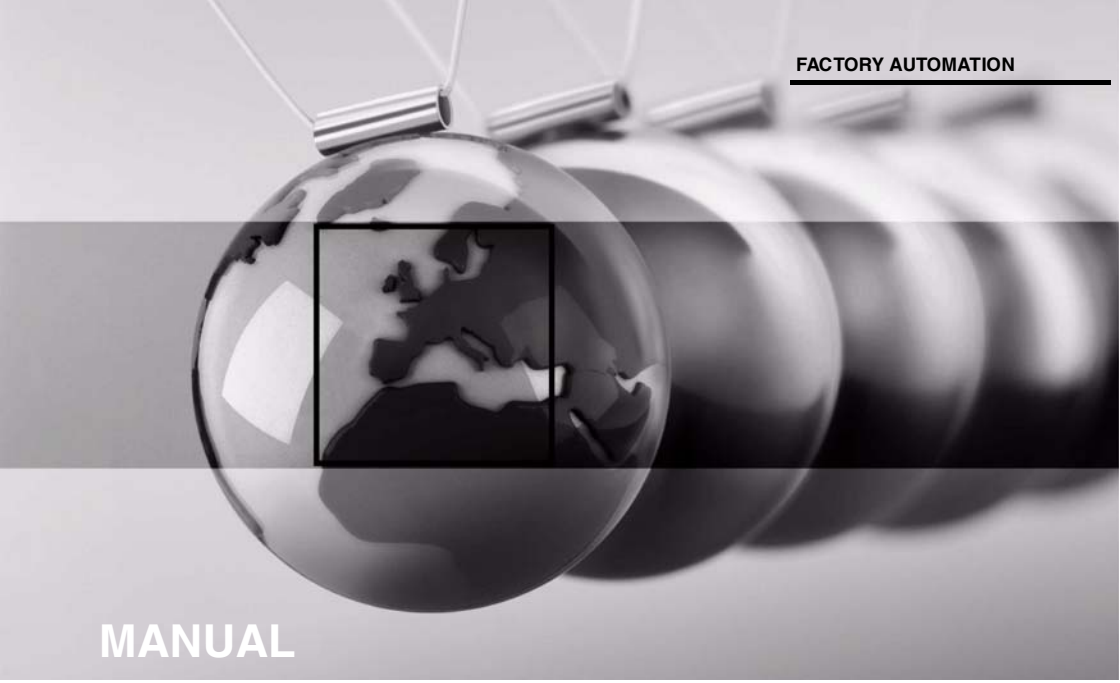
FACTORY AUTOMATION



MANUAL

Absolute Encoders with POWERLINK

EVS58-PZ
EVM58-PZ
ESS58-PZ
ESM58-PZ

PEPPERL+FUCHS
SENSING YOUR NEEDS

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

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1 Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Before installing this equipment and put into operation, read this manual carefully. This manual containes instructions and notes to help you through the installation and commissioning step by step. This makes sure bring such a trouble-free use of this product. This is for your benefit, since this:

- ensures the safe operation of the device
- helps you to exploit the full functionality of the device
- avoids errors and related malfunctions
- avoids costs by disruptions and any repairs
- increases the effectiveness and efficiency of your plant

Keep this manual at hand for subsequent operations on the device.

After opening the packaging please check the integrity of the device and the number of pieces of supplied.

Symbols used

The following symbols are used in this manual:

Note!

This symbol draws your attention to important information.

Handling instructions

You will find handling instructions beside this symbol

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

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2 Declaration of conformity

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

Note!

A Declaration of Conformity can be requested from the manufacturer.

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

ISO**9001**

3 Safety

3.1 Symbols relevant to safety

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 devices and any connected facilities or systems, or result in their complete failure.

3.2 Intended Use

This absolute rotary encoder detects the rotation angle—and, in the case of a multiturn absolute rotary encoder, the revolutions of the rotary encoder shaft—with high precision and resolution. The absolute position value derived is provided by the rotary encoder via the Powerlink interface in accordance with the standard Powerlink communication profile (EPSG DS301). The rotary encoder is to be integrated into a Powerlink network (EPSG DS301), and should be used only in this way. Typical applications include positioning tasks and length measurement, for example, for cranes, construction machinery, elevators, and packaging machines.

The rotary encoder has a Powerlink interface with integrated hub. As a result, the rotary encoder supports a daisy chain structure with the profile specification EPSG DS 301 V1.1.0.

Read through these instructions thoroughly. 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 plant is only guaranteed if the device is operated in accordance with its intended use.

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3.3 General safety instructions

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

Installation and commissioning of all devices must be performed by a trained professional only.

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

Note!

Disposal

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

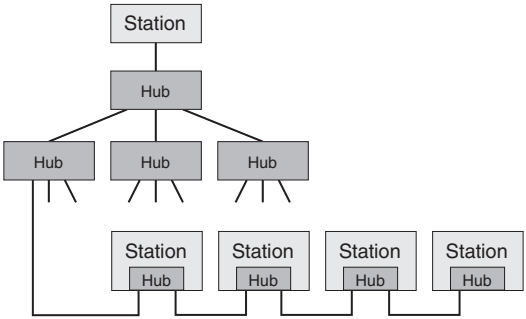
4 Network

4.1 Ethernet

The current developments in the field of Industrial Ethernet are based on the vision of integrated access to all corporate data via a standardized communication system. At higher levels of corporate communication, Ethernet is the most important medium for data transmission. Together with other IT technologies, Ethernet is internationally standardized. Over the long term, automation technology will benefit from the rapid progress of IT and web technologies in mass markets.

Technically, Ethernet represents a system with higher data transmission rates than conventional fieldbus systems. TCP/IP and UDP have statistical procedures for accessing the medium, which prevents deterministic processes. Many developments focus on additional real-time mechanisms, such as Powerlink. A deterministic time response was achieved on the Ethernet protocol. The jitter for synchronization is less than 1 µs. This allows effective and reliable synchronization of a large number of devices in a network.

4.2 Network Topology



Ethernet enables different types of topology. A rotary encoder can either be directly connected to a hub or linked serially to other rotary encoders through use of the integrated hub. Using the latter procedure, a line structure can be developed like those more commonly associated with other fieldbus systems (e.g., CANopen). As the internal hub supports auto-crossover detection, multiple rotary encoders can be interconnected both with straight and crossover cables. At least one Cat5e cable is required for a transmission rate of 100 Mbit/s. To increase immunity, only cables with strands twisted in pairs (AWG26) and a film shield or copper braid should be used (S/UTP).

Due to low frame jitter and low latency, only hubs are to be used—not switches. To fulfill the requirements for timing, up to 7 hubs or rotary encoders can be connected with an integrated HUB with a maximum cable length of 100 m. These are requirements from the Powerlink specification. For more information on Powerlink, visit the website **www.ethernet-powerlink.org**.

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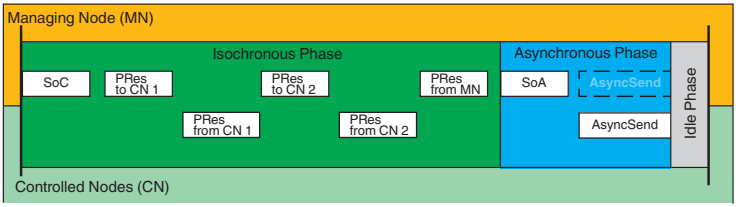
4.3 Powerlink Protocol, Version 2

The Powerlink protocol, version 2, is an open standard communication protocol. This protocol offers maximum independence for both manufacturers and users. The *Ethernet Powerlink Standardization Group* organization can be contacted for all general information and support. Visit the website of the organization: www.ethernet-powerlink.org.

Our Powerlink rotary encoders support Powerlink protocols, version 1 and version 2. You do not need to perform a device configuration because the rotary encoder has automatic detection.
What must be taken into account? Changing the protocol during operation is not permitted. When booting, the network must be in a defined state in terms of the protocol. The rotary encoder then recognizes the protocol version of the telegram.

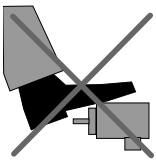
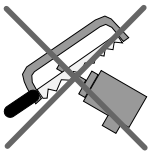
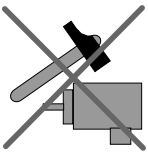
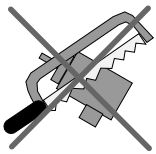
Powerlink cycle

The Powerlink protocol provides isochronous communication. Deterministic transfer is a requirement of high-performance applications. The deterministic network cycle is achieved with a time frame principle that is controlled by the managing node (MN). The EPL cycle is initiated with the SoC (Start of Cyclic) telegram. The managing node (MN) then sends a request to each node, with the controlled node (CN) responding immediately. This framework is called the isochronous phase, and includes real-time data. An asynchronous phase is started with the SoA (Start of Asynchronous) telegram. The asynchronous phase is closed with an AsyncSend telegram.



5 Installation

5.1 General Installation and Operating Instructions

	Do not loosen the connection cover!
	The rotary encoder must be connected to the main signal ground. Create the ground connection via the machine chassis or via a separate equipotential bonding cable.
	Do not stand on the rotary encoder!
	Do not make subsequent modifications to the drive shaft!
	Avoid impact!
	Do not make subsequent modifications to the housing!

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5.2 Mounting

Mounting of the rotary encoder depends on the mechanical design of the shaft and flange.

Solid shaft encoders have a rotating synchro groove on the flange side for mounting with eccentric clamping elements. In addition, solid shaft encoders have threaded holes on the face side for mounting. Solid shaft encoders with a clamping flange can be clamped to the flange or mounted to the threaded holes using mounting brackets. Rotation is transferred to the solid shaft via a suitable coupling, a measuring wheel, or a cable pull. Couplings with the required properties, measuring wheels of different diameters and coatings, as well as cable pulls with a large variety of expansion lengths can be found in our extensive range of rotary encoder accessories.

Hollow shaft encoders are connected directly to the drive shaft and permanently attached to it using a clamping element. An integrated or attached torque rest prevents the rotary encoder from turning with the drive shaft.

5.3 Electrical Connection

The device has 3 M12 x 1.4 pin connectors. The middle device plug is A-coded and is used to supply power to the device. The two outer device sockets are D-coded and are used to connect the device to Powerlink. The two device sockets for Powerlink are equivalent connections to the integrated hub.

Connector for the Power Supply

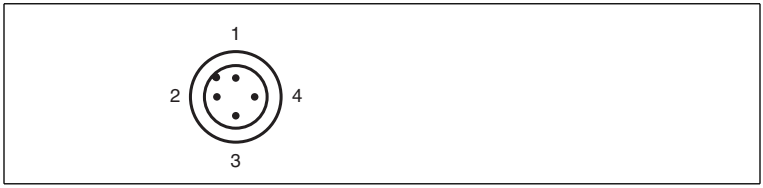

Figure 5.1 Power supply connection layout

1 + supply voltage

2 n. c.

3 - supply voltage (GND)

4 n. c.

The connector housing is located on the shield.

Ethernet Powerlink Connector

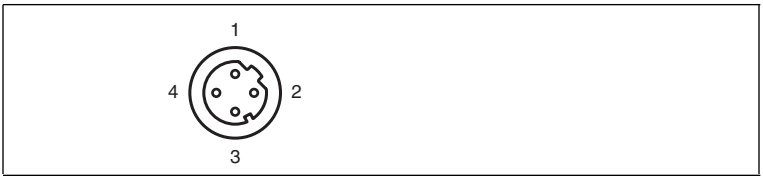

Figure 5.2 Ethernet connection layout

1 Tx+
2 Rx+
3 Tx-
4 Rx-

The connector housing is located on the shield.

5.4 Ethernet Cable

RJ45 - M12, crossed

Signal	Pin (RJ45)	Pin (M12)	Signal
Tx+	3	2	Rx+
Tx-	6	4	Rx-
Rx+	1	1	Tx+
Rx-	2	3	Tx-

RJ45 - M12, straight

Signal	Pin (RJ45)	Pin (M12)	Signal
Tx+	3	1	Tx+
Tx-	6	3	Tx-
Rx+	1	2	Rx+
Rx-	2	4	Rx-

M12 - M12, crossed

Signal	Pin (M12)	Pin (M12)	Signal
Tx+	1	2	Rx+
Tx-	3	4	Rx-
Rx+	2	1	Tx+
Rx-	4	3	Tx-

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5.5 Diagnostic LEDs

The rotary encoder has an LED window on the back, where there is a combination LED labeled "LS/DA" for each hub port. In addition, there are two LEDs to display the network status for Powerlink with the names "error" and "status." The exact meaning of the LED display can be found in the following tables.

LEDs for the Hub Ports

LED	Color	Status	Description
LS/DA1	Green	On	LINK active on hub port 1
		Flashing	Activity on hub port 1
LS/DA2	Green	On	LINK active on hub port 2
		Flashing	Activity on hub port 2

Function LEDs for Powerlink

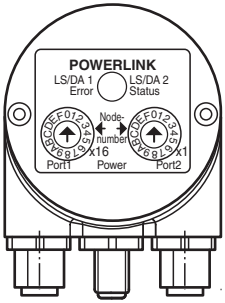
LED	Color	Status	Description
Error	Red	On	- Unauthorized node number - Internal communication error - Buffer empty or overflow - Data collision - CRC error or SoC loss
		Off	No error
Status	Green	Off	Inactive
		Flickers	Basic Ethernet mode
		Flashes once	Pre-operational 1
		Flashes twice	Pre-operational 2
		Flashes three times	Ready for operation
		On	Operational
		Flashing	Stopped

6 Network Configuration

Caution!
The connection cover must not be removed

Dismounting the connection cover damages the rotary encoder and results in the loss of your warranty claims.

All of the displays and operating controls required for configuration are freely accessible on the back of the rotary encoder.



6.1 Configuring the IP Address for Powerlink

Setting the node number (EPL node ID)

The node number is set using the two hexadecimal switches x16 and x1. The range of possible node numbers is 1 – 239. Each node number can be issued only once within a Powerlink segment. The set node number is calculated using the following formula: node number (EPL node ID) = decimal value$_{[switch\ x16]}$ x 16 + decimal value$_{[switch\ x1]}$ x 1.

Example

[Switch x16] = A, [switch x1] = 5

$A_{hex} = 10_{dec} \times 16 = 160 + 5 = 165$

IP address for Powerlink

The IP address consists of a fixed predefined partial address (192.168.100) and the set node number (EPL node ID). The Powerlink IP address is therefore 192.168.100.EPL node ID. In accordance with the above example, the IP address would be 192.168.100.165.

Software setting of the node number

Alternately, the node number can be set with EPL telegrams. In this case, both rotary switches are to be set to 0 for the node number. The factory setting of the software node ID is 165. It can subsequently be changed to the desired value via SDO telegrams.

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6.2 Definition of the Node Numbers (EPL Node IDs)

The following table shows the definition of the node IDs used in a Powerlink network.

EPL node ID	Description in accordance with EPSG DS 301 V1.1.0	Description
0	C_ADR_INVALID	Generally not permitted
1 – 239		Controlled node (such as rotary encoder)
240	C_ADR_MN_DEF_NODE_ID	Managing node
241 – 250		Reserved
251	C_ADR_SELF_ADR_NODE_ID	Pseudo node number. Used for self-addressing
252	C_ADR_DUMMY_NODE_ID	Dummy node
253	C_ADR_DIAG_DEF_NODE_ID	Diagnostics node
254	C_ADR_RT1_DEF_NODE_ID	Router Powerlink to classic Ethernet
255	C_ADR_BROADCAST	Broadcast message

7 Project Integration

The project integration is described below using the example of a B&R (Bernecker + Rainer Industrie Elektronik GmbH) controller and the "Automation Studio" project planning tool. In principle, you can integrate the device with any project planning tool and any hardware that uses a Powerlink network.

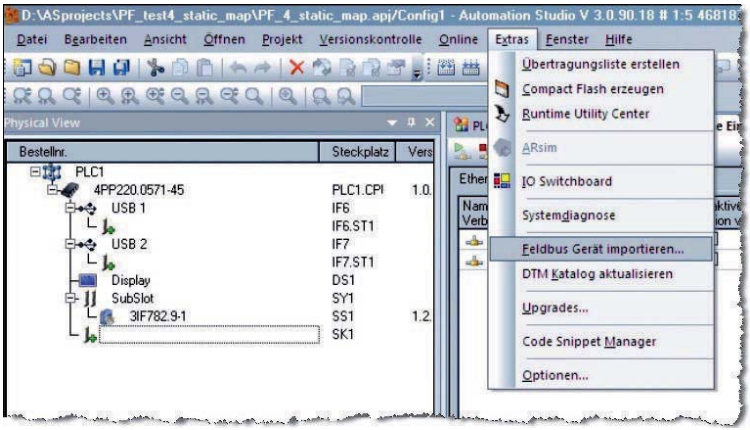
7.1 XDD File

An XDD file describes the properties and functions of the device, such as timing and configurable device parameters. Using the XDD file enables simple and easy integration of a Powerlink device into a project tool. Detailed knowledge of Powerlink is not required to configure the device. The current XDD file can be downloaded from the Pepperl+ Fuchs website: **www.pepperl-fuchs.com**.

The format of the XDD file is XML, and is similar to an EDS file used in the CANopen environment.

7.2 Importing the Rotary Encoder into the Project Tool

In the main menu "Extras," select the entry "Feldbus Gerät importieren" as shown in the screenshot.



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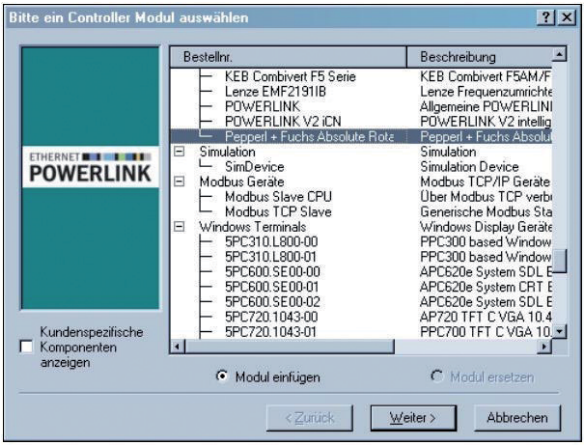
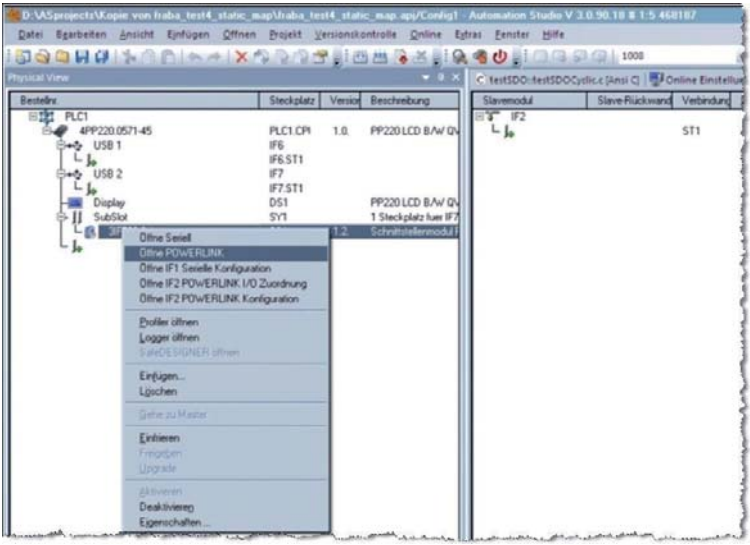
A new window will open. Go to the option "POWERLINK Geräte" and select the correct XDD file for the encoder used.

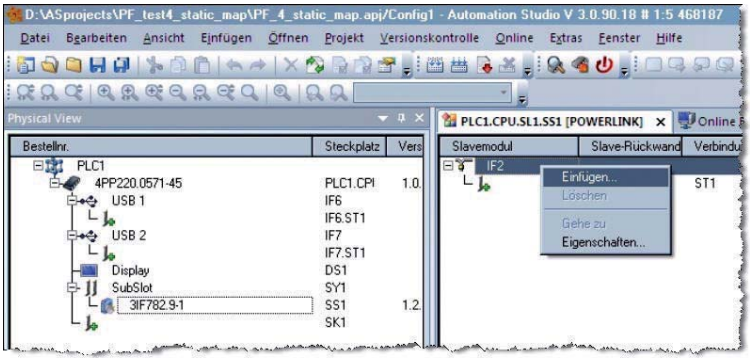


7.3 Adding Rotary Encoders to a Network

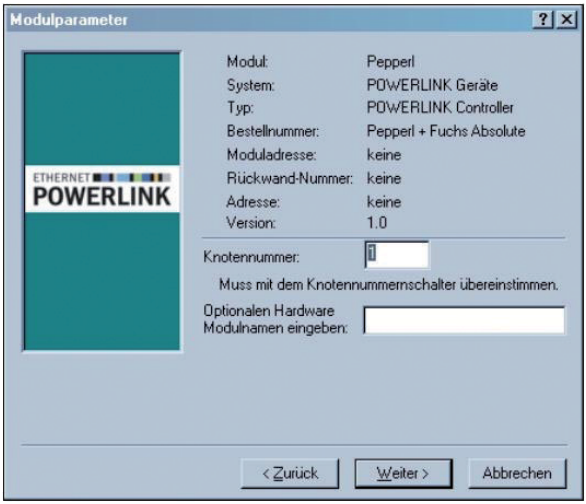
You are now taken back to the main view. Open the interface card in the left-hand window (Physical View) and select "Öffne POWERLINK."



Click the slave module in the right-hand window pane and select ""Einfügen..."



A new window opens called "Modulparameter." Enter the node number (EPL node ID) in the field "Knotennummer."

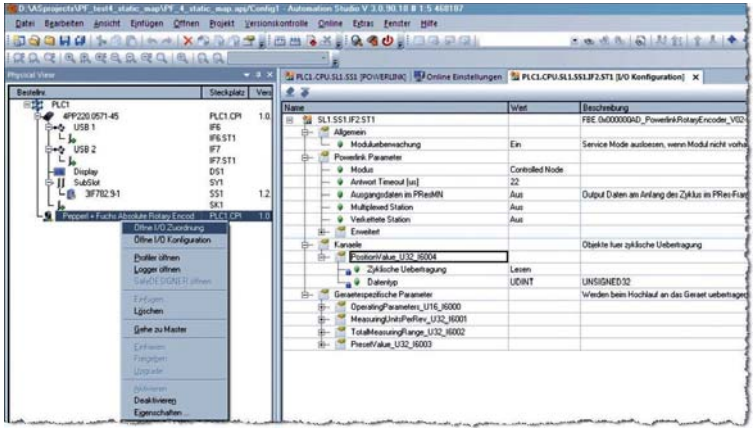


Note!

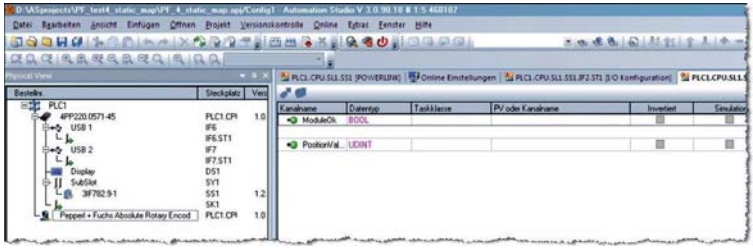
Make sure that the node number (node ID) entered here is consistent with the setting of the rotary switches at the rotary encoder, or with the software-configured node ID.

7.4 Online Diagnostics

After completing this configuration, you can see the newly added device (Pepperl+Fuchs absolute rotary encoder) in the left-hand part of the window (physical view). If you select this device with the right mouse button, the option "Öffne I/O Zuordnung" opens.

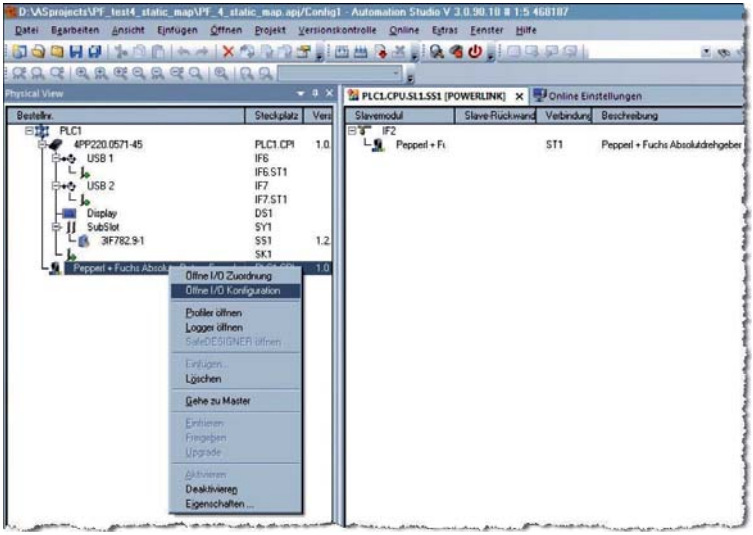


The transferred position value and the device status appear on the right-hand side of the open window.



7.5 Configuring the Network

To configure the network and set the rotary encoder operating mode, select the rotary encoder on the left-hand side (physical view) again. The right mouse button takes you to the menu entry "Öffne I/O Konfiguration."

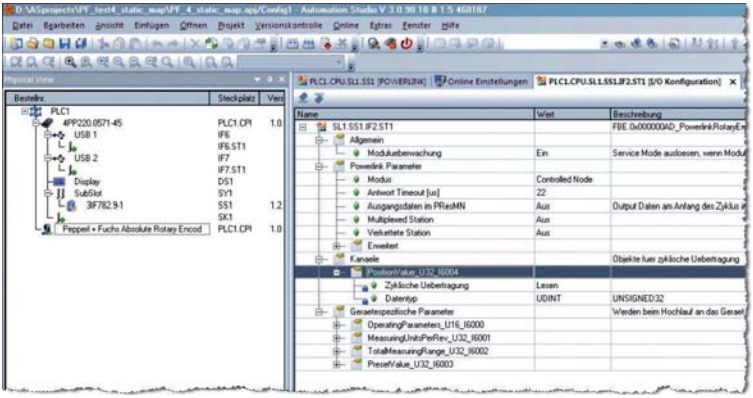


In the section "Powerlink Parameter," you can decide whether the rotary encoder is to be a multiplex station. Configuration as a multiplex station means that the rotary encoder position value is not read in each Powerlink cycle. You therefore get a short cycle time and a high bandwidth for the network data. If the rotary encoder is not a multiplex station, then this configuration results in a transfer of the position value in each Powerlink cycle. As a result, you achieve a high update rate in your application. Which setting you choose really depends on your requirements. In the next configuration step "Extended / Erweitert," you can set which entries in identity object 1018h are to be read and checked. This is useful to ensure that the correct devices are configured in the network and that they are in line with the project settings. We recommend that control of the "manufacturer-ID / Hersteller ID" and "product code / Prüfe Produktcode" is activated.

At the higher logical level, you will see the section "Channel / Kanaele." Here, you will see the position data that can be mapped to the output data (object 6004h). The mapping is fixed, and a change is not possible.

7.6 Initial Configuration

In the section "Device Specific Parameter / Gerätespezifische Parameter," the configured values for the displayed parameters are transferred in the startup phase. However, this is only the case if the configuration of the rotary encoder has been changed, i.e., if the configuration differs from the values in the project tool.



The displayed parameters contain the number of the object in their designation, and the object name from the device profile DS-406 see chapter 8.1. In addition, the data type is specified in short form as "U16" (unsigned 16 bit) and "U32" (unsigned 32 bit). The required value can be entered in the "Initialwert" field. When a rotary encoder is replaced, the managing node (master) will detect the changed configuration and transmit the start value to the new device. This enables a simple replacement and simple initial integration.

Note!

With regard to the "preset value," we advise particular caution. If the rotary encoder is replaced, it makes sense to transfer the objects 6000h, 6001h, and 6002h. However, the set value of object 6003h (preset value) is also transferred at the current position. The user must check whether this meets the requirements in the application. As a rule, this will not be the case. To adjust the preset value, two procedures are generally possible:

Procedure 1

Move the system to the desired position and reset the preset value as the start value.

Procedure 2

Move the system to the desired position. Now send an SDO configuration telegram in the Powerlink cycle to reset the preset value. We recommend using this procedure.

7.7 Configuration Example

Please refer to the type label for the type designation of your rotary encoder. Download the associated datasheet from the Pepperl+Fuchs website: **www.peperl-fuchs.com**.

The example given here refers to the following rotary encoder type:
13 bit singleturn resolution = 8192 steps per revolution
12 bit multiturn resolution = 4096 revolutions

In the example, the start values are 3600 measuring steps per revolution (object 6001h) and an overall measuring range of 7200 measuring steps. The rotary encoder then calculates a scaling factor internally to adapt the physical resolution to the needs of the user. The rotary encoder therefore delivers 3600 measuring steps per revolution with a resolution of 0.1 degrees. After two revolutions, the position value starts again at 0. There is no mechanical lock at the end of the measuring range. Remember that the specific values for objects 6001h and 6002h in the rotary encoder are effective only when bit 2 is set to one (SFC = 1) in object 6000h. Otherwise, the position value with the physical resolution is issued and the start values are ignored. The preset value can be used to set the rotary encoder position to the desired position value in your application. An offset is determined within the sensor and stored in nonvolatile memory (object 6509h).

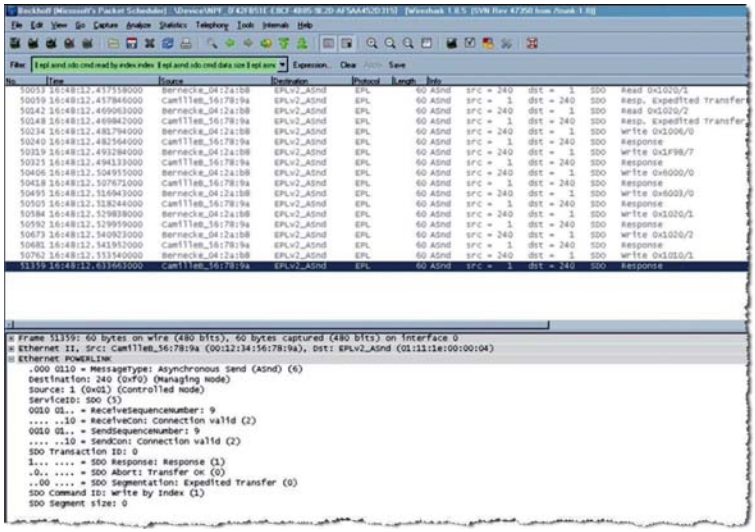
Remember to send a memory command to the rotary encoder. The setpoint value and the calculated offset value set in the rotary encoder are not stored as nonvolatile memory, and are available after a power failure. An SDO command must be used for storage and a specific signature "save" written to object 1010h.

Tip

For more information, see the profile **EPSG DS 301 V1.1.0**.

7.8 Diagnostics

If you encounter problems, it is possible to perform diagnostics using standard Ethernet tools such as Wireshark (http://www.wireshark.org). Wireshark is one of many tools on the market that can be used, as Powerlink works with standard Ethernet frames. This tool can be used to interpret Ethernet frames in accordance with Powerlink. You simply have to select exactly the right filter "EPL," and you then have a powerful tool. In the event of problems, it is advisable to log the analysis carried out. This log can be sent to Pepperl+Fuchs for further evaluation. Experience has shown that this tool has some limitations with very low Powerlink cycles. Nor should the time stamps and the sequence of the recorded telegrams be entirely trusted. In these cases, we strongly recommend the "Time Logger module" from Bernecker + Rainer to detect time-critical situations and obtain reliable logs.



In this screenshot, you can see a log of configuration telegrams (SDO messages). The telegrams, as well as the associated object with subindex, are displayed in the right-hand column. This makes it easy to check which parameters/objects of the rotary encoder are set. To display this type of view, you must set the filter in the following way:

epl.asnd.sdo.cmd.response ||
epl.asnd.sdo.cmd.read.by.index.index ||
epl.asnd.sdo.cmd.data.size ||
epl.asnd.sdo.cmd.write.by.index.data

The symbol || stands for a logical OR link. The above is just one example of possible diagnostics. There are many other ways to perform diagnostics with other tools or filter settings.

8 Appendix

8.1 Rotary Encoder Profiles

The CANopen device profiles were adopted for the Powerlink protocol to minimize the cost of integration for the user. For rotary encoders, this means that the device parameters correspond to profile DS406. The following table lists the supported parameters.

Object	Description	Data type	Access
6000h	Operating parameters	Unsigned 16	r/w
6001h	Measuring steps per revolution	Unsigned 32	r/w
6002h	Overall measuring range in measuring steps	Unsigned 32	r/w
6003h	Preset value	Unsigned 32	r/w
6004h	Position value	Unsigned 32	r/w
6500h	Operational status	Unsigned 16	r
6501h	Singleturn resolution	Unsigned 32	r
6502h	Number of revolutions	Unsigned 32	r
6503h	Alarms	Unsigned 16	r
6504h	Supported alarms	Unsigned 16	r
6505h	Warnings	Unsigned 16	r
6506h	Supported warnings	Unsigned 16	r
6507h	Profile and software version	Unsigned 8	r
6509h	Offset value	Integer 32	r
650Bh	Serial number (in accordance with identity object 1018h)	Unsigned 32	r

Object 6000h: Operating Parameters

The object contains the parameters for the code change direction (cw/ccw), commissioning diagnostics, and scaling functions.

Subindex	Description	Data type	Default setting	Access
0h	Operating parameters	Unsigned 16	4h	r/w

Code change direction
The code change direction defines the direction of rotation of the rotary encoder shaft into which the output position value increases when looking at the rotary encoder shaft.

Scaling function
The parameter scaling function is used to determine whether the position value of the rotary encoder corresponds to the physical measuring steps (scaling function deactivated) or whether the output is scaled with the values set in objects 6001h and 6002h (scaling function activated).

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Bit structure of operating parameters																
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	MS	MS	MS	MS	R	R	R	R	R	R	R	R	MD	SFC	CD	CS

MS: manufacturer-specific function (not available)

R: reserved for future applications

MD: Measuring direction (not available)

SFC: Scaling function (0 = deactivated, 1 = activated)

CD Commissioning diagnostics function (not available)

CS: Code change direction (0 = clockwise cw, 1 = counter-clockwise, ccw)

Object 6001h: Measuring Steps per Revolution

This object specifies the number of distinguishable measuring steps per revolution. Note that the value entered here must not be greater than the physical number of measuring steps, see object 6501h.

Subindex	Description	Data type	Default setting	Access
0h	Measuring steps per revolution	Unsigned 32	see type label	r/w

Note:
The XDD file contains 2000 hex as the standard value. This value must be adapted to the specific encoder value in the project tool. Note the type label and the type code on the data sheet.

Object 6002h: Overall Measuring Range in Measuring Steps

This object specifies the number of distinguishable measuring steps across the entire measuring range. Note that the value entered here must not be greater than the physical number of measuring steps of the rotary encoder per revolution, multiplied by the number of possible distinguishable revolutions (multiturn), see objects 6501h and 6502h.

Subindex	Description	Data type	Default setting	Access
0h	Overall measuring range in measuring steps	Unsigned 32	see type label	r/w

Note:
The XDD file contains 1000 hex as the standard value. This value must be adapted to the specific encoder value in the project tool. Note the type label and the type code on the data sheet.

Object 6003h: Preset Value

A preset position value, the preset value of the rotary encoder, can be defined in this object. The position value currently output can be set to the preset value in any shaft position, e.g., to calibrate the zero position.

Subindex	Description	Data type	Default setting	Access
0h	Reset value	Unsigned 32	0h	r/w

Object 6004h: Position Value

This object contains the current position value of the rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Position value (process value)	Unsigned 32	-	r-map

Object 6500h: Operating Status

This object represents the operating state of the rotary encoder and provides information on internal programmed rotary encoder parameters.

Subindex	Description	Data type	Default setting	Access
0h	Operational status	Unsigned 16	4	r

Object 6501h: Singleturn Resolution

The object contains the physical measuring steps per revolution of the absolute rotary encoder. Note that a value written in object 6001h must not be higher than the value defined here.

Subindex	Description	Data type	Default setting	Access
0h	Singleturn resolution	Unsigned 32	see type label	r

Object 6502h: Number of Revolutions

The object contains the number of distinguishable revolutions of the absolute rotary encoder. Note that a value written in object 6002h must not be higher than the product of the value defined here and the value defined in object 6501h.

Subindex	Description	Data type	Default setting	Access
0h	Number of revolutions	Unsigned 16	see type label	r

Object 6503h: Alarms

The object contains the status of the alarms of the absolute rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Alarms	Unsigned 16	0h	r

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Object 6504h: Supported Alarms

The object contains a list of the supported alarms of the absolute rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Supported alarms	Unsigned 16	1h	r

Object 6505h: Warnings

The object contains the status of the warnings of the absolute rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Warnings	Unsigned 16	0h	r

Object 6506h: Supported Warnings

The object contains a list of the supported warnings of the absolute rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Supported warnings	Unsigned 16	10h	r

Object 6507h: Profile and Software Version

The object contains the implemented profile version and the manufacturer-specific software version of the absolute rotary encoder.

Subindex	Description	Data type	Default setting	Access
0h	Profile and software version	Unsigned 8	SSssPPpph	r

The value is divided into one part for the profile version and one part for the software version. Each of these parts is subdivided into parts for the main version and the sub-version.

MSB							LSB
Software version SS.ss				Profile version PP.pp			
Software main version		Software sub-version		Profile main version		Profile sub-version	
SS		ss		PP		pp	

Object 6509h: Offset Value

The object contains the offset value. This is calculated automatically by the rotary encoder from the physical shaft position and the preset value when activating the preset function. The position value output corresponds to the value of the physical shaft position, displaced by the offset value.

Subindex	Description	Data type	Default setting	Access
0h	Offset value	Integer 32	-	r

Object 650Bh: Serial Number

The object contains the serial number of the absolute rotary encoder. The serial number is identical to the value in object 1018h, subindex 4h.

Subindex	Description	Data type	Default setting	Access
0h	Serial number	Unsigned 32	see type label	r

8.2 Manufacturer-Specific Profile

Along with the standard profiles, the rotary encoder supports additional manufacturer-specific objects for configuration and parameterization. Below you will find a list and explanation of the manufacturer-specific objects.

Object	Description	Data type	Access
3000h	Software node ID	Unsigned 8	r/w
2104h	Limit switch, minimum value	Unsigned 32	r/w
2105h	Limit switch, maximum value	Unsigned 32	r/w
2110h	Limit switch control	Unsigned 8	r/w

Object 3000h: Software Node ID

This object defines the setting of the node ID of the encoder by software. The factory setting for the node ID is 165 decimal (A5h). If another value is required, this can be changed by SDO telegrams.

Note: To store the setting in nonvolatile memory in the EEPROM of the rotary encoder, use object 1010h.

The user is responsible for ensuring the correct setting of the node ID in the network to prevent duplicate issuing of a node ID and resulting conflicts. This object is hardwired with object 1F93h subindex 3 "SWNodeID_U8" to ensure data consistency. If object 1F93h subindex 3 is changed, the value is included in object 3000h automatically. Object 3000h was introduced to offer the user a simple type of configuration in the Automation Studio of B&R (Bernecker + Rainer Industrie Elektronik GmbH).

Subindex	Description	Data type	Default setting	Access
0h	Software node ID	Unsigned 8	A5h	r/w

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Object 2104h: Limit Switch, Minimum Value

This object defines the minimum value for the operating range of the rotary encoder. The value must be less than the overall measuring range defined in object 6002h. If the limit switch minimum value is reached or undershot, bit 30 is set in the position value (object 6004h). The bit is reset only when the position exceeds the limit switch minimum value. The function of the limit switch can be activated/deactivated, see object 2110h: limit switch control.

Subindex	Description	Data type	Default setting	Access
0h	Limit switch, minimum value	Unsigned 32	0	r/w

Effect on object 6004h

Function	Status bits		Position value																											
Bit #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = 1 or 0, depending on the position value

Object 2105h: Limit Switch, Maximum Value

This object defines the maximum value for the operating range of the rotary encoder. The value must be less than the overall measuring range defined in object 6002h. If the limit switch maximum value is reached or exceeded, then the highest value bit (MSB), bit 31 is set in the position value (object 6004h). The bit is reset only when the position falls below the limit switch maximum value. The function of the limit switch can be activated/deactivated, see object 2110h: limit switch control.

Subindex	Description	Data type	Default setting	Access
0h	Limit switch, maximum value	Unsigned 32	-	r/w

Effect on object 6004h

Function	Status bits		Position value																											
Bit #	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x = 1 or 0, depending on the position value

Object 3000h: Software Node ID

This object defines the setting of the node ID of the encoder by software. The factory setting for the node ID is 165 decimal (A5h). If another value is required, this can be changed by SDO telegrams.

Note: To store the setting in nonvolatile memory in the EEPROM of the rotary encoder, use object 1010h.

The user is responsible for ensuring the correct setting of the node ID in the network to prevent duplicate issuing of a node ID and resulting conflicts. This object is hardwired with object 1F93h subindex 3 "SWNodeID_U8" to ensure data consistency. If object 1F93h subindex 3 is changed, the value is included in object 3000h automatically. Object 3000h was introduced to offer the user a simple type of configuration in the Automation Studio of B&R (Bernecker + Rainer Industrie Elektronik GmbH).

Subindex	Description	Data type	Default setting	Access
0h	Software node ID	Unsigned 8	A5h	r/w

FACTORY AUTOMATION – SENSING YOUR NEEDS

Worldwide Headquarters
Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

USA Headquarters
Pepperl+Fuchs Inc.
Twinsburg, Ohio 44087 · USA
Tel. +1 330 4253555
E-mail: sales@us.pepperl-fuchs.com

Asia Pacific Headquarters
Pepperl+Fuchs Pte Ltd.
Company Registration No. 199003130E
Singapore 139942
Tel. +65 67799091
E-mail: sales@sg.pepperl-fuchs.com

www.pepperl-fuchs.com

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