	1								
SSC Velocity State	0	Res	Res	Res	Res	Res	Res	SSC2.2 State	SSC2.1 State

Table 4.7: Process data SSP 4.2.2

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.4.3 64-Bit Profile

Description	Byte	7(MSB)	6	5	4	3	2	1	0(LSB)
Position Value	12	Max							
Position Value	11								
Position Value	10								
Position Value	9								
Position Value	8								
Position Value	7								
Position Value	6								
Position Value	5								0
Velocity Value	4	Max							
Velocity Value	3								
Velocity Value	2								
Velocity Value	1								0
Device Status	0	System error	Signal quality bad	Res	Res	Res	Res	Res	Res

Table 4.8: Process data 64-Bit

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.5 Configuration and diagnostic parameters

Index	Subindex	Object Name			
003A		Teach Select	RW	UINT8	Selection of which channel is used for teaching
003B	0	Teach Result	RO	UINT8	
	1	State	RO		0 = idle 1 = SP1 success 2 = SP2 success 3 = SP1, SP2 success 4 = wait for command 5 = busy 7 = error
	2	Flag SP1 TP1	RO	Boolean	0 = inital or nOK 1 = OK
	3	Flag SP1 TP2	RO	Boolean	see above.
	4	Flag SP2 TP1	RO	Boolean	see above.
	5	Flag SP2 TP2	RO	Boolean	see above.
003C	0	SSC1ParamPosition	RW	RecordT	
	1	HighLimit	RW	INT32	SP1 for SSC1
	2	LowLimit	RW	INT32	SP2 for SSC2
003D	0	SSC1ConfigPosition	RW	RecordT	
	1	Logic	RW	UINT8	0 = high active 1 = low active
	2	Mode	RW	UINT8	0 = deactivated 1 = single point 2 = window 3 = two point
	3	Hysteresis	RW	INT32	0 = off
003E	0	SSC2ParamPosition	RW	RecordT	
	1	HighLimit	RW	UINT64	see above.
	2	LowLimit	RW	UINT64	see above.
003F	0	SSC2ConfigPosition	RW	RecordT	
	1	Logic	RW	UINT8	see above.
	2	Mode	RW	UINT8	see above.
	3	Hysteresis	RW	INT32	see above.

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

400C	0	SSC1ParamVelocity	RW	RecordT	Note: The Velocity SSC channels are only available in profile 4.2.2.
	1	HighLimit	RW	INT32	see above.
	2	LowLimit	RW	INT32	see above.
400D	0	SSC1ConfigVelocity	RW	RecordT	
	1	Logic	RW	UINT8	see above.
	2	Mode	RW	UINT8	see above.
	3	Hysteresis	RW	INT32	see above.
400E	0	SSC2ParamVelocity	RW	RecordT	
	1	HighLimit	RW	INT32	see above.
	2	LowLimit	RW	INT32	see above.
400F	0	SSC2ConfigVelocity	RW	RecordT	
	1	Logic	RW	UINT8	see above.
	2	Mode	RW	UINT8	see above.
	3	Hysteresis	RW	INT32	see above.
0052	0	Operating Temperature	RO	Array	Indicates the measured temperature of the internal temperature sensor
	1	Actual Operating Temperature	RO	INT16	Current operating temperature
	2	Operating Temperature Min (Since last start)	RO	INT16	Lowest measured temperature since the last bootup
	3	Operating Temperature Max (Since last start)	RO	INT16	Highest measured temperature since the last bootup
	4	Operating Temperature Min (Lifetime)	RO	INT16	Lowest measured temperature since first bootup
	5	Operating Temperature Max (Lifetime)	RO	INT16	Highest measured temperature since first bootup
0053	0	Operating Temperature Thresholds	RW	Array	
	1	Operating Temperature Lower Threshold	RW	INT16	Lower temperature threshold (event)
	2	Operating Temperature Upper Threshold	RW	INT16	Upper temperature threshold (event)
0055	0	Device Variant	RW	UINT16	Setting the sensor profile 1 = SSP 4.2.1 2 = SSP 4.2.2 3 = 64-bit

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

00C1		Measurement Offset	RW	UINT64	The preset function shifts part of the position value to the offset. The offset value is automatically saved in the device and can be used for diagnostics. Offset Value = Preset Value - Position value
00C2		Measurement Preset	RW	UINT64	The preset value is subject to scaling and can be reset again and again. With a preset, the current position value is adapted to the index stored in it. System command 0xE0 must be executed to perform the preset.
00C3		Measurement Output Characteristics	RW	INT8	Counting direction of the position value with a view of the shaft. 0 = CW 255 = CCW
00C4		Measurement Hysteresis	RW	UINT8	Hysteresis of the position value. This value may only be changed after intensive consultation with Support. Default = 4
0202	0	Measurement Range	RO	RecordT	Working range of the device
		Teach Select	RW	UINT8	Minimum position value
	1	Measurement Range - Lower Limit	RO	UINT64	Maximum position value
00FE		Device discovery timeout time	RW	UINT16	Defines the duration of the system command 0xAF (device discovery).
1160	0	Position Value	RO	UINT64	Current position of the encoder
1161	0	Operation Mode	RW	UINT8	Defines the mode of the position value calculation. 0 = no scaling 1 = scaling mode 2 = gear ratio mode
1162	0	Position Scaling	RW	RecordT	
	1	Measuring Units per Revolution	RW	UINT32	Single turn resolution of the device
	2	Total Measuring Range	RW	UINT64	Multiturn resolution of the device

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

1163	0	Position Gear Ratio	RW	RecordT	If the operation mode = 2, the gear ratio is activated. The two gear ratio parameters, numerator and denominator, can be used to adjust the position value so that an existing gear is taken into account. -The total resolution for this function is limited to 20 bits (max. 1,048,576 steps) - The revolution resolution has no relevance for this function; the 16-bit raw resolution is always used. Example rotary table: Gear encoder: 12 teeth Driven rotary table: 250 teeth One rotation of the rotary table should be mapped to 100,000 steps. If the driven rotary table rotates once, the rotary encoder shaft rotates 250/12, i.e. 20.8333 times. The following setting must be selected here: Gear ratio numerator: 12 Gear ratio denominator: 250 Total resolution: 100000
	1	Gear Ratio Numerator	RW	UINT16	Counter
	2	Gear Ratio Denominator	RW	UINT16	Denominator
00BD	0	Position Filter	RW	UINT16	Number of average values for the item value. This value should only be changed after intensive consultation with the support team. Default: 48
1170	0	Velocity Value	RO	INT32	Speed of the shaft of the encoder in increments
1171	0	Velocity Factor	RW	RecordT	
	1	Velocity Factor enable	RW	Boolean	(De)activate speed factorization. If factorization is deactivated, the numerator and denominator are also ignored.
	2	Velocity Numerator	RW	UINT16	Speed counter
	3	Velocity Denominator	RW	UINT16	Denominator of the speed

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

1172	0	Velocity Integration Time	RW	UINT16	Integration time over which the rotary encoder determines its speed. Changing the value makes the speed value slower (high time) or more dynamic (low time). Note: The default setting is a good setting for most applications.
1173	0	Velocity source	RW	UINT8	Source of speed 0 = scaled position 1 = Raw position
4080	0	MDCDescr	RO	RecordT	
	1	LowerLimit	RO	UINT64	0
	2	UpperLimit	RO	UINT64	== Multiturn resolution
	3	Unit	RO	UINT16	None
	4	Scale	RO	INT8	Always 1
0070	0	Diagnosis suppression level configuration	RW	UINT8	Event suppression level 0 = all events 1 = Warnings and errors 2 = Errors 3 = No events
0071		Event code suppression	RW	Array[5]	The event codes to be suppressed can be written in the fields of the array.
	1	suppressedEvents 0	RW	UINT16	
	2	suppressedEvents 1	RW	UINT16	
	3	suppressedEvents 2	RW	UINT16	
	4	suppressedEvents 3	RW	UINT16	
	5	suppressedEvents 4	RW	UINT16	
0072	0	Event code suppression Teach-in	WO	UINT16	The event code entered is written to a free field in the array from 0x0071.
0073	0	Event code suppression delete	WO	UINT16	The event code entered is deleted from a field in the array from 0x0071.
0058	0	Boot cycle counter	RO	RecordT	NA
	1	Boot cycle counter	RO	UINT32	Counter for the number of bootups
0057	0	Operating hours counter	RO	RecordT	Operating hours counter
	1	Current operating hours	RO	UINT32	Operating hours since the last bootup
	2	Total operating hours	RO	UINT32	Operating hours since the last reset (delivery)
0074	0	Operating hours saving mode	RO	UINT8	0 = dynamic storage mode 1 = static storage mode

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

0093	0	Pin 2 function	RW	RecordT	
	1	Pin 2 behaviour IO-Link	RW	UINT8	0 = inactive 1 = active
	2	Pin 2 mode	RW	UINT8	0 = inactive 3 = digital input If pin 2 has been configured as a digital input, it can be used to perform a preset.
00CE	0	Low signal quality threshold	RW	UINT8	Determines the threshold value for signal quality bad.
00CF	0	Signal quality	RO	RecordT	
	1	Current signal quality	RO	UINT8	0..100%
	2	Signal quality status	RO	Boolean	0 = signal quality good 1 = signal quality bad

Table 4.9: Configuration and diagnostic parameters

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.6 Switching Signal Channel (CAM)

- **Before changing the sensor profile, make sure that you reset the parameters of the switching signal channel.**

4.6.1 Single Point

In Figure 4.1 and Figure 4.2 the 'switching' behaviour of the Single Point mode is shown. The switching state changes when the measured value exceeds or falls below the value set in SP1. If a hysteresis has been set, this is also considered as shown in the illustrations. SP2 is ignored in single point mode.

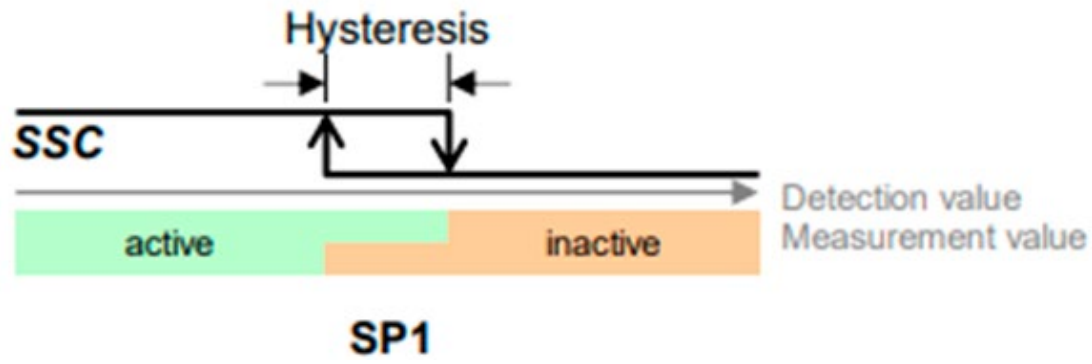


Figure 4.1: Single Point mode 1

Figure 4.2: Single Point mode 2

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

4.6.2 Window mode

The 'switching' behaviour of the window mode is shown in Figure 4.3. The switching state changes when the measured value exceeds or falls below the value set in SP1 or SP2. The hysteresis is considered here and shows symmetrical behaviour for both setpoints.

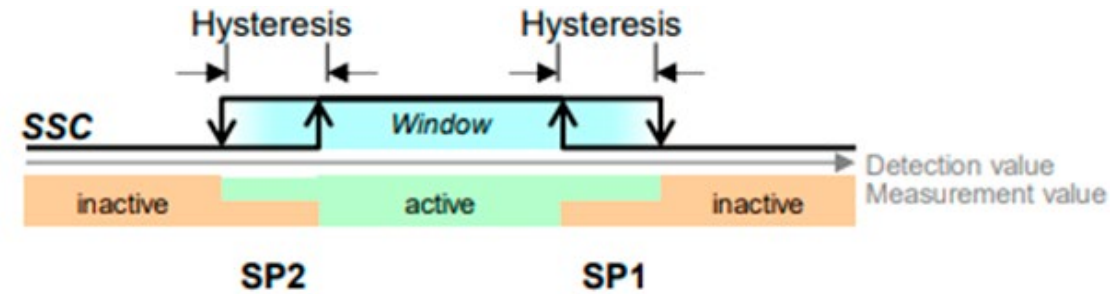


Figure 4.3: Window mode

4.6.3 Two-point mode

In Figure 4.4 and Figure 4.5 the 'switching' behaviour of the Two Point mode is shown. The switching state changes when the measured value exceeds or falls below the value set in SP1. The switching state also changes when the measured value exceeds or falls below the value set in SP2, depending on the counting direction.

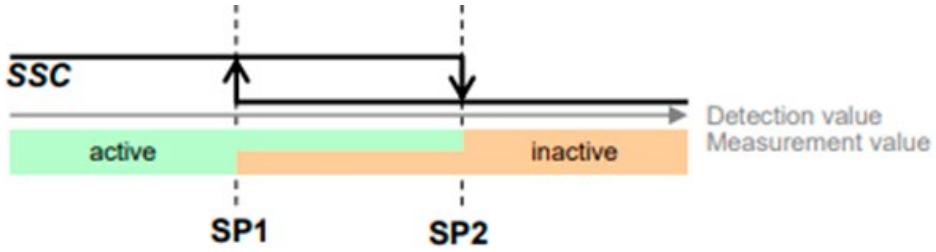


Figure 4.4: Two point mode increasing

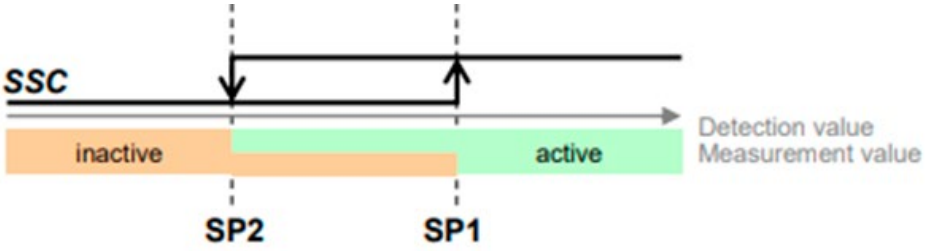


Figure 4.5: Two point mode decreasing

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com

5. TECHNICAL SUPPORT

Do you have any questions about this product?
EPC Technical Support will be happy to help you.

Tel.: +1-208-263-8541
Fax: +1-208-263-0541
E-mail: support@encoder.com

Notes:

1-800-366-5412 | 1-208-263-8541 | encoder.com | sales@encoder.com