POSITAL

USER MANUAL
ABSOLUTE ROTARY ENCODER
ETHERNET POWERLINK

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Content

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General Security Advice

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Please Note

Electrical equipment should be serviced only by qualified trained personnel. No responsibility is assumed by POSITAL for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About this Manual

Background

This user manual describes how to install and configure an Absolute Rotary Encoder with Powerlink interface. General technical data and mechanical drawings are specified in the document data sheet, which can be downloaded from the website: www.posital.com

Relate Note

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User Annotation

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1 Introductions to Install Encoder

Do not remove the connection cap!

The absolute rotary encoder must be connected to the main signal ground over the machine chassis or by means of a separate potential compensating line.

Do not stand on the encoder!

Do not adapt the driving shaft additionally!

Avoid mechanical load!

Do not adapt the housing additionally!

2 Introduction

This manual explains how to install and configure the Absolute Rotary Encoder with Powerlink interface applicable for military and industrial applications with Powerlink protocol. The products are compliant with standard DS406 (encoder device profile) and Ethernet POWERLINK Communication Profile Specification
EPSG DS 301 V1.1.0.

2.1 General Definitions

In the following chapters general definitions are described.

2.2 Intended Usage

The absolute rotary encoder measures the physical measure and angle and revolutions and converts this into a digital position value transmitted via the Powerlink bus according to the Powerlink communication profile (EPSG DS301) to other field devices. The encoder shall be connected to a Powerlink network according to (EPSG DS301) and shall only be used for this purpose. The sensor can be used in applications like positioning tasks or length measurements. General applications could be like cranes, construction machines, lifts, packing machines etc.

2.3 Interfaces

The sensor has one Powerlink interface with integrated HUB functionality to support a daisy chain cable structure and supports the profile Specification EPSG DS 301 V1.1.0.

2.4 Maintenance

For the device is no maintenance necessary!

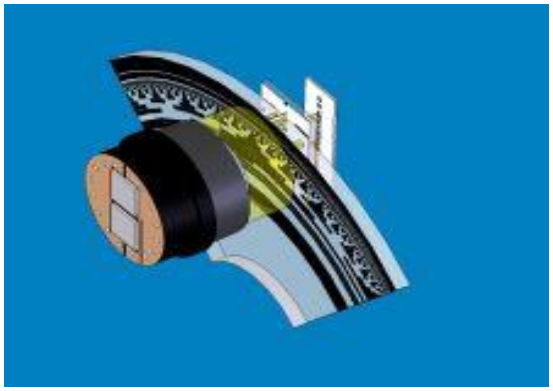
2.5 Intended Time of Usage

Refer to the data sheet of the Absolute Rotary Encoder.

2.6 Optical Measurement Principle

The absolute rotary encoders use highly integrated Opto-ASICs, providing a resolution up to 16 bits (65,536 steps) per turn. For multiturn models, the measuring range is extended by the mechanically geared code disks to as many as 16,384 (2^{14}) revolutions. These encoders are fully capable of operating in rugged industrial settings.

2.6.1 Singleturn



The measuring system in the single-turn module consists of a light source, a code disc pivoted in a precision ball bearing and an opto-electronic scanning device. A LED is used as a light source which shines through the code disc and onto the screen behind. The tracks on the code disk are evaluated by an opto-array behind the reticle. With every position another combination of slashes in the reticle is covered by the dark spots on the code disk and the light beam on the photo transistor is interrupted. That way the code on the disc is transformed into electronic signals. Fluctuations in the intensity of the light source are measured by an additional photo transistor and another electronic circuit compensates for these.

After amplification and conversion the electronic signals are available for evaluation. Single turn encoders specify the absolute position for one turn of the shaft i.e. for 360°. After one turn the measuring range is completed and starts again from the beginning.

2.6.2 Multiturn

Linear systems normally need more than one turn of a shaft. A single turn encoder is unsuitable for this type of application because of the additional requirement of the number of turns. The principle is relatively simple: Several single turn encoders are connected using a reduction gear. The first stage supplies the resolution per turn, the stages behind supply the number of turns. In the following picture you can see the gearing module with the several stages of reduction gears.

Typical Applications:

- Packing Machines
- Robots
- Printing Machines
- Theater / Moving Platforms

There are several types of encoder versions. Please refer to the datasheets to find out which is the best version for your application.

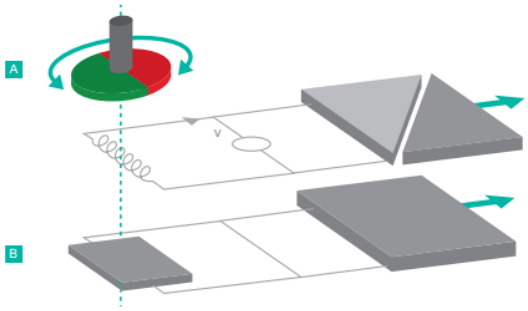
2.7 Magnetic Measurement Principle

Magnetic rotary encoders determine angular position using magnetic field sensor technology. A permanent magnet A fixed to the encoder's shaft creates a magnetic field which is sampled by a sensor B that generates an accurate absolute position reading.

2.7.1 Singleturn

The technological leap that pushes POSITAL's IXARC magnetic encoders to the performance level of optical systems is based on a new generation of sensor systems. The combination of a custom Hall-effect sensor and complex signal processing algorithms running on a powerful 32 bit microprocessor results in a considerably improved resolution and accuracy, along with latency times of only a few microseconds.

2.7.1 Multiturn



POSITAL can also provide absolute multiturn measurements by means of a revolution counter system that uses an energy harvesting system based on the Wiegand effect. This system requires no gears or batteries. Eliminating batteries brings about many advantages. Batteries have a limited lifespan, weigh a lot, and often contain harmful substances. Gear units have disadvantages of their own being large, complex, costly and vulnerable to shock and vibration. Regardless of the rotational speed, even at near-zero, the energy harvesting system generates short, powerful voltage pulses, sufficient to power the counting electronics. The result is a revolution counter that is independent of any external power supply. This technology, which has proven itself since 2005, enables maintenance-free reliable measurement of absolute positions, even in demanding environments, for years to come. There are several types of encoder versions. Please refer to the datasheets to find out which is the best version for your application.

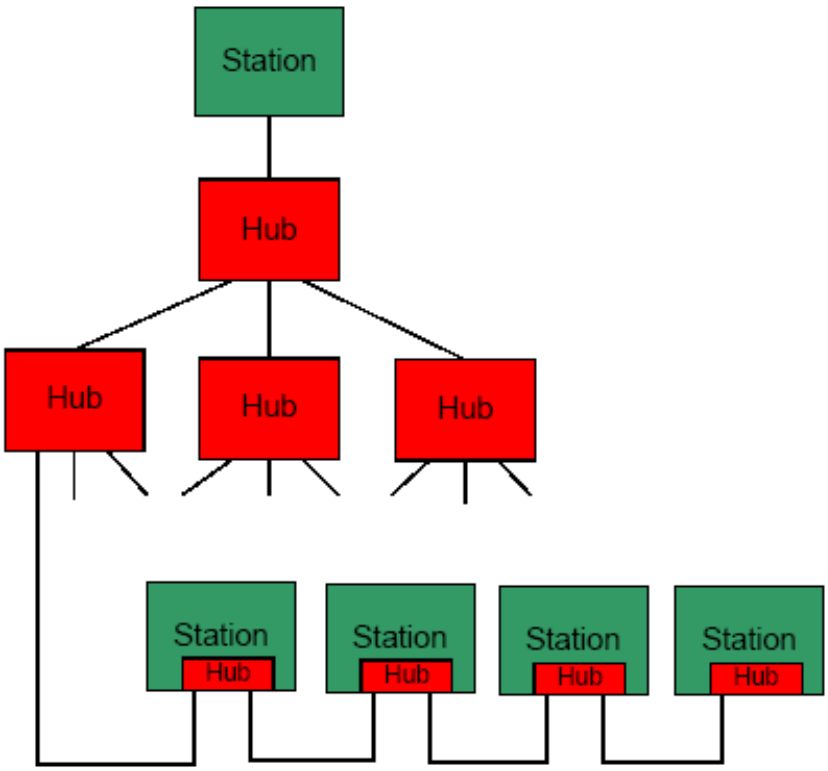
2.8 Ethernet

The present developments in the field of Industrial Ethernet are based on the vision of an integrated access of all data of a company through a uniform communication system. In higher levels of enterprise communication Ethernet is the main medium of data transfers. Combined with other IT technologies it is internationally standardized. In the long run automation engineers will benefit from the rapid technological progress in the mass markets of IT and web technologies.

Ethernet technically provides a system with higher data transfer rates than common field bus systems. TCP/IP and UDP do have a statistical access method to access the medium thereby prohibiting determined response times. Many developments are intensely done on additional real time mechanisms, e.g. Ethernet Powerlink. With the Ethernet Powerlink protocol a deterministic time behavior is achieved and the jitter effect for synchronization is below 1 µs. This makes the synchronization over a network with huge number of devices very effective and reliable. A detailed description of the network in described in the following chapters.

3 Hardware Set-Up and Ethernet Connection

3.1 Network Topology



Using Ethernet there are different kinds of topologies possible. The connection of the encoder can be made directly to a hub or as a daisy chain where the integrated hub of the encoder is used. With the last method an installation as a line structure can be built up like known from standard field bus systems e.g. CANopen. The sensor can be connected to other devices by usage of “straight” or crossover network cable, because the PHY of the encoder is capable to realize Auto crossover. You need at least a cable of category Cat5e to get a data transfer rate up to 100 Mbit. To increase noise immunity only cables with foil and copper netting shield should be used (S/UTP), twisted pair, AWG26.

The symbolized structure shows a classic star topology and a line cabling structure. An integrated hub in encoder version type OCD-E2A2… (please refer to the data sheet for more information about the type key) offers both: star or more useful a line structure.

Only hubs shall be used because of low frame jitter and latency time and no switches. For fulfilling time requirements up to 7 hubs / encoder with integrated HUB can be connected together with a maximum cable length of 100m.
These requirements are specified in Powerlink specification. For more details visit the web site: www.ethernet-powerlink.org

4 Connection an Absolute Encoder

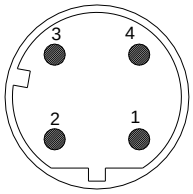
The encoder is connected by a 4 pin A coded M12 connector for the power supply and two 4 pin, D-coded M12 connector for Ethernet.

4.1 Connector Ethernet Powerlink

4 pin female, D-coded

Pin Number	Signal
1	Tx +
2	Rx +
3	Tx -
4	Rx -

Sketch on encoder view

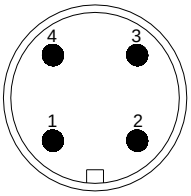


4.2 Connector Power Supply

4 pin male, A-coded

Pin Number	Signal
1	Power supply (10V – 30V)
2	Reserved, not connected
3	Power supply (GND)
4	Reserved, not connected

Sketch on encoder view



4.3 Ethernet Cables

RJ45 – M12 crossed

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

RJ45 – M12 straight

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

M12 – M12 crossed

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

5 Diagnostic LED's

The encoder provides on the backside of the connection cap several diagnostic LEDs. For each port of the HUB there is a functional combined LED for link status and activity named "LS/DA".

Furthermore there are two LEDs to indicate the network status for Powerlink named "error" and "Status". The exact meaning of the LED indication is specified in the following tables.

5.1 Function of LEDs for HUB Port

LED	Color	Status	Description for LED = on
LS/DA 1	Green	On	LINK is active for HUB port 1
		Blinking	Activity on HUB port 1
LS/DA 2	Green	On	LINK is active for HUB port 2
		Blinking	Activity on HUB port 2

5.2 Function of LEDs for Powerlink

LED	Color	Status	Description for LED = on
Error	Red	On	Not allowed node number (0, 240 – 255 decimal) Internal communication error Buffer underrun/overflow, Collision CRC error, Loss of SoC
		Off	No error
Status	Green	Off	Not active
		Flickering	Basic Ethernet mode
		Single flash	Pre-Operational 1
		Double flash	Pre-Operational 2
		Triple flash	Ready to operate
		On	Operational
		Blinking	Stopped

6 Network Configuration

A dismounting of the connection cap is not allowed! All configurations can be directly executed without opening the housing.

6.1 Configuration

Depending of your version of encoder the setting of the controlled node number is achieved either by 2 hexadecimal coded rotary-switches on the outside of the connection cap or just by software configuration. Possible addresses are between 1 and 239 whereby every address can only be used once in a Powerlink segment. If using the HEX coded switches the node number is calculated as follows:

EPL-node-ID [decimal] = switchx16 [hex value] * 16 + switchx1 [hex value] * 1

Example

Rotary switch x16 = A

Rotary switch x1 = 5

EPL-node-ID [decimal] = A [hex value] * 16 + 5 [hex value] *1

EPL-node-ID [decimal] = 10 [decimal value] * 16 + 5 [decimal value] * 1

EPL-node-ID [decimal] = 165

IP address for Powerlink

The IP-address is set up with a part named net-ID (192.168.100) which is constant and Host-ID (EPL-node ID).

The resulting IP-address for Powerlink is: 192.168.100.EPL-node-ID.

According to the example above the resulting IP-Address would be: 192.168.100.165

Set up for Software Node ID

If rotary switches are present on your encoder and the node-ID shall be set up via EPL telegrams, then the node switches shall be set to address 0.

The factory default software node-ID is 165 and can be modified by SDO telegrams afterwards to the desired value.

6.2 Definition of NODE-IDs

The following table shows the definition for the NODE-IDs used in a Powerlink network.

Powerlink Node-ID	Naming (acc. To EPSG DS 301 V1.1.0)	Description
O	C_ADR_INVALID	General not allowed
1 – 239		Controlled node (like encoder)
240	C_ADR_MN_DEF_NODE_ID	Managing node
241 – 250		Reserved
251	C_ADR_SELF_ADR_NODE_ID	Pseudo node ID. Used for self addressing
252	C_ADR_DUMMY_NODE_ID	Dummy node
253	C_ADR_DIAG_DEF_NODE_ID	Diagnostic node
254	C_ADR_RT1_DEF_NODE_ID	Router Powerlink to legacy Ethernet
255	C_ADR_BROADCAST	Broadcast message

7 Project Integration

This integration description is an example related to B&R control units and automation studio. In general the user can integrate the encoder in any project tool or hardware set up using a Powerlink network.

7.1 XDD File

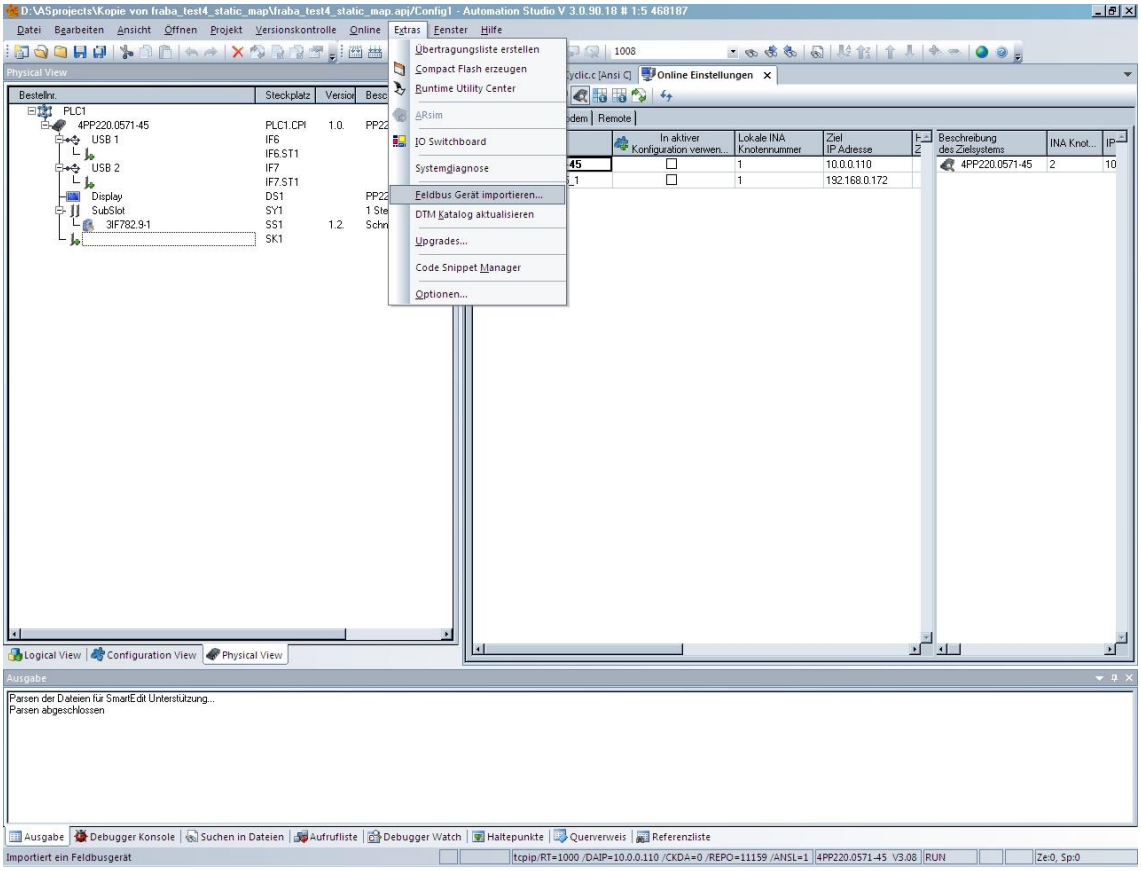
A XDD file describes the properties and functions of the sensor like timings and configurable sensor parameters. By using the XDD file an easy and abstract integration of a Powerlink device in a project tool is realized. A detailed knowledge of Powerlink is not needed to configure the device.
An actual XDD file can be downloaded from the website: www.posital.com

The format of the XDD file is XML and is similar like an EDS file used in the CANopen world.

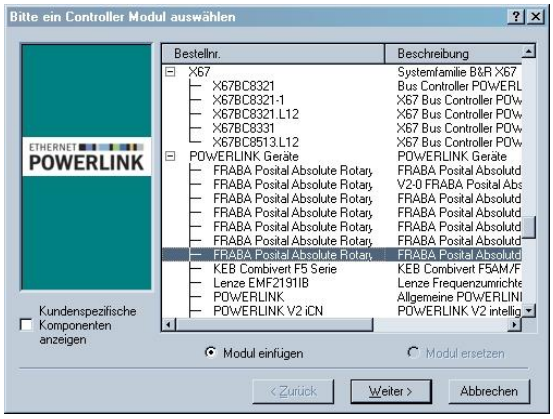
If product version without rotary switches wanted be used or if the node-ID wanted to be set by software with rotary switches set to address 0 please use configuration file with ending "_SWNode-ID"!

7.2 Import the Encoder to the Project Tool

Select in the main menue "Extras" the entry "Feldbus Gerät importieren" like shown in the screen shot.

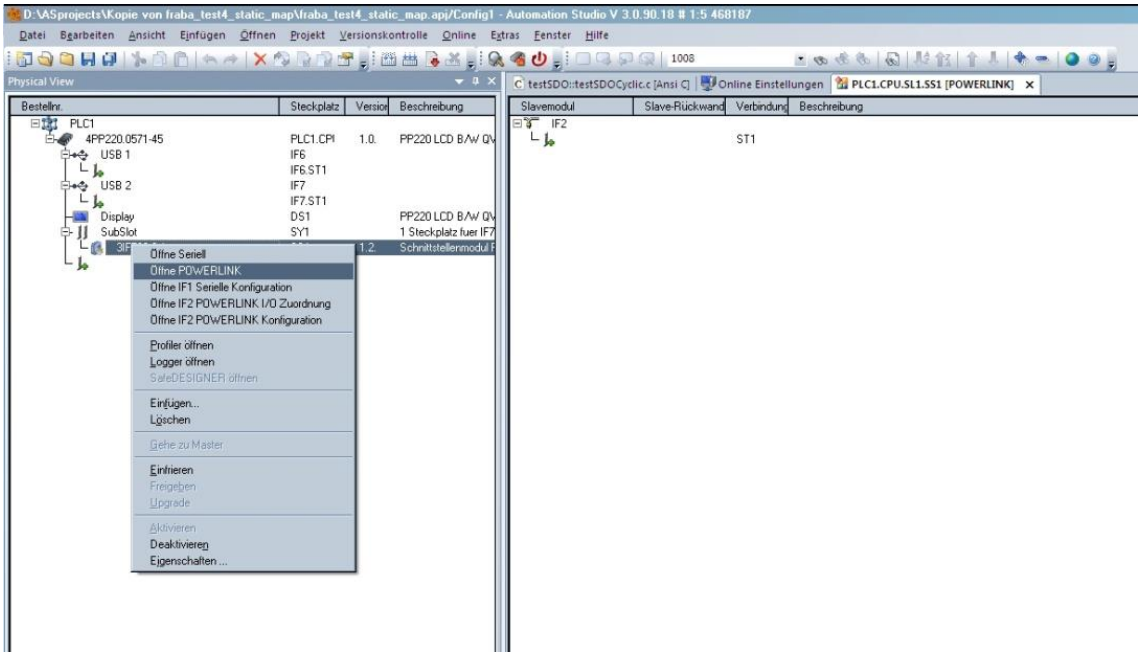


Another window is opening, go to the section “POWERLINK Geräte” and select the right XDD file for the used encoder type.



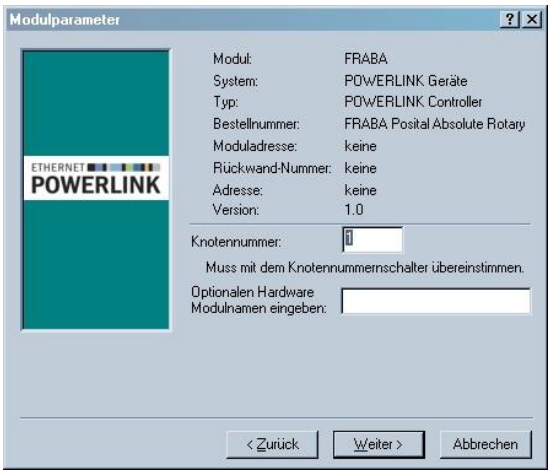
7.3 Add to a Network

Then you will get back to the general view and you have to open the interface card in the left window of the physical view and select “Öffne Powerlink”.



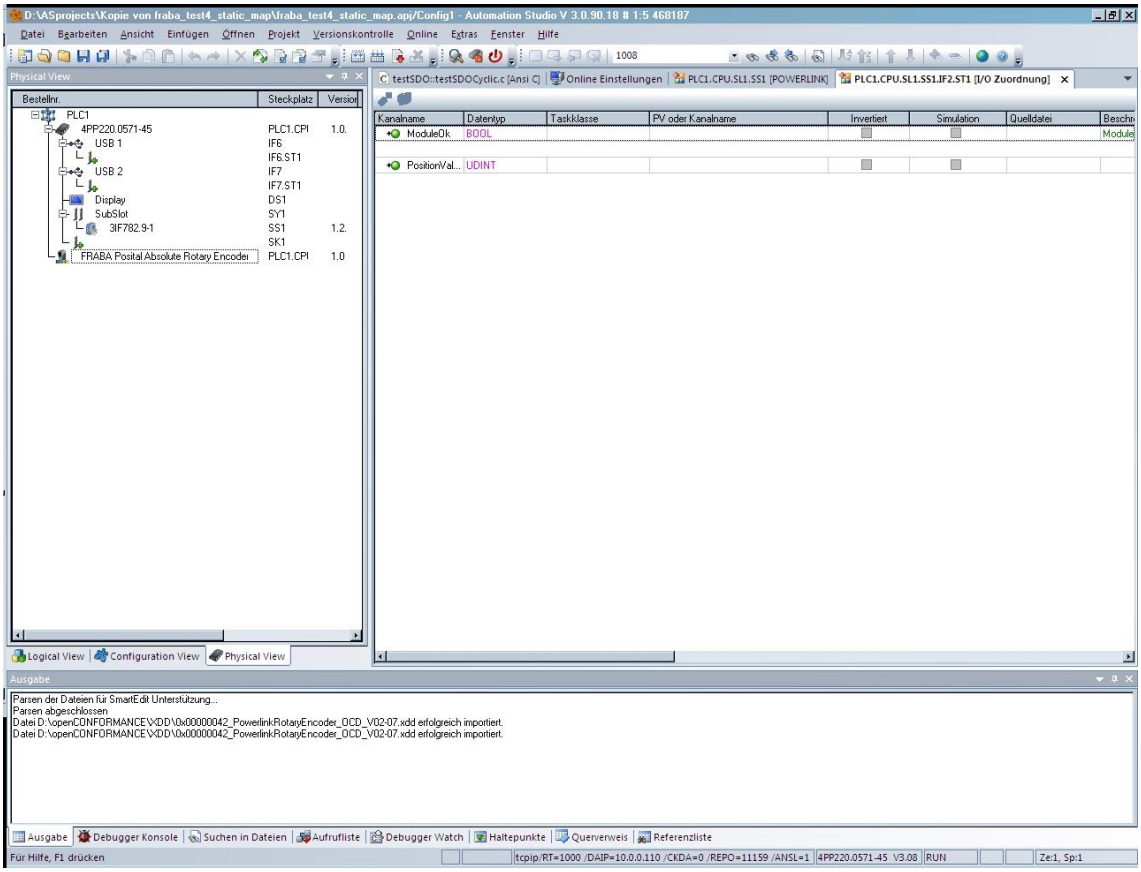
Select in the right part of the window the salve module and the entry “Einfügen…”

A new window named “Modulparameter” will open where the user can configure the node-ID in the entry field “Knotennummer”. **Take care, that this configuration value is identical with the setting of the hardware rotary switch in the connection cap or the software configured node-ID.**



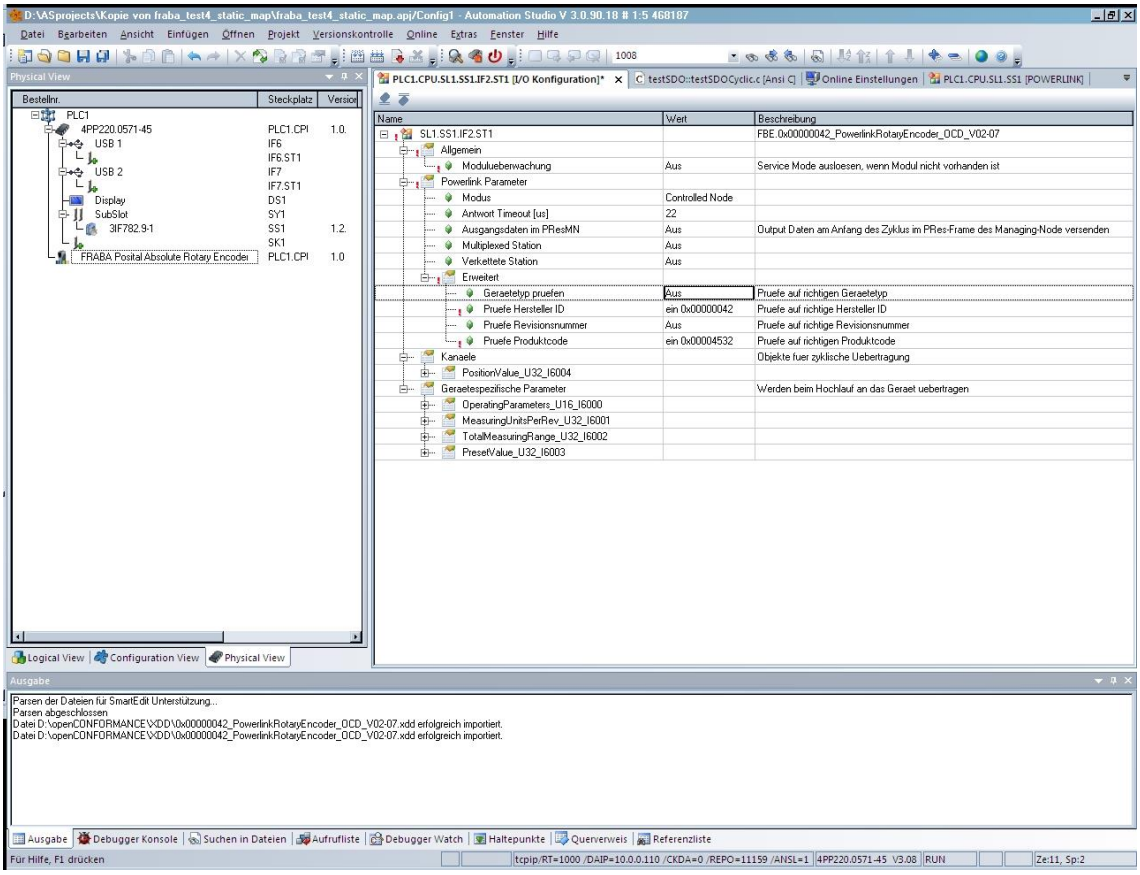
7.4 Online Diagnostic

After this configuration you can see in the left part of the window in the physical view an added device: “FRABA Posital Absolute Rotary Encoder”. When you select with the right mouse key this device, you can choose “Öffne I/O Zuordnung”. In the opened window on the right side you can watch the transmitted position value and the module state of the device.



7.5 Configuration Network

For setting the network configuration and operation mode of the encoder you have to select in the physical view of the left part the encoder again and via right mouse click the menu entry “Öffne I/O Konfiguration”.



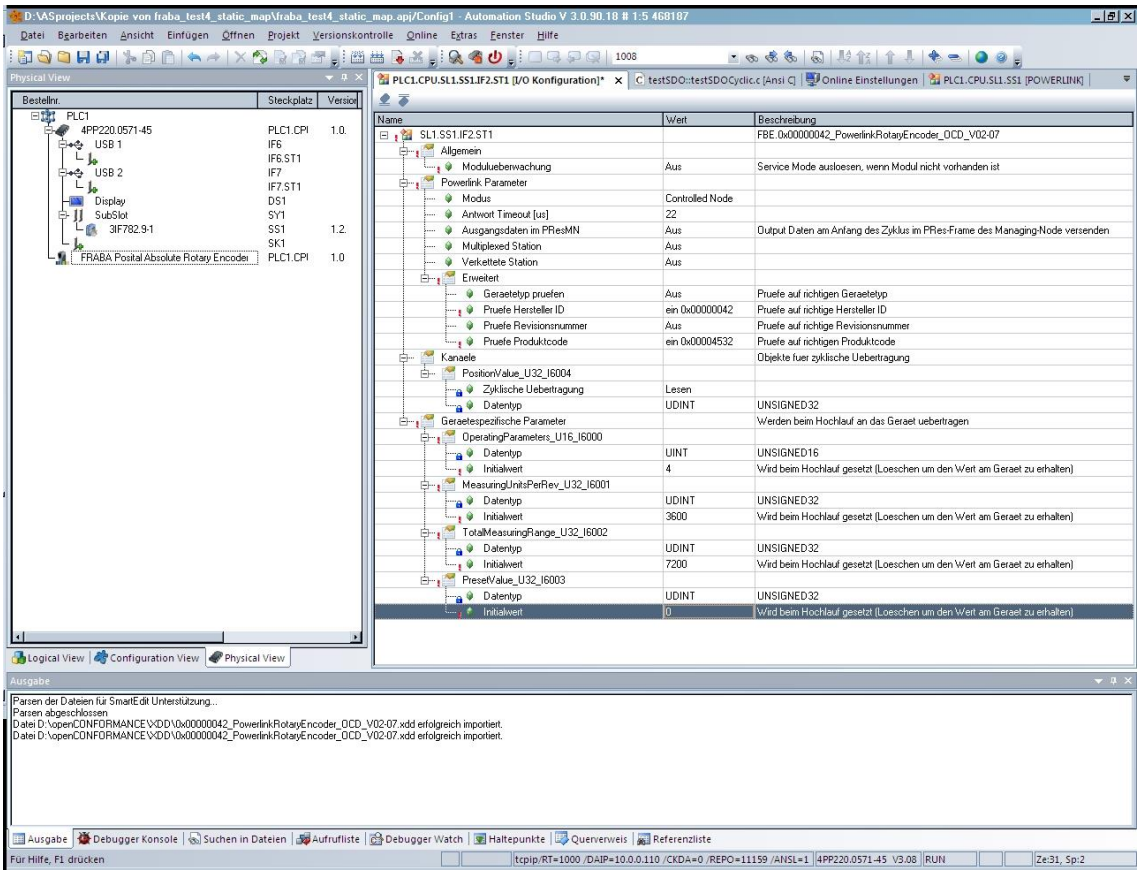
In the section “Powerlink Parameter” can be decided, if the encoder is a multiplexed station or not. Multiplexed means, that the encoder position value is not read in each Powerlink cycle to achieve a short cycle time and high bandwidth of network data. Multiplexed station configured off results in a transmission of position value in each Powerlink cycle, so the application has a high update rate. It really depends on the requirements of the customer.

In the next configuration section “Extended / Erweitert” you can configure, what entries in the Identity object 1018 hex are read and checked. This is useful to guarantee, that the right devices are configured in the network and matching the project settings. We recommend to activate the check on the “manufacturer-ID / Hersteller ID” and “product code / Prüfe Produktcode”.

On the higher logical level you see the section “Channel / Kanaele“. Here we the position value which can be mapped to the output data. It is the object 6004 hex. The mapping is fixed, because a modification is not possible.

7.6 Initial Configuration

In the section “Device Specific parameter/ Gerätespezifische Parameter” the configured values for the displayed parameters will be transmitted in the start up phase. But this is only the case, if the configuration has been changed in the encoder, that means different to the values set in the project tool.



The displayed parameters contain in the name the object number and name from the device profile DS-406 (see chapter Encoder Device Profile). Furthermore the data type is given in short form as “U16” unsigned 16 bit and “U32” unsigned 32 bit. In the field “initial value” the desired configuration value can be set. In the case, that the encoder is exchanged, the managing node (master) will detect this because of changed configuration and transmits these initial value to the new device. This allows an easy replacement and also easy first integration.

Regarding the “Preset Value” the user has to take special care. If the encoder is exchanged the parameters 6000 hex, 6001 hex and 6002 hex make sense. But the preset value 6003 hex will be set at the current position and the user has to check, if the set preset value at the current encoder position in the machine fulfills the

requirement / desired position. If not, then you can set the preset value by two methods:

1. Method

Drive to the desired position and set the preset value as initial value again. In the case that the initial value is already identical you have to set in between any other value.

2. Method

Configure the encoder to the right position value by driving to the desired position. Then send an SDO configuration telegram in the Powerlink cycle to set the Preset value. **This is the recommended and professional way!**

7.7 Example Device Configuration

Please refer to the type shield to get the type of the encoder and check the data sheet, which can be downloaded from the website www.posital.com.

If you have the following encoder type:
13 Bit resolution per turn = 8192 steps per turn
12 Bit numer of turns = 4096 number of turns

In the example for initial values the MeasuringUnitsPerRev is set to 3600 and TotalMeasuringRange to 7200. The encoder is internal calculating a gearing factor to adapt the physical resolution to the customer demand. The encoder outputs 3600 steps per turn with 0.1 degree resolution, and after two turn starts with position value 0 again. There is no mechanical blockage, when the end of the measuring range is reached. Be aware, that the specific values for object 6001 hex and 6002 hex are only activated in the encoder, if in the object 6000 hex bit 2 is set to one. Otherwise the physical value and highest resolution is send out and the initial values will be ignored.

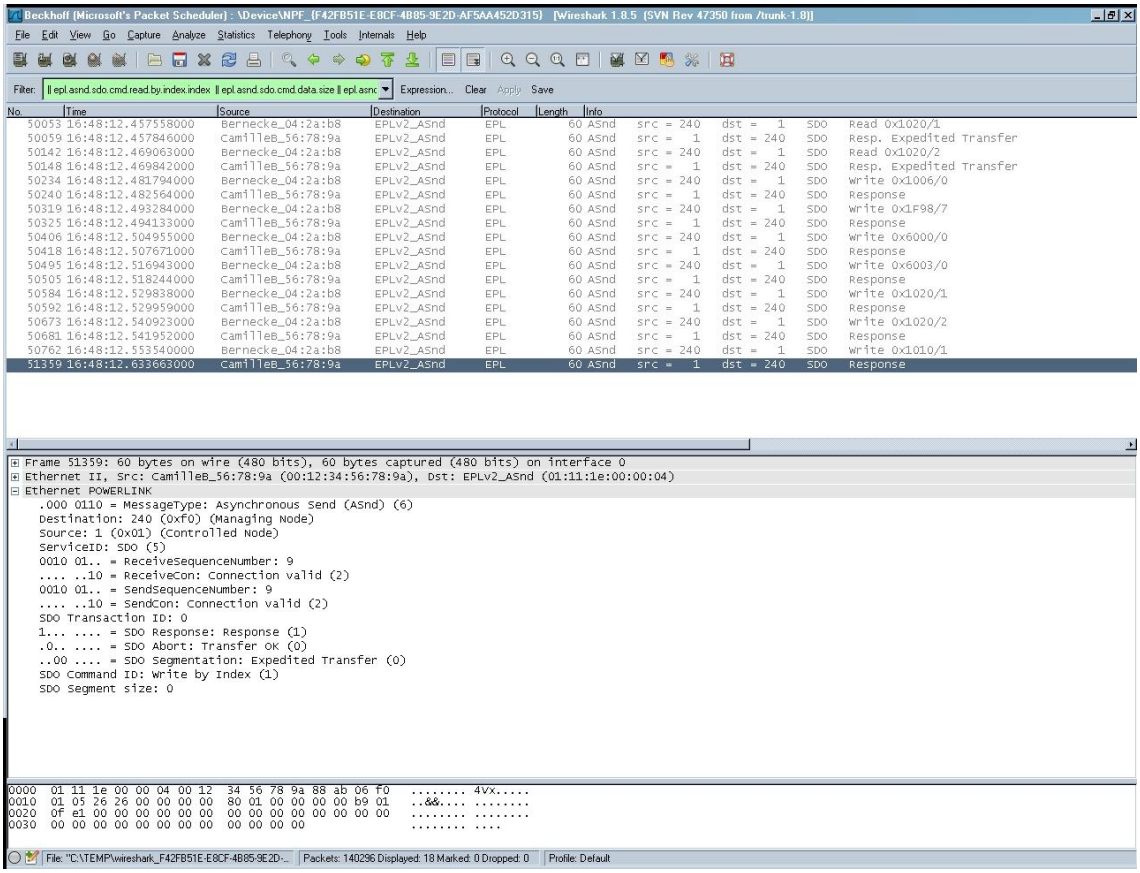
With the preset value you can set the encoder position to the desired value in your application. Inside the sensor an offset is calculated and stored in a non-volatile memory.

Take care to conduct a storing command for the encoder, that the set preset value and calculated offset value in the encoder is stored and a power loss don't lead to lost position / position jump. For storing a SDO command is used and a specific signature "save" has to be written in the object 1010 hex. For more details refer to the profile **EPSG DS 301 V1.1.0.**

7.8 Diagnostic

If problems occur it is possible to conduct diagnosis with standard Ethernet tools like Wireshark (http://www.wireshark.org) . It is one tool of many available on the market which can be used, because Powerlink is using standard Ethernet frames. With this tool an interpretation of Ethernet frames according to Powerlink is possible. Just the right filter “EPL” has to be selected and the user has a powerful tool. In case of problems it is recommended to log a trace for own analysis or send this log to Posital for further evaluation purposes.

Anyhow our experience is, that this tool has also restrictions at very low Powerlink cycles and that you cannot trust time stamps and the order of logged telegrams. In those cases the hard time logger module from B&R is strongly recommended to find time related critical issues and reliable logs.



In this screen shot you can see a log of configuration telegrams (SDO messages).

In the right column the direct on transmission with read / write and the related object in hexadecimal with sub-index is displayed. So it is easy to control, which parameter / objects of the encoder are set.

For getting this kind of view the filter has to be set in the following way:

epl.asnd.sdo.cmd.response	||	The symbol || defines an logical “or” operation. With the sample above we would just give an idea how a diagnosis is possible and there are many other ways to conduct this with other tools or filter settings.
epl.asnd.sdo.cmd.read.by.index.index	||	
epl.asnd.sdo.cmd.data.size	||	
epl.asnd.sdo.cmd.write.by.index.data		

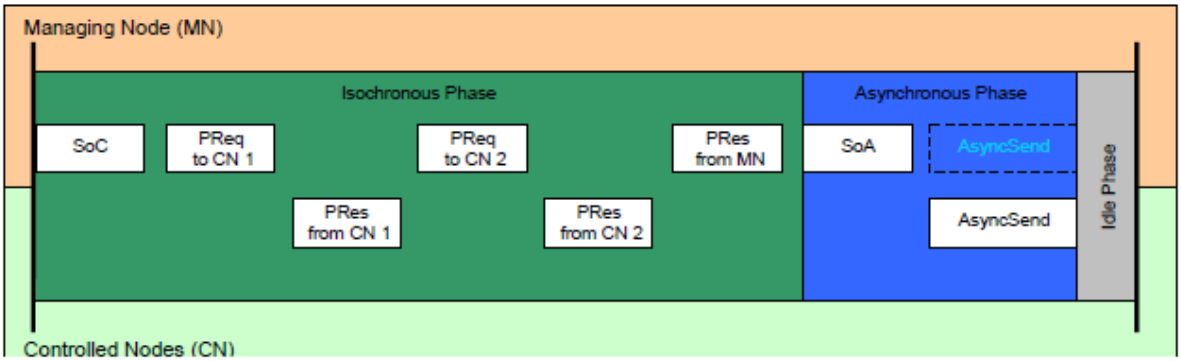
8 Powerlink Protocol Version 2

The Powerlink protocol version 2 is a standard communication protocol and offers for manufacturer and customer maximum of independence, because it is an open protocol and not a manufacturer specific solution. The organization Ethernet POWERLINK Standardization Group can be contacted for any general information and assistance. Organization web site address: www.ethernet-powerlink.org.

Our standard Powerlink encoder is capable to support both Powerlink protocol versions: 1 and 2. The customer hasn't got to do a device configuration for a specific protol, because the encoder has an auto-detection. What must be taken into account? It is not allowed to change the protocol during runtime. During power up the network must be in a defined state regarding used protocol, so that the encoder can detect the protocol version telegrams.

8.1 Powerlink Cycle

The Powerlink protocol offers an isochronous communication. A deterministic transmission is a requirement out of high performance applications. The deterministic network cycle is achieved with a time slot principle, which is controlled by the managing node. With the SoC telegram (Start of Cyclic) the EPL cycle is initiated. Afterwards the MN (managing node) is sending a poll request to each node, whereby the CN (controlled node) is sending immediately a response. This frame is called isochronous phase and covers real time data. With the telegram SoA (Start of Asynchronous) an asynchronous phase is started and closed by an AsyncSend telegram. Our Powerlink encoder i.e.



9 Encoder Profile

The CANopen Device profiles have been overtaken for the Powerlink protocol to minimize integration effort for the customer. This means for encoders, that device parameters are corresponding to the profile DS406. In the following table the supported parameters are listed:

Object	Description	Data type	Access type
6000h	Operating Parameters	Unsigned 16	r / w
6001h	Measuring units per revolution	Unsigned 32	r / w
6002h	Total measuring range in measuring units	Unsigned 32	r / w
6003h	Preset value	Unsigned 32	r / w
6004h	Position Value	Unsigned 32	r / w
6500h	Operating status	Unsigned 16	r
6501h	Single-turn resolution	Unsigned 32	r
6502h	Number of distinguishable 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 32	r
6509h	Offset Value	Unsigned 32	r
650Bh	Serial Number (fits to Identity Object 1018h)	Unsigned 32	r

Object 6000h: Operating Parameters

This object shall indicate the functions for code sequence, commissioning diagnostic control and scaling function control

Subindex	Description	Data Type	Default Value	Access
0h	Operating Parameter	Unsigned 16	4h	rw

Code sequence: The code sequence defines, whether increasing or decreasing position values are output, in case the encoder shaft rotates clockwise or counter clockwise as seen from the point of view of the shaft.

Scaling function control: With the scaling function the encoder numerical value is converted in software to change the physical resolution of the encoder. The measuring units per revolution (object 6001h) and total measuring range in measuring units (object 6002h) are the scaling parameters. The scaling function bit is set in the operating parameters. If the scaling function bit is set to zero, the scaling function is disabled.

Bit structure for the operating parameters

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

Table Description:
MS: Manufacturer Specific Function (not available)
R: Reserved for future use
MD: Measuring direction (not available)
SFC: Scaling function (0 = disable, 1 = enable)
CD: Commissioning diagnostic control (not availabe)
CS: Code sequence (0 = CW, 1 = CCW)

Object 6001h: Measuring Units per Revolution

This object shall indicate the number of distinguishable steps per revolution.

Subindex	Description	Data Type	Default Value	Access
0h	Measuring units per revolution	Unsigned 32	See type shield	rw

Attention: The XDD file has as default value 2000 hex. This value has to be adapted in the project tool to the specific encoder value. Please refer to the type shield for the type key and data sheet.

Object 6002h: Total Measuring Range in Measuring Units

This object shall indicate the number of distinguishable steps over the total measuring range.

Subindex	Description	Data Type	Default Value	Access
0h	Total measuring steps	Unsigned 32	see type shield	rw

Attention: The XDD file has as default value 1000 hex. This value has to be adapted in the project tool to the specific encoder value. Please refer to the type shield for the type key and data sheet.

Object 6003h: Preset Value

This object indicates the preset value for the output position value. The encoder output position can be set to a desired value: Preset value.

Subindex	Description	Data Type	Default Value	Access
0h	Preset Value	Unsigned 32	0h	rw

Object 6004h: Position Value

This object contains the process value of the encoder.

Subindex	Description	Data Type	Default Value	Access
0h	Process Value	Unsigned 32	–	romap

Object 6500h: Operating Status

This object shall provide the operating status of the encoder. It gives information on encoder internal programmed parameters.

Subindex	Description	Data Type	Default Value	Access
0h	Operating status	Unsigned 16	4	ro

Object 6501h: Singleturn Resolution

The object contains the physical measuring steps per revolution of the absolute rotary encoder.
A value written in object 6001h must be lower than defined in 6501.

Subindex	Description	Data Type	Default Value	Access
0h	Singleturn Resolution	Unsigned 32	see type shield	ro

Object 6502h: Number of Distinguishable Revolutions

This object contains number of revolutions of the absolute rotary encoder.
A value written in object 6002h must be lower than defined as the multiplication of object 6501h and 6502h. Object 6002h <= 6501h * 6502h.

Subindex	Description	Data Type	Default Value	Access
0h	Number of Revolutions	Unsigned 16	see type shield	ro

Object 6503h: Alarms

The object shall provide the status of alarms of the device.

Subindex	Description	Data Type	Default Value	Access
0h	Alarms	Unsigned 16	0h	Ro

Object 6504h: Supported Alarms

The object shall provide the supported alarms of the device..

Subindex	Description	Data Type	Default Value	Access
0h	Supported Alarms	Unsigned 16	1h	Ro

Object 6505h: Warnings

The object provides the status of warnings of the device.

Subindex	Description	Data Type	Default Value	Access
0h	Warnings	Unsigned 16	0h	ro

Object 6506h: Supported Warnings

The object provides the supported warnings of the device. No warning is supported.

Subindex	Description	Data Type	Default Value	Access
0h	Supported Warnings	Unsigned 16	10h	ro

Object 6507h: Profile and Software Version

This object provides the implemented encoder device profile version and the manufacturer-specific software version.

Subindex	Description	Data Type	Default Value	Access
0h	Profile and Software Version	Unsigned 32	xxyy0302h	ro

The value is divided into the profile version part and the Software version part. Each part is divided in upper version and lower version.

MSB LSB

Software Version xx.yy		Profile Version 3.2	
Upper Software Version	Lower Software Version	Upper Software Version	Lower Software Version
xx	yy	xx	yy

Object 6509h: Offset Value

This object contains the offset value. It is been calculated by the preset function and shifts the physical position value with the desired value.

Subindex	Description	Data Type	Default Value	Access
0h	Offset value	Integer 32	–	ro

Object 650Bh: Serial Number

This object contains the serial number of the device. The serial number is identical with the value in object 1018h subindex 4h.

Subindex	Description	Data Type	Default Value	Access
0h	Serial Number	Unsigned 32	See type sign	ro

10 Manufacturer Specific Profile

The encoder has also manufacturer specific objects for configuration or parameter setting listed in the following table and detailed explanation.

Object	Description	Data type	Access type
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 node-ID of the encoder via software setting. For usage of this feature a function has to be enabled at factory. The factory default setting for the node-ID is 165 decimal (A5h). If another value is desired this can be handled by SDO telegrams.

It is necessary to store the setting into the EEPROM by usage of the object 1010h to prevent a loss of configuration after power off.

The user is responsible for the right node-ID setting in the network to prevent double definitions and resulting conflicts.

This object is “hard-wired” with the object 1F93h sub-index 3 “SWNodeID_U8 to guarantee data consistency. If Object 1F93h sub-Index 3 is modified, then the value is also overtaken automatically in object 3000h. This object 3000h is introduced to offer the user an easy kind of configuration within the Automation Studio from B&R.

Subindex	Description	Data Type	Default Value	Access
0h	Software Node-ID	Unsigned 8	A5h	rw

Object 2105h: Limit Switch Maximum Value

This object defines the maximum value for a working area of the encoder. The value has to be less than the configured total resolution set in object 6002h. If the position value has reached or exceeded this limit value than the highest significant bit (MSB) Bit31 in the position value is set till the position is below the maximum value of the limit switch. The function of the limit switch can be enabled / disabled by setting a bit in the object 2110h Limit Switch Control.

Subindex	Description	Data Type	Default Value	Access
0h	Limit Switch Maximum Value	Unsigned 32	–	rw

Func-tion	Status-bits		Position value																											
BitNo.	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: any number of position value

Object 2104h: Limit Switch Minimum Value

This object defines the maximum value for a working area of the encoder. The value has to be less than the configured total resolution set in object 6002h. If the position value has reached or exceeded this limit value, than the bit30 in the position value is set till the position is above the minimum value of the limit switch. The function of the limit switch can be enabled / disabled by setting a bit in the object 2110h Limit Switch Control.

Subindex	Description	Data Type	Default Value	Access
0h	Limit Switch Minimum Value	Unsigned 32	0	rw

Func-tion	Status-bits		Position value																											
BitNo.	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: any number of position value

Object 2110h: Limit Switch Control

This object controls independently the limit switches from each other. LSB (bit 0) controls the Limit Switch Minimum Value and bit 1 controls the Limit Switch Maximum Value. If the corresponding bit is set to logical “1”, the Limit Switch is activated

Subindex	Description	Data Type	Default Value	Access
0h	Limit Switch Minimum Value	Unsigned 32	0	rw

Bit 0 = Control Limit Switch Minimum

Bit 1 = Control Limit Switch Maximum

Bit 2 – 7 = Reserved

11 Glossary

Term	Explanation
10 Base T	Transmission line with 10 Mbit data transmission rate
100 Base T	Transmission line with 100 Mbit data transmission rate
ASCII	**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange ASCII describes as code the correlation from digital integers to a normal font described character.
Batch file	Script program for MS-DOS
Baud rate	Transmission rate; it displays the transmission bits per second
Binary	Numeric system with value 0 or 1.
Browser	Software program to display HTML-Sides on different operating systems (Linux, Unix, Windows, ...)
CAT5	Terminations for transmission rates up to 100 Mbit.
CRC	The cyclic redundancy check is a method from the information technology to control a checksum for data, to reduce errors by the transmission.
EMC	**E**lectro**m**agnetic **c**ompatibility, there are rules to verifying devices.
Ethernet	Ethernet is a computer network technology based on frames.
Fast Ethernet	Transmission technology with 100 Mbit transmission rate.
FCS-Bytes	The **F**rame **C**heck **S**equenz-Bytes are a 32 Bit CRC-Checksum.
Flash	Internal memory, saved data will be available after power down.
HTML	The **H**yper**t**ext **M**arkup **L**anguage is a document format used in the World Wide Web to be displayed by a browser
HTTP	The **H**yper**t**ext **T**ransfer **P**rotocol is a stateless transmission protocol for data transmission.
HUB	The hub connects different network segments e.g. in an Ethernet network.
IP-Address	IP-address allow a logic addressing from computer in a network.
IP-Protokoll	The **I**nternet **P**rotocol is widespread in computer networks. It is the implementation of the internet layer of the TCP/IP-model
Mbit	Transmission rate or baud rate, million bits per second
OSI-Modell	The **O**pen **S**ystem **I**nterconnection reference model is a open layer model for the organisation of a communication.
PPP-Packet	The **P**oint-to-**P**oint **P**rotocol will be need for a connection establishment. It enables the transmission between different network protocols.
SMTP	**S**imple **M**ail **T**ransfer **P**rotocol manages the transmission of e-mails.
Switch	A switch is an electronic device to connect computers e.g. network segments in a local network. Unlike a hub, a switch uses stacks to avoid network collisions.
TCP	The **T**ransmission **C**ontrol **P**rotocol is a connection orientated transmission protocol, in a network.
TCP-Client	MS-DOS program available from FRABA to communicate with the encoder.

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