hohner®
AUTOMAZIONE SRL

Technical Manual
Absolute Encoder
ProfiNet

Rev2

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1 1. Introduction

This manual describes the implementation and configuration of an absolute rotary encoder with PROFINET interface. The device fulfills the requirements of a PROFINET IO device with RT (real time) or IRT (isochronous real time) classification.

1. 1 Absolute rotary encoder

The basic principle of an absolute rotary encoder is the optical sampling of a transparent code disc which is fixed with the driving shaft.

The absolute rotary encoder has a maximum resolution of 65,536 steps per revolution (16 bits).

The multli-turn version can detect up to 16,384 revolutions (14 bits). Therefore the larg- est resulting resolution is 30 bits = 2^{30} = 1,073,741,824 steps. The standard single-turn version has 13 bits, the standard multi-turn version 25 bits.

1. 2 PROFINET technology

PROFINET is an Industrial Ethernet standard merging plant automation with other enterprise IT resources.

It provides comparable functionality to PROFIBUS with techniques used by engineering, IT, and management personnel.

Established IT standards are employed as basis of communication: TCP, UDP, IP. XML is used as description language for device profiles (GSDML files).

Two ways of using PROFINET are available: PROFINET IO, similar to PROFIBUS DP as a distributed I/O system and PROFINET CBA as a modular component-based system for larger systems.

PROFINET offers scalable communication for different applications in industrial automation:

- PROFINET NRT (non real time) is suited for non-time-critical process automation with clock rates of roughly 100 msec.
- PROFINET RT (real time) offers a communication channel with optimized performance (10 msec clock rate) for most factory automation tasks
- PROFINET IRT (isochronous real time) employs special communication hardware to enable clock rates of less than 1 msec and a jitter precision of less than 1 µsec. This channel is mainly of use for motion control applications.

PROFINET IO uses a view of distributed I/O similar to PROFIBUS DP. IO controllers (e.g. PLCs) run an automation program, IO devices (e.g. absolute encoders) are remotely assigned field devices, and IO supervisors (e.g. programming devices) are used for commissioning and diagnostics.

The engineering of PROFINET IO is done similar to PROFIBUS. The field buses (i.e. Ethernet topologies) are assigned to control systems during configuration. The IO device is configured in the actual system based on the contents of its GSDML file.

After completion of the engineering the installer loads the data for the expansion into the IO controller (PLC) and the IO controller assumes data exchange with the IO device.

An IO device is addressed within PROFINET (and also possibly by external IT components) through its IP address.

Data can be exchanged from the IO controller to the IO device (and vice versa) cyclically (for process data). Apart from this, parameter data can be exchanged acyclically during engineering of the IO device or by the use of PLC programming blocks.

1. 3 Features of the Encoder

- Integrated Boot loader for customer firmware upgrades
- Round axis (Endless shaft)
- Neighbouring detection
- Engineering identification call
- Different filters for velocity
- Used Profinet Encoder Profile V4.0/V4.1

2 Installation

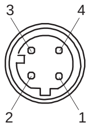
2. 1 Electrical Connection

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

The Encoder uses a second D-coded connector and provides integrated switch functionality. On or in the packaging of the connector is the mounting description.

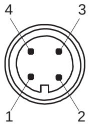
Connector Ethernet

4 pin female, D-coded

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

Connector power supply

4 pin male, A-coded

Pin Number	Signal	Figure
1	U_S (10 ... 30 V DC)	
2	-	
3	GND (0 V)	
4	-	

2. 2 Pin / Signal asignment

2.2.1 RJ45 – M12 crossed

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

2.2.2 RJ45 – M12 straight

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

2.2.3 M12 – M12 crossed

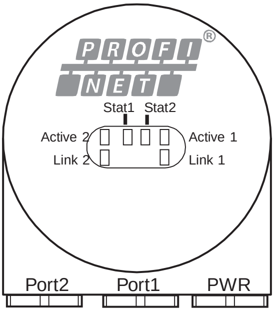
Signal	M12 Pin	M12 Pin
Tx+	1	1
Tx-	2	2
Rx+	3	3
Rx-	4	4

2. 3 Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing traffic at port 1
Link1*	Green	Link to another Ethernet component via port 1
Active2	Yellow	Incoming and outgoing data traffic at port 2
Link2*	Green	Link to another Ethernet component via port 2
Stat1	Green	Status 1, details see next table
Stat2	Red	Status 2, details see next table

* flashes with 2 Hz if engineering identification call is activated and link connection is available

2. 4 Status LED indication



Status 1 Green	Status 2 Red (Bus failure)	Meaning	Cause
OFF	OFF	No connection to controller Criteria: no data exchange	Bus disconnected - IO-Controller not available / switched off / not in run
ON	ON	Parameterization fault, no data exchange Criteria: connection available. However, the slave did not switch to the data exchange mode.	• Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
ON	Blinking 1)	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	• Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
ON	OFF	Data exchange. Slave and operation ok.	

2. 5 Notes on the mechanical Installation and on the electrical Connection

The following points have to be particularly observed:

STOP

Warning

Commissioning and operation of this electrical device must be performed by qualified personnel only. These are presons with the authorization to commission (according to Fail-Safe Technology), ground and mark devices, systems and circuits.

STOP

Warning

Disconnect the voltage before wiring, opening and closing electrical connections. Short circuits, voltage peaks and similar can result in malfunction and in uncontrolled states or in considerable personal injury and damage to property.

Warning

Check all electrical connections before switching on the plant. Incorrect connections can result in malfunction, wrong connection can result in considerable personal injuries and damage to property.

Attention

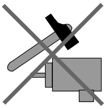
Do not open the rotary encoder housing (this does not refer to the removal of the cover). Improper opening or closing of the device can result in damages and in soiling.

Attention

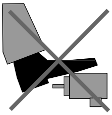
Electrical modifications of the rotary encoder are not allowed.

Attention

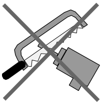
Connection lines to the rotary encoder have to be laid in a large distance (or locally separated) to energy lines which are subject to interferences. For a save data transfer, completely shielded cables have to be used, a perfect grounding has to be ensured.



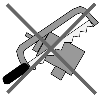
Do not drop the rotary encoder and avoid shacking. The rotary encoder is a precision instrument.



The absolute value rotary encoders by Hohner are robust, but in very rough environment they should be protected against damage by suitable protective measures. In particular, they should not be installed such that they could be suited as holding lever or step.



Do not subsequenty handle the drive shaft!



Do not subsequenty handle the housing!

Note

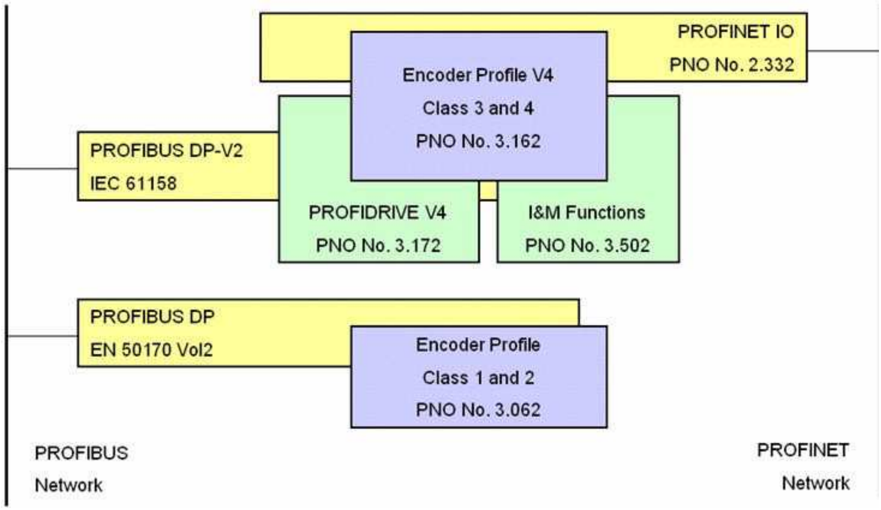
The shaft of the rotary encoder (full shaft version) has to be connected to the shaft to be measured via a suitable coupling. This coupling is used to dampen impacts and balance errors and to avoid unacceptable high forces to the shaft of the rotary encoder. Suitable couplings are available as accessories.

3 Device configuration

3. 1 Standardization

This actual generation of PROFINET devices is based on the Encoder Profile V4.0/V4.1 (PNO No. 3.162). With this standardization it is possible to substitute all products that fulfill the specification.

See the next figure with the coherences.



3. 2 Encoder Classes

Application Class	Description
3	Isochronous mode **is not** supported (RT)
4	Isochronous mode **is** supported (IRT)

3. 3 Encoder functions

Function	Implementation	
	Class 3	Class 4
Code sequence	-/X*	X
Class 4 functionality	X	X
G1_XIST1 Preset control	-/X*	X
Scaling function control	-/X*	X
Alarm channel control	X	X
Preset value	-/X*	X
Preset value 64bit	-	-
Measuring units per revolution / Measuring step	-/X*	X
Total measuring range	-/X*	X
Measuring units per revolution 64bit	-/X*	X
Total measuring range 64bit	-/X*	X
Maximum Master Sign-Of-Life failures	-/X*	X
Velocity measuring unit	-/X*	X
Encoder Profile version	X	X
Operating time	-	-
Offset value	-/X*	X
Offset value 64 bit	-/X*	X
Round axis (Endless shaft)	X	X
Velocity filter	X	X

* If Class 4 functionality is activated

3. 4 Signal list for Cyclic Data Transmission

Signal No.	Significance	Abbreviation	Length (bit)	Sign
3	Master's sign-of-life	STW2_ENC	16	-
4	Slave's sign of life	ZSW2_ENC	16	-
6	Velocity value A	NIST_A	16	X
8	Velocity value B	NIST_B	32	X
9	Control word	G1_STW	16	-
10	Status word	G1_ZSW	16	-
11	Position value 1	G1_XIST1	32	-
12	Position value 2	G1_XIST2	32	-
39	Position value 3	G1_XIST3	64	-

3.4.1 Format Position Value

NOTE:

The alignment in the data-frame (left or right-aligned) is considered for each individual resolution. G1_XIST1 and G1_XIST2 are the transmitterdposition values in binary format. An example for absolute encoders is given, below.

Attention:

The alignment of the output format (left or right-aligned) remains constant and has an effect to the adjusted resolution. The number of transmitted bits depends on the resolution.

Example:

25 bit Multi-turn absolute encoder (8192 steps per revolution, 4096 distinguishable revolutions).

- All values are presented in binary format G1_XIST2 displays the error telegram instead of the right aligned position value if error occurs.
- The shifting factors in P979 "sensor format" display the actual format. P979, Subindex 4 (Shift factor for G1_XIST2) = 0
- The settings in the Encoder parameter data affect the position value in both G1_XIST1 and G1_XIST2.

Case Encoder Profile 4.0*

- The default setting is G1_XIST1 left aligned.
- P979, Subindex 3 (Shift factor for G1_XIST1) = 32 - Total resolution (next binary value)
- G1_XIST1 send values independent Bit 10 in stw2 and Bit 13 in g1_stw1

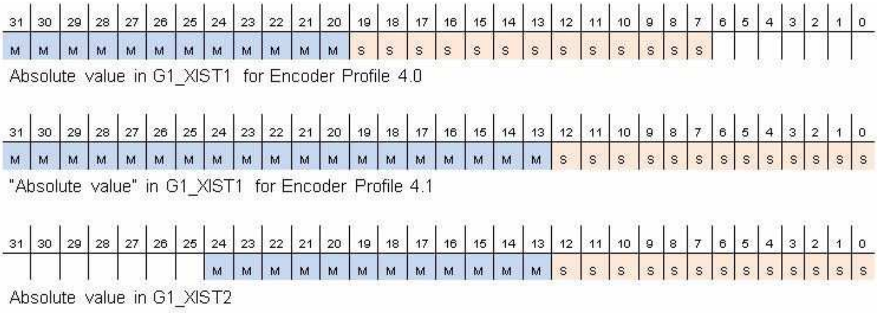
Case Encoder Profile 4.1*

- The default setting is G1_XIST1 right aligned.
- If a 32bit counter that starts with the absolute position value. After increasing maximum counter value start again with 0 or after 0 decreasing to the maximum counter value
- P979, Subindex 3 (Shift factor for G1_XIST1) = 0
- G1_XIST1 send values independent Bit 10 in stw2 and Bit 13 in g1_stw1

* Profile 4.0 realized with GSDML-V2.2-Hohner-20100808, Profile 4.1 with newer files

M = Distinguishable Revolutions (Multi-turn value)

S = Pulses (Single-turn steps per revolution)



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
M	M	M	M	M	M	M	M	M	M	M	M	S	S	S	S	S	S	S	S	S	S	S	S	S							

Absolute value in G1_XIST1 for Encoder Profile 4.0

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
M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	S	S	S	S	S	S	S	S	S	S	S	S	S

"Absolute value" in G1_XIST1 for Encoder Profile 4.1

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
							M	M	M	M	M	M	M	M	M	M	M	M	S	S	S	S	S	S	S	S	S	S	S	S	S

Absolute value in G1_XIST2

G1_XIST3

For 64bit position values is the G1_XIST3 available. The binary value will transmit right aligned and without shifting factor.

IO Data	1	2	3	4
Format	64 bit position value			

3.4.2 Encoder control word (STW2_ENC)

4-Bit-counter, left justified. The master application starts the sign of life with any value between 1 and 15. The master increases the counter in every cycle of the master application.

Valid values for the master's sign of life are 1 to 15, "0" indicates an error and is left out in normal operation.

Bit	Function	Implementation	
		Class 3	Class 4
0 ... 9	Reserved, currently not used		
10	Control by PLC	x	x
11	Reserved, currently not used		
12 ... 15	Controller Sign-Of-Life	-	x

Bit	Value	Significance	Comments
10	1	Control by PLC	Control via interface, EO IO Data is valid
	0	No control by PLC	EO IO Data is not valid. Except Sign-Of-Life
12…15		Controller Sign-Of-Life	Send continuous counting value from 0 to 15

3.4.3 Encoder status word (ZSW2_ENC)

4-Bit-counter, left justified. The slave application starts the sign of life with any value between 1 and 15 after successful synchronization to the clock pulse. The counter is increased by the slave application in every DP-cycle. Valid values for the slave's sign of life are 1 to 15, "0" indicates an error and is left out in normal operation.

Bit	Function	Implementation	
		Class 3	Class 4
0 ... 8	Reserved, currently not used		
9	Control requested	Mandatory	Mandatory
10 ... 11	Reserved, currently not used		
12 ... 15	Encoder Sign-Of-Life	-	Mandatory

Bit	Value	Significance	Comments
9	1	Control requested	The automation system is requested to assume control
	0	No control by PLC	EO IO Data is not valid. Except Sign-Of-Life
10 ... 15		Encoder Sign-Of-Life	Send back continuous Controller Sign-Of-Life (counting value from 0 to 15)

3.4.4 Encoder control word

Bit	Value	Function	Comments
0 ... 10			Reserved, currently not used
11	0/1	"Home position mode"	Specifies if the position value shall be set to a previously programmed absolute value or shifted by this value. 0: set home position / preset (absolute) 1: shift home position / preset (relative = offset)
12	1	Set preset / request shift	Preset (resp. shift) is set when changing this Bit to "1" (rising edge). Default preset value (shift): 0 **Warning:** After setting the preset the offset will be save in the non volatile memory. In this 5-10ms the encoder will not send position values.
13	1	Request absolute value cyclically	Request of additional cyclic transmission of the absolute actual position in G1_XIST2. If no other data needs to be transferred due to commands or errors the absolute position value will be transmitted automatically.
14	1	Activate parking sensor	If the "activate parking sensor" bit is set, the encoder transmits no error messages.
15	1	Acknowledging a sensor error	Request to acknowledge / reset a sensor error

3.4.5 Encoder status word (G1_ZSW)

Bit	Value	Meaning	Comments
0 ... 10			Reserved, currently not used
11		Acknowledgement sensor error in process	Is set if the reset of a sensor error (after acknowledging) takes longer than one bus cycle.
12	1	Set preset / shift reference point executed	Acknowledgement for "set preset / request shift"
13	1	Transmit absolute value cyclically	Acknowledgement for "request absolute value cyclically"
14	1	Parking sensor activated	Acknowledgement for "activate parking sensor". The encoder transmits no error messages.
15	1	Sensor error	Indicates a sensor error. A device specific error code is transmitted in G1_XIST2.

3. 5 Standard + manufacture telegrams

Standard Telegram 81

IO Data (DWord)	**1**	**2**
Setpoint	STW2_ENC*	G1_STW1*

* Details about the variables are available in chapter 3.4

IO Data (DWord)	**1**	**2**	3	4	5	6
Actual value	ZSW2_ENC*	G1_ZSW1*	G1_XIST1*		G1_XIST2*	

Standard Telegram 82

IO Data (DWord)	**1**	**2**
Setpoint	STW2_ENC*	G1_STW1*

IO Data (DWord)	**1**	**2**	3	4	5	6	7
Actual value	ZSW2_ENC*	G1_ZSW1*	G1_XIST1*		G1_XIST2*		NIST_A*

Standard Telegram 83

IO Data (DWord)	**1**	**2**
Setpoint	STW2_ENC*	G1_STW1*

IO Data (DWord)	**1**	**2**	3	4	5	6	7	8
Actual value	ZSW2_ENC*	G1_ZSW1*	G1_XIST1*		G1_XIST2*		NIST_B*	

Standard Telegram 84

IO Data (DWord)	**1**	**2**
Setpoint	STW2_ENC*	G1_STW1*

IO Data (DWord)	**1**	**2**	3	4	5	6	7	8	9	10
Actual value	ZSW2_ENC*	G1_ZSW1*	G1_XIST3				G1_XIST2*		NIST_B*	

Manufacture Telegram 860

With this telegram it is not necessary to set special bits to get cyclic data transmission. It is ajar according the Profibus functionality and support an easy way to set a customer preset value during the running PLC. The velocity value uses the format that is defined in the Velocity measuring unit.

- No control word
- No Status word
- No Life Sign monitoring.
- Output: 32 Bit-Unsigned Preset value (Bit 31 Preset-Control , less than Total Resolution)
- Input: 32 Bit-Unsigned Position Value + 32 Bit-Integer Velocity Value

Input Data (Input data from Encoder to Controller): 8 Bytes							
Position value - 32 Bit Unsigned Integer				**Velocity value** - 32 Bit Signed Integer			
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
MSB			LSB	MSB			LSB

Output Data (Output data from Controller to Encoder): 4 Bytes	
Preset - 32 Bit Unsigned Integer	
Bit 31	Bit 30 ... Bit 0
Preset Control	Preset value < Total Resolution

The rotary encoder with PROFINET interface can be programmed according to the needs of the user. The GSDML file pertaining to the rotary encoder has to be installed in the used PLC engineering software tool.

3. 7 Rotary encoder functionality overview

Function	Communication channel
Position value	Cyclic input (IO device -> IO controller)
Preset	Cyclic output (IO controller -> IO device)
Coding sequence	Acyclic input/output
Scaling function	Acyclic input/output

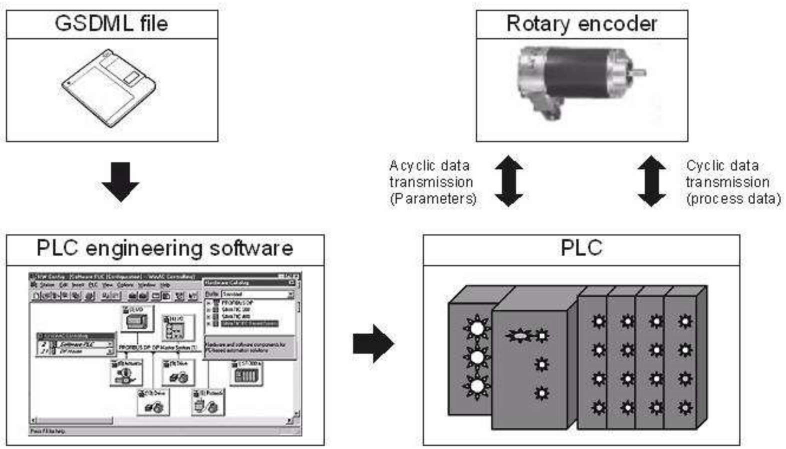
3. 8 Rotary encoder functions - data format

PROFINET IO devices are set up in modules. Each module can be plugged in physical and/or logical slots. These are subdivided into sub slots individually to accommodate further data hierarchy. One sub slot can contain several cyclic input/output channels as well as acyclic record channels (used for parameters).

There are two versions of PLC available. Some of them support only one sub slot. Other ones i.e. S7 400 support several sub slots. To work with both PLCs there are in the GSDML-file two directories: Standard and Encoder Profile 4.

Hohner rotary encoders offer for the standard profile one slot (address #0) with one sub slot (address #0) for all device data for old PLC's that doesn't support several sub slots.

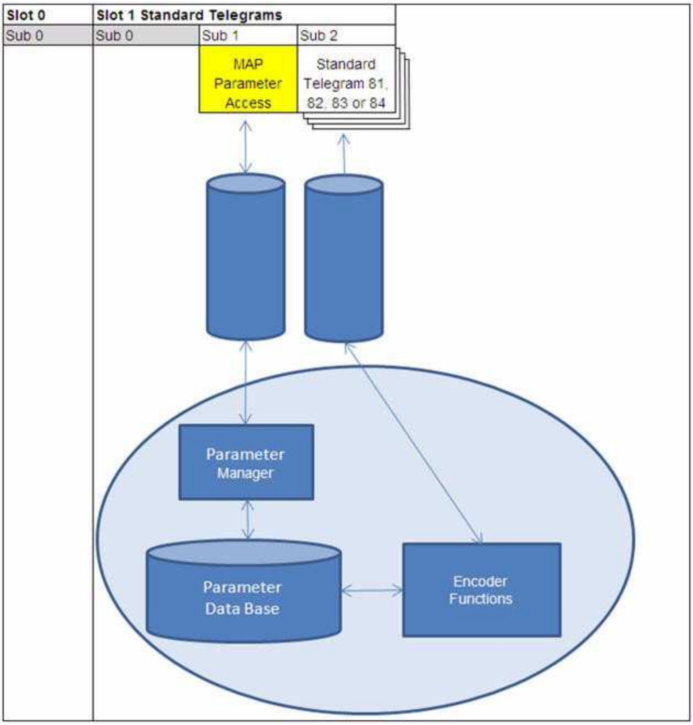
Device parameters are grouped together as records in the PROFINET interface. The following table gives an overview over addresses of Hohner rotary encoder's data channels.


GSDML file
Rotary encoder
Acyclic data transmission (Parameters)
Cyclic data transmission (process data)
PLC engineering software
PLC

3. 9 Parameter for Acyclic Data Transmission

The user parameter data is sent to the encoder in the start-up phase as a Record Data Object using the data record 0xBF00. For the mapping of the different encoder functions into the user data section of the Record Data Object. In addition to the parameter data configuration the encoder supports a number of PROFIdrive parameters and encoder specific parameters accessible via the Acyclic Data Exchange service.

With the actual GSDML you can download from www.hohner.it it is possible to change the telegram type without changing the MAP parameters..



3.9.1 Base Mode Parameter

Function	Slot	Sub slot	Index	Offset	Length	IO
Code sequence	1	1	0xBF00	0.0	1 Bit	-
Class 4 functionality	1	1	0xBF00	0.1	1 Bit	-
G1_XIST1 Preset control	1	1	0xBF00	0.2	1 Bit	-
Scaling function control	1	1	0xBF00	0.3	1 Bit	-
Alarm channel control	1	1	0xBF00	0.4	1 Bit	-
Compatibility mode	1	1	0xBF00	0.5	1 Bit	-
Measuring units per revolution	1	1	0xBF00	1	8 Byte	-
Total measuring range	1	1	0xBF00	9	8 Byte	-
Maximum Master Sign-Of-Life failures	1	1	0xBF00	17	1 Bit	-
Velocity measuring unit	1	1	0xBF00	18	1 Bit	-

3.9.2 Device Parameter

Function	Slot	Sub slot	Index	Offset	Length	IO
Preset value	1	1	0xB02E	Via Parameter Number 65000		-

3.9.3 Vendor Parameter

Function	Slot	Sub slot	Index	Offset	Length	IO
Preset value	1	1	0x1000	0	1 Byte	-

3. 10 Patronized Parameter

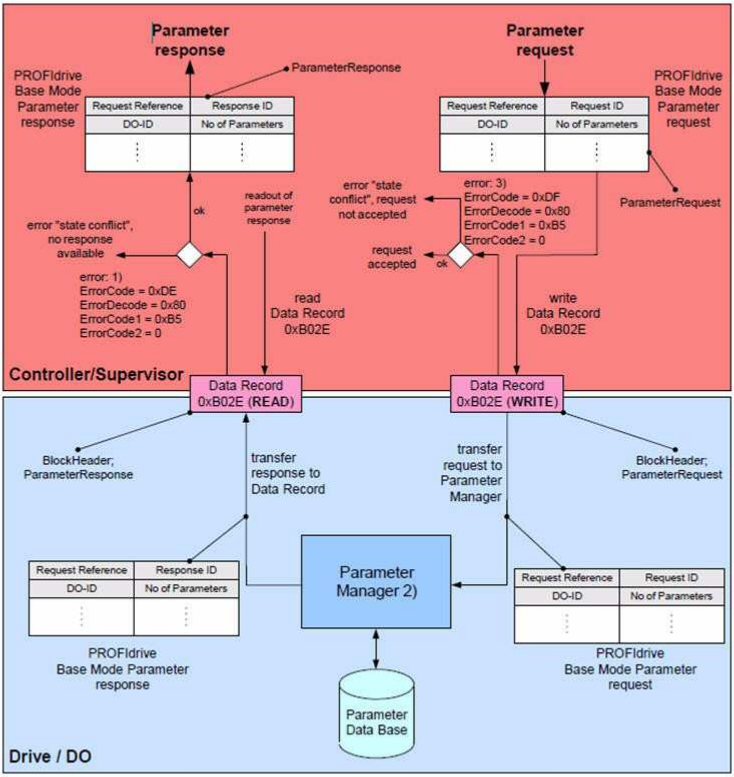
According the Profidrive profile the following parameters are available

Record Read-Write Index: 0xB02E

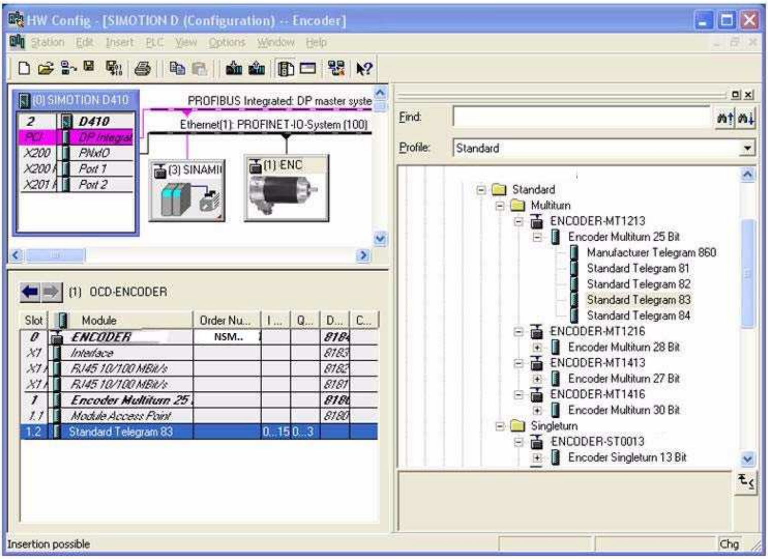
Create Parameter Request Program: (example: Parameter Read)

Number	Parameter	Read only	Read/Write
922	Telegram selection	□	
925	Number of life sign failures that may be tolerated		□
964	Drive Unit identification	□	
965	Profile identification number	□	
971	Transfer into a nonvolatile memory		□
975	DO identification	□	
979	Sensor format	□	
980	Number list of defined parameter	□	
65000	Preset		□
65001	Operating status	□	

Parameter model



Sample of configuration according Encoder Profile V4.1



(1) OCD-ENCODER

Slot	Module	Order Nu...	I ...	Q...	D...	C...
0	ENCODER	NSM..			8184	
X1	Interface				8183	
X1	RJ45 10/100 MBit/s				8182	
X1	RJ45 10/100 MBit/s				8181	
1	Encoder Multiturn 25				8186	
1.1	Module Access Point				8180	
1.2	Standard Telegram 83		0...15	0...3		

3. 11 Rotary encoder function description

Details of this functionality are available on the next pages.

Function	Implementation		Description
	Class 3	Class 4	Chapter
Code sequence	-/X*	X	3.11.1
Class 4 functionality	X	X	3.11.2
G1_XIST1 Preset control	-/X*	X	3.11.3
Scaling function control	-/X*	X	3.11.4
Alarm channel control	X	X	3.11.5
Compatibility mode	X	X	3.11.6
Preset value	-/X*	X	3.11.7
Preset value 64bit	-	-	-
Measuring units per revolution / Measuring step	-/X*	X	3.11.9
Total measuring range	-/X*	X	3.11.9
Measuring units per revolution 64bit	-/X*	X	-
Total measuring range 64bit	-/X*	X	-
Maximum Master Sign-Of-Life failures	-/X*	X	3.11.10
Velocity measuring unit	-/X*	X	3.11.11
Encoder Profile version	X	X	3.11.14
Operating time	-	-	-
Offset value	-/X*	X	3.11.8
Offset value 64 bit	-/X*	X	-
Round axis (Endless shaft)	X	X	3.11.13
Velocity filter	X	X	3.11.12

* If Class 4 functionality is activated

3.11.1 Code sequence

The parameter "code sequence" defines the counting direction of the position value. The code increases when the shaft is rotating clockwise (CW) or counter-clockwise (CCW) (view onto the shaft).

Code sequence	Direction of rotation when viewing the shaft	Code sequence
0 (default)	Clockwise (CW)	Increasing
1	Counter-clockwise (CCW)	Decreasing

3.11.2 Class 4 functionality

The parameter "Class 4 functionality" defines that the scaling, preset and code sequence affects the position value in G1_XIST1, 2 and 3.

Class 4 control	Class 4 function
0 (default)	Deactivated
1	Activated

3.11.3 Preset control for G1_XIST1

The parameter "preset control" defines the preset functionality. If parameter Class 4 is activated and Preset control is disabled then the Preset will not be affected for G1_XIST1..

Preset control	Preset function
1	Preset does not affect G1_XIST1
0 (default)	G1_XIST1 is affected by a Preset command

3.11.4 Scaling function control

The parameter "scaling function control" enable / disenable the scaling function. If not, the physical position value is returned by the rotary encoder. This is only available if class 4 control is activated.

Scaling function control	Scaling function
0	Deactivated
1(default)	Activated

3.11.5 Alarm channel control

The parameter "Alarm channel control" defines the length of diagnostic telegram. If the Alarm channel is deactivated then will only transmit the first 6 bytes of the diagnostic telegram.

Alarm channel control	Alarm channel function
0 (default)	Deactivated
1	Activated

3.11.6 Compatibility mode

This parameter defines if the encoder should run in a mode compatible to Version 3.1 of the Encoder Profile. See next tables for an overview of the functions affected when the compatibility mode is enabled.

Compatibility mode	Compatibility function	Meaning
0	Enable	Compatibility with Encoder Profile V3.1
1(default)	Disable	No backward compatibility

Function	Compatibility mode Enable (=0)	Compatibility mode Enable (=1)
Control by PLC (STW2_ENC)	Ignored; the Control word (G1_STW) and setpoint values are always valid. Control requested (ZSW2_ENC) is not supported and is set to 0	Supported
User parameter "Maximum Master Sign-Of-Life failures"	Supported	Not supported; one Sign-Of-Life failure tolerated, P925 is optional to control the life sign monitoring
User parameter "Alarm channel control"	Supported	Not supported; the application alarm channel is active and controlled by a PROFIdrive parameter
P965 - Profile version	31 (V3.1)	41 (V4.1)

3.11.7 Preset value

3.11.7.1Telegram 81-84

With the Preset value it is possible to adapt the encoder zero point to the zero point of the application. When using this function the current encoder position value is set to the desired preset value. The integrated microcontroller calculates the internal zero point shift. It is stored in a permanent memory (~ 10 ms).

Note:

- Set Preset only in standstill!
- There is no preset activated when the Preset value is written to the encoder. The preset function is controlled by the bits in sensor control and status words (G1_STW and G1_ZSW). The Preset value is used when a preset is requested by bit 12 in the Sensor control word (G1_STW).
- Class 4 functionality must be enabled!
- If the Preset value is greater than the total resolution then error no. 0x02 comes back to the base mode parameter response (Low or High limit exceeded).

Parameter	Meaning	Data type
Preset value	Preset value will defined with asynchronous data exchange. Default value = 0	Integer 32

Sample for a parameter order to set Preset with Record Read-Write for SIMATIC CPU300

RecordWriteData[] = {

```
0x00,0x02,0x00,0x01,                  // Header
0x10,0x00,0xFD,0xE8,0x00,0x00,        // Parameter Address (Preset)
0x43,0x01,0x00,0x00,0x00,0x64         // Parameter Value (Preset=100=0x64h)
};
```

Meaning:

```
0x00,0x02,0x00,0x01,                           // Header
 |  |  |   |-------------------------------    No. of Parameters   = 1
 |  |  |-----------------------------------    Axis-No./DO-ID      = 0
 |  |--------------------------------------    Request ID          = 2 Change value
 |-----------------------------------------    Request Reference
```

```
0x10,0x00,0xFD,0xE8,0x00,0x00,        // Parameter Address (Preset)
 |   |   |   |   |  |------------------------------  Subindex  LOW Byte
 |   |   |   |   |----------------------------------  Subindex HIGH Byte
 |   |   |   |--------------------------------------  Parameter Number (PNU) LOW Byte
 |   |   |------------------------------------------  Parameter Number (PNU) HIGH Byte
 |   |----------------------------------------------  No. of Elements
 |--------------------------------------------------  Attribute

0x43,0x01,0x00,0x00,0x00,0x64         // Parameter Value   (Preset Value = 100 = 0x64 Hex)
 |   |   |   |   |  |------------------------------  Preset Value  LSB
 |   |   |   |   |----------------------------------  Preset Value
 |   |   |   |--------------------------------------  Preset Value
 |   |   |------------------------------------------  Preset Value  MSB
 |   |----------------------------------------------  No. of Values =1
 |--------------------------------------------------  Format   : 0x43= DWORD  , oder  4= Ingeger 32Bit
```

```
SIMATIC S7:-                          SFB53
                                      -FC x:
CALL  "WRREC" , DB53
 REQ   :=M41.7                        // activate sfb request
 ID    :=DW#16#0                      // logical slot address -> adapt
 INDEX :=W#16#B02E                    // record index number  sizeof (RecordWriteData)
 LEN   := 16                          // data length in byte
 DONE  :=M41.1                        // request finished
 BUSY  :=M41.2                        // busy bit
 ERROR :=M41.3                        // error bit
 STATUS:=MD46                         // error number, if error bit = 1
 RECORD:= RecordWriteData[]           // record buffer address -> adapt
```

3.11.7.2Telegram 860

With this manufacture telegram it is easy to set a user defined preset value during the running application according to the Profibus functionality. In this case set bit 31 of the Output Data to "1" and then back to "0". For a different preset value than 0 set the other bits.

Output Data (Output data from Controller to Encoder): 4 Bytes	
Preset - 32 Bit Unsigned Integer	
Bit 31	Bit 30 ... Bit 0
Preset Control	Preset value < Total Resolution

If the Preset value is greater than the total resolution then will set the Preset value to the maximum resolution - 1.

3.11.8 Offset value

The offset value is calculated in the preset function and shifts the position value with the calculated value.

3.11.9 Scaling parameters

The Scaling parameters will be used to change the resolution. This parameter will only affect to the output values if the Scaling function is activated.

Parameter	Meaning	Data type
Measuring units per revolution / Measuring step	Single turn resolution in steps	Unsigned 32
Total measuring range in measuring units	Total measuring range measuring steps	Unsigned 32

3.11.10Max. Master Sign-Of-Life failures.

Parameter	Meaning	Value
Maximum Master Sign-Of-Life failures	Number of permissible failures of the master's life sign	1 … 255

3.11.11Velocity measuring units

This parameter defines the coding of velocity measuring units used to configure the values NIST_A and NIST_B. Only Telegrams 82-84 uses the velocity outputs.

With each cycle will calculate the velocity from the position value. To get a high velocity precision it is necessary to use a short cycle time.

Velocity measuring unit	Value
Steps/s	0
Steps/100ms	1
Steps/10ms	2
RPM	3

3.11.12Velocity filter

The velocity value can used with three different exponential moving average filter types.

Default: Fine

Parameter	Meaning	Data type
Velocity filter	Select for the parameter Fine, Normal, Coarse	Integer 32

Ratio between old and actual velocity value:

Fine:	7:3
Normal:	96:4
Coarse:	996:4

3.11.13Endless Shaft (RoundAxis)

Normally the period, i.e. "Total resolution" / "measuring units" per revolution must be an integer and it must fit an integer number of times (integer multiple) into 4096 for an encoder with 12 Bit for the revolutions. This means that i.e. 100 or 325 revolutions could make trouble. So the following equation must apply:

(4096 x measuring units per revolution) / Total resolution = integer

But this Profinet encoder solves this problem automatically. The encoder checks if the parameters need the endless shaft and activates the functionality by self.

Note: The internal software routine only works if the encoder is in operation. If it is necessary to turn the encoder shaft more than 1024 revolutions without power supply this can lead to problems (the internal routine will not work without power supply). With this function there will be save additional values in the internal EEPROM.

3.11.14Encoder Profile version

The Encoder Profile Version is the version of the Encoder Profile document implemented in the encoder. This parameter is not affected by the Compatibility mode settings.

bits	Meaning
0 ... 7	Profile Version, least significant number (value range: 0…99), decimal coding
8 ... 15	Profile Version, most significant number (value range: 0…99), decimal coding
16 ... 31	Reserved

4 Configuring with STEP7

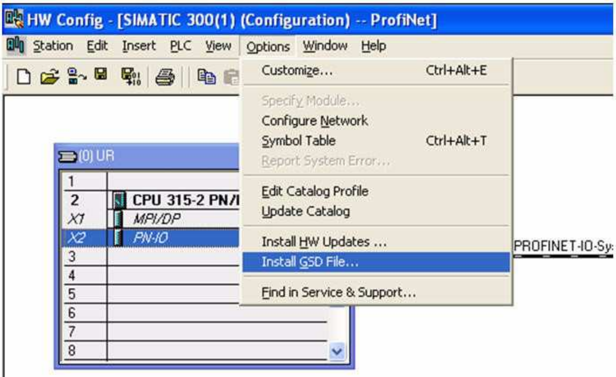
In the following chapter the configuration of the Hohner encoder with the configuration tool Hardwaremanager STEP 7 is shown exemplarily. In this example STEP 7 Version 5.4 SP4 and the CPU 315-2PN/DP or Simotion Scout with single axis controller D410 (PROFINET controller integrated) are used. If there are questions about other software tools please contact the manufacturer.

4. 1 Installing the GSDML file

If Hohner encoders are used for the first time it is necessary to install the GSDML file to import encoder parameterization into the hardware catalogue of the tool:

Choose "Install GSD File..." in the "HW Config"-window of the project (menu item "Options") and select the GSDML-file.

The GSDML file is supplied by Hohner (free of charge from www.hohner.it). In order to represent the encoder with a bitmap in STEP7 the bitmap file will be installed automatically with the GSDML file - both files must be in the same directory. The main number of the "Soft- ware Release" in the GSDML file and the Firmware must be the same, i.e. 4.xx.



After the successful installation of the GSDML file the Hohner encoder can be found in the hardware catalog un- der "PROFINET-IO" - "Additional Field Devices" - "Encoders" -

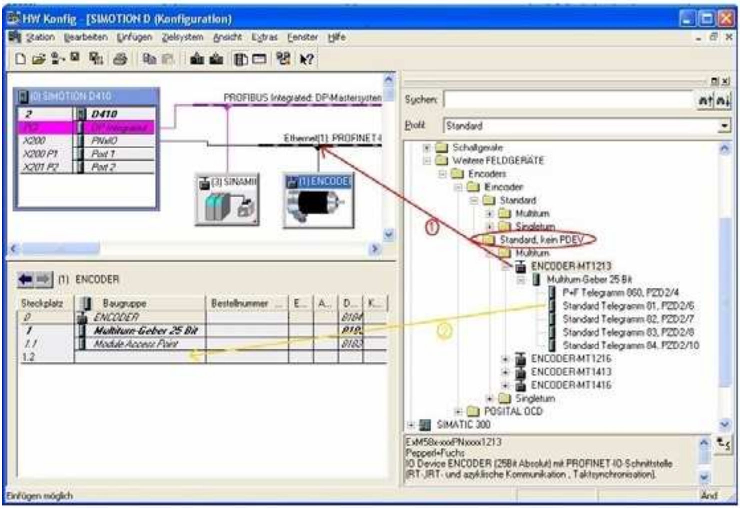
(Possibly, you need to update the hardware cat- alog by choosing "Op- tions" -> "Update catalog").

4. 2 Engineering a Hohner encoder into a STEP7 project

To engineer the rotary encoder into a project, drag the device "ENCODER…" on to an existing PROFINET ethernet network (or choose the network and double-click the "Encoder" icon). See the red arrow. Then move the telegram to the free slot (orange arrow).

4.2.1 Standard Encoder no PDEV

Asynchronous + RT Communication for Controller which does not support IRT functionality.



(1) ENCODER

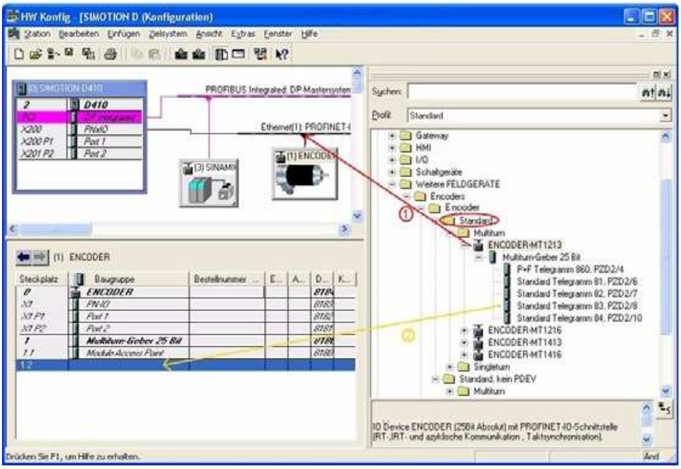
Steckplatz	Baugruppe	Bestellnummer ...	E...	A...	D...	K...
0	ENCODER				8184	
1	Multiturn-Geber 25 Bit				819	
1.1	Module Access Point				8183	
1.2						

ExM58x-xxxPNxxxx1213
Pepperl+Fuchs
IO Device ENCODER (25Bit Absolut) mit PROFINET-IO-Schnittstelle (RT-,IRT- und azyklische Kommunikation , Taktsynchronisation).

4.2.2 Standard Encoder with PDEV

Asynchronous + RT- + IRT-

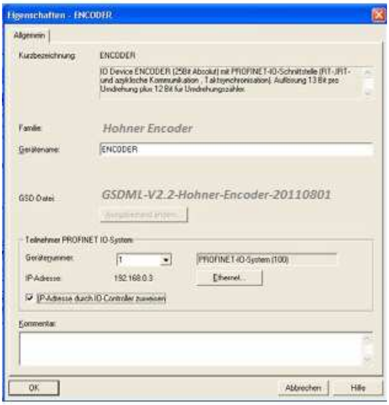
Communication for Controller which supports IRT functionality (Standard).


HW Konfig - [SIMOTION D (Konfiguration)]
Station Bearbeiten Einfügen Zielsystem Ansicht Extras Fenster Hilfe
(0) SIMOTION D410
2 D410
X200 PNxIO
X200 P1 Port 1
X201 P2 Port 2
PROFIBUS Integrated: DP-Mastersystem
Ethernet(1): PROFINET-I
(3) SINAMI
(1) ENCODE
1
2
Suchen:
Profil Standard
Gateway
HMI
I/O
Schaltgeräte
Weitere FELDGERÄTE
Encoders
Encoder
Standard
Multiturn
ENCODER-MT1213
Multiturn-Geber 25 Bit
P+F Telegramm 860, PZD2/4
Standard Telegramm 81, PZD2/6
Standard Telegramm 82, PZD2/7
Standard Telegramm 83, PZD2/8
Standard Telegramm 84, PZD2/10
ENCODER-MT1216
ENCODER-MT1413
ENCODER-MT1416
Singleturn
Standard, kein PDEV
Multiturn
Drücken Sie F1, um Hilfe zu erhalten.
Änd

(1) ENCODER

Steckplatz	Baugruppe	Bestellnummer ...	E...	A...	D...	K...
0	ENCODER				818	
X1	PN-IO				8183	
X1 P1	Port 1				8182	
X1 P2	Port 2				8181	
1	Multiturn-Geber 25 Bit				818	
1.1	Module Access Point				8180	
1.2						

IO Device ENCODER (25Bit Absolut) mit PROFINET-IO-Schnittstelle (RT-,IRT- und azyklische Kommunikation , Taktsynchronisation).



Eigenschaften - ENCODER

Allgemein

Kurzbezeichnung: ENCODER

IO Device ENCODER (25Bit Absolut) mit PROFINET-IO-Schnittstelle (RT-,IRT- und azyklische Kommunikation , Taktsynchronisation). Auflösung 13 Bit pro Umdrehung plus 12 Bit für Umdrehungszähler.

Familie: Hohner Encoder

Gerätename: ENCODER

GSD-Datei: GSDML-V2.2-Hohner-Encoder-20110801

Teilnehmer PROFINET IO-System

Gerätenummer: 1 — PROFINET-IO-System (100)

IP-Adresse: 192.168.0.3

☑ IP-Adresse durch IO-Controller zuweisen

Kommentar:

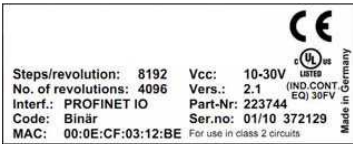
Double-click the rotary encoder icon to set communication parameters that the PLC will use. Set a device name and by clicking "Ethernet" the IP address of the Hohner encoder. Also, under the "IO cycle" tab, set the desired update timeThe device name and IP address now have to be set physically within the rotary encoder. Connect the PLC and rotary en- coder to ethernet and switch them on.

Click "PLC" -> "Ethernet" -> "Edit Ether-net Node" and click "Browse" for acces-sible ethernet nodes in the new window.

STEP7 will scan for devices on Ethernet and will displays them in a window. The rotary encoder should be displayed under the device type "Hohner". Select this entry and click "Flash" to have the identification LED flash with 2 Hz. Click "OK" to take the MAC address of the chosen device to the previous window and select "Use IP parameters". The MAC address is available on the type label on the bottom left (see picture below with red marking). Enter the IP address (and subnet mask) for the encoder that you previously assigned and click "Assign IP configuration". Also, enter the device name previously chosen in the text field "Device name" and click "Assign Name".

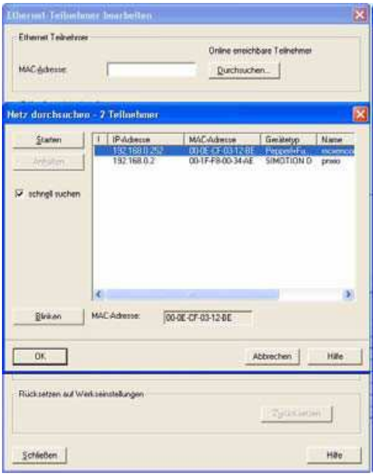
Please note:

If more than one rotary encoder is used in the same PROFINET network, each encoder must have a different name and each encoder must be assigned its name before another is connect-ed to the network.



Steps/revolution:	8192	Vcc:	10-30V
No. of revolutions:	4096	Vers.:	2.1
Interf.:	PROFINET IO	Part-Nr:	223744
Code:	Binär	Ser.no:	01/10 372129
MAC:	00:0E:CF:03:12:BE	For use in class 2 circuits	

CE
c UL us LISTED
(IND.CONT. EQ) 30FV
Made in Germany



Ethernet-Teilnehmer bearbeiten

Ethernet Teilnehmer

MAC-Adresse:

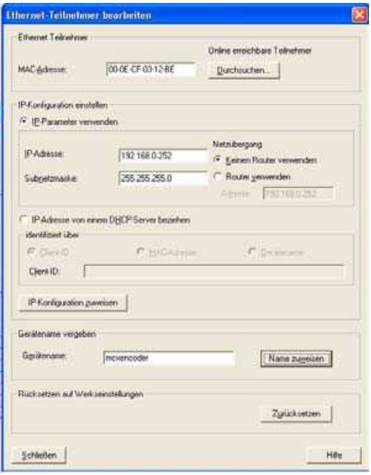
Netz durchsuchen - 2 Teilnehmer

☑ schnell suchen

!	IP-Adresse	MAC-Adresse	Gerätetyp	Name
	192.168.0.252	00-0E-CF-03-12-BE	Pepperl+Fu...	mcxenco...
	192.168.0.2	00-1F-F8-00-34-AE	SIMOTION D	proxio

MAC-Adresse: 00-0E-CF-03-12-BE

Rücksetzen auf Werkseinstellungen



Ethernet-Teilnehmer bearbeiten

Ethernet Teilnehmer

MAC-Adresse: 00-0E-CF-03-12-BE

IP-Konfiguration einstellen

● IP-Parameter verwenden

IP-Adresse: 192.168.0.252

Subnetzmaske: 255.255.255.0

Netzübergang

● Keinen Router verwenden

○ Router verwenden

Adresse: 192.168.0.252

○ IP-Adresse von einem DHCP-Server beziehen

identifiziert über

● Client-ID ○ MAC-Adresse ○ Gerätename

Client ID:

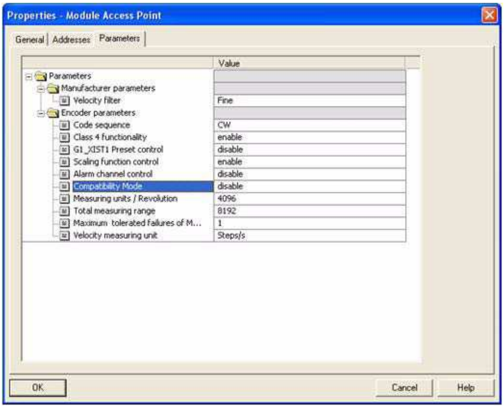
Gerätename vergeben

Gerätename: mcxencoder

Rücksetzen auf Werkseinstellungen

4. 3 Module Access Point Parameter setup :

A double click on the Module Access Point will open the window with the lis of parameters. This parameters wil
transmit to the encoder on each star of the PLC.



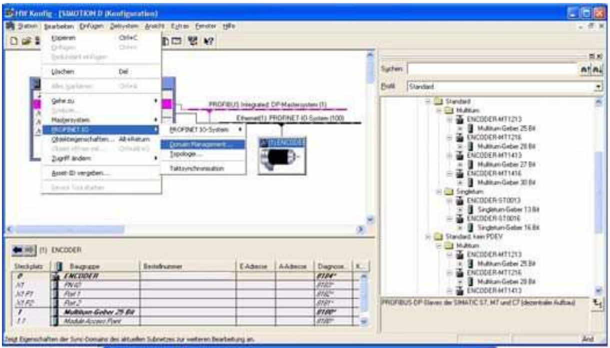
Properties - Module Access Point

General | Addresses | Parameters

	Value
Parameters	
Manufacturer parameters	
Velocity filter	Fine
Encoder parameters	
Code sequence	CW
Class 4 functionality	enable
G1_XIST1 Preset control	disable
Scaling function control	enable
Alarm channel control	disable
Compatibility Mode	disable
Measuring units / Revolution	4096
Total measuring range	8192
Maximum tolerated failures of M...	1
Velocity measuring unit	Steps/s

4. 4 HW Config IRT-Setup:

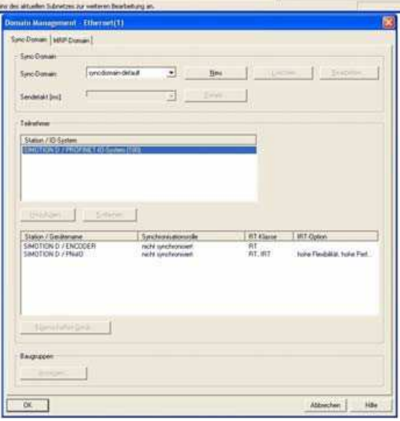
On the next screenshots are the necessary steps available for an IRT coummunication.



(1) ENCODER

Steckplatz	Baugruppe	Bestellnummer	E-Adresse	A-Adresse	Diagnose...	K...
0	ENCODER				8184*	
X1	PN-IO				8183*	
X1 P1	Port 1				8182*	
X1 P2	Port 2				8181*	
1	Multiturn-Geber 25 Bit				8180*	
1.1	Module Access Point				8179*	

Zeigt Eigenschaften der Sync-Domains des aktuellen Subnetzes zur weiteren Bearbeitung an.



Domain Management - Ethernet(1)

Sync-Domain | MRP-Domain

Sync-Domain

Sync-Domain: syncdomain-default

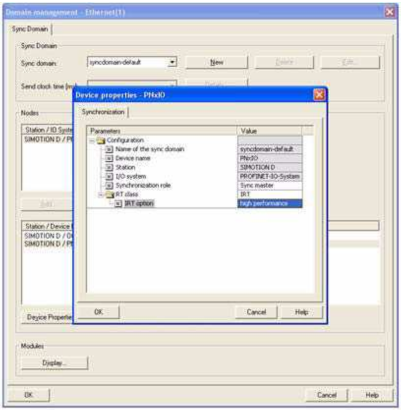
Sendetakt [ms]:

Teilnehmer

Station / IO-System
SIMOTION D / PROFINET IO-System (100)

Station / Gerätename	Synchronisationsrolle	RT-Klasse	IRT-Option
SIMOTION D / ENCODER	nicht synchronisiert	RT	
SIMOTION D / PNIO	nicht synchronisiert	RT, IRT	hohe Flexibilität, hohe Perf...

IRT- Domain Management **Controller**



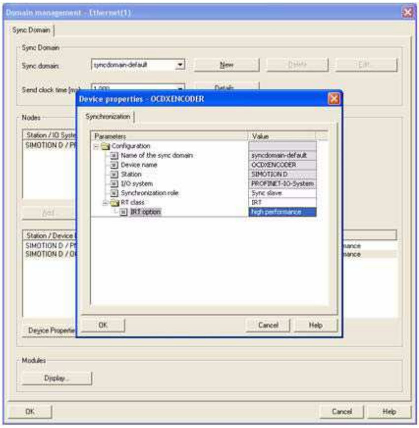
Domain management - Ethernet(1)

Sync Domain: syncdomain-default

Device properties - PNxIO

Parameters	Value
Configuration	
Name of the sync domain	syncdomain-default
Device name	PNxIO
Station	SIMOTION D
I/O system	PROFINET-IO-System
Synchronization role	Sync master
RT class	IRT
IRT option	high performance

IRT- Domain Management **Encoder**



Domain management - Ethernet(1)

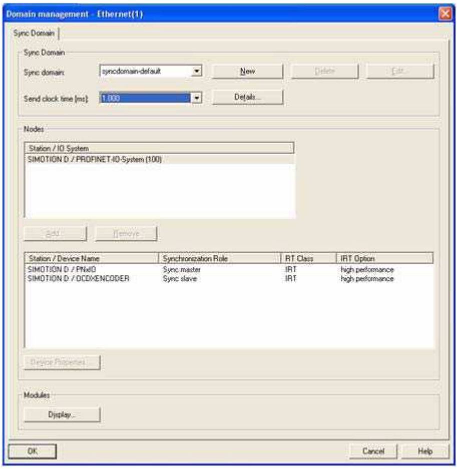
Sync Domain: syncdomain-default

Send clock time [ms]: 1.000

Device properties - OCDXENCODER

Parameters	Value
Configuration	
Name of the sync domain	syncdomain-default
Device name	OCDXENCODER
Station	SIMOTION D
I/O system	PROFINET-IO-System
Synchronization role	Sync slave
RT class	IRT
IRT option	high performance

Sync Clock:



Domain management - Ethernet(1)

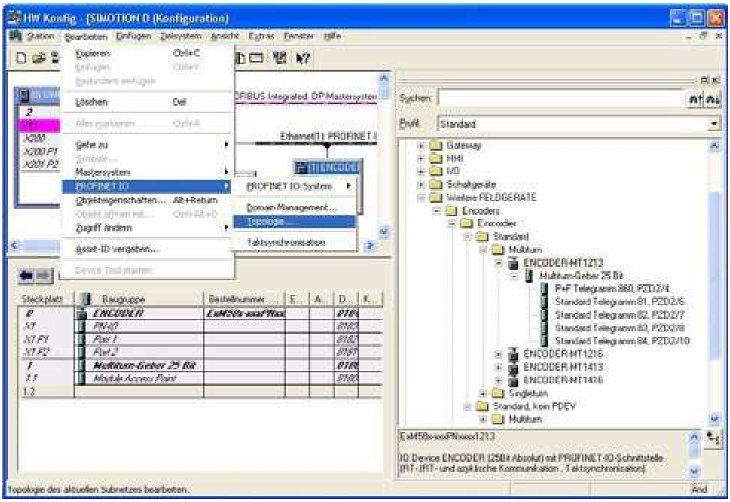
Sync domain: syncdomain-default

Send clock time [ms]: 1.000

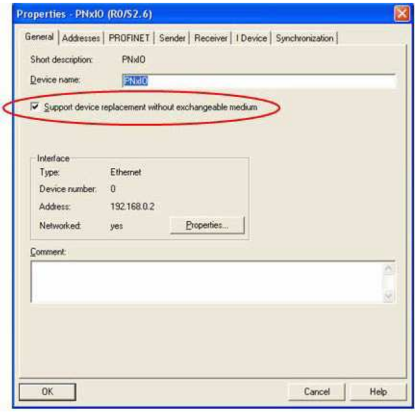
Station / IO System
SIMOTION D / PROFINET-IO-System (100)

Station / Device Name	Synchronization Role	RT Class	IRT Option
SIMOTION D / PNxIO	Sync master	IRT	high performance
SIMOTION D / OCDXENCODER	Sync slave	IRT	high performance

4. 5 IRT- Topology...



4. 6 LLDP (Link Layer Discovery Protocol)



Short description: PNxIO

Device name: PNxIO

☑ Support device replacement without exchangeable medium

Interface

Type: Ethernet

Device number: 0

Address: 192.168.0.2

Networked: yes

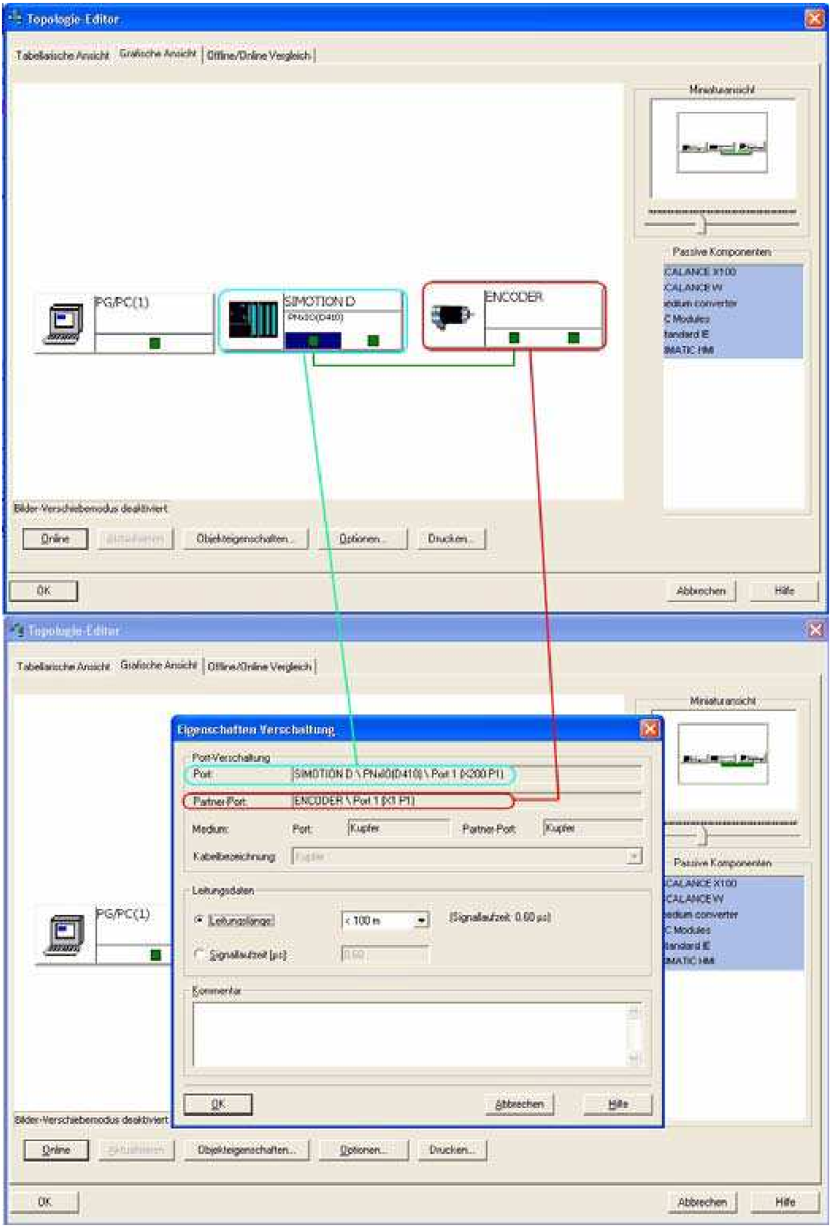
Comment:

The Link Layer Discovery Protocol allows replacing a device of the Profinet-network. The partner port before and behind of the replaced device save relevant information's so that no additional configuration is necessary.

But the flag for activate

"Support Device replacement without replacement medium" must be activated in Object Properties Interface under tab General.

Topology Setup



Port: SIMOTION D \ PNx0(D410) \ Port 1 (X200 P1)

Partner Port: ENCODER \ Port 1 (X1 P1)

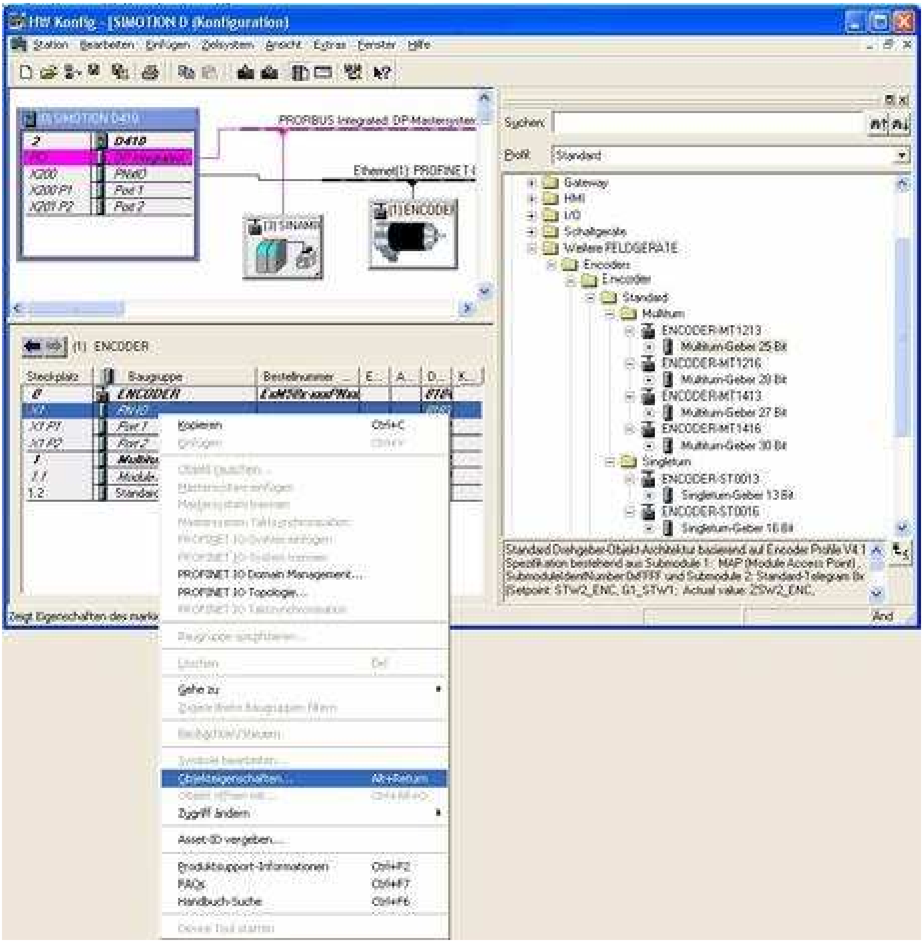
Medium: Port: Kupfer Partner Port: Kupfer

Kabelbezeichnung: Kupfer

● Leitungslänge: < 100 m (Signallaufzeit: 0.60 µs)

○ Signallaufzeit [µs]: 0.60

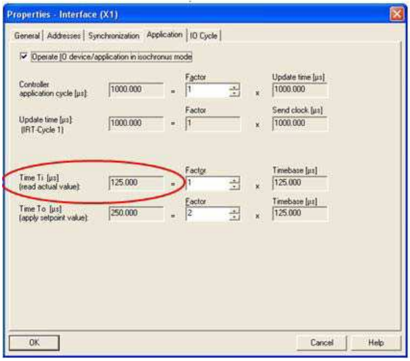
IRT-Encoder Interface X1
Dialog:



(1) ENCODER

Steckplatz	Baugruppe	Bestellnummer	E...	A...	D...	K...
0	ENCODER	[illegible]			[illegible]	
X1	PN-IO				[illegible]	
X1 P1	Port 1					
X1 P2	Port 2					
1	Multitu...					
1.1	Module...					
1.2	Standar...					

Standard Drehgeber-Objekt Architektur basierend auf Encoder Profile V4.1 Spezifikation bestehend aus Submodule 1: MAP (Module Access Point), SubmoduleIdentNumber 0xFFFF und Submodule 2: Standard-Telegram 8x (Setpoint: STW2_ENC, G1_STW1; Actual value: ZSW2_ENC,

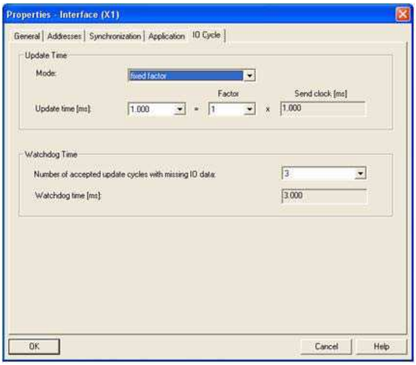


☑ Operate IO device/application in isochronus mode

			Factor		
Controller application cycle [µs]:	1000.000	=	1	x	Update time [µs]: 1000.000
Update time [µs]: (IRT-Cycle 1)	1000.000	=	1	x	Send clock [µs]: 1000.000
Time Ti [µs] (read actual value):	125.000	=	1	x	Timebase [µs]: 125.000
Time To [µs] (apply setpoint value):	250.000	=	2	x	Timebase [µs]: 125.000

IRT- Encoder interface X1 Tab Application:

The minimum time for **Ti** is 125µs.



Update Time

Mode: fixed factor

			Factor		Send clock [ms]
Update time [ms]:	1.000	=	1	x	1.000

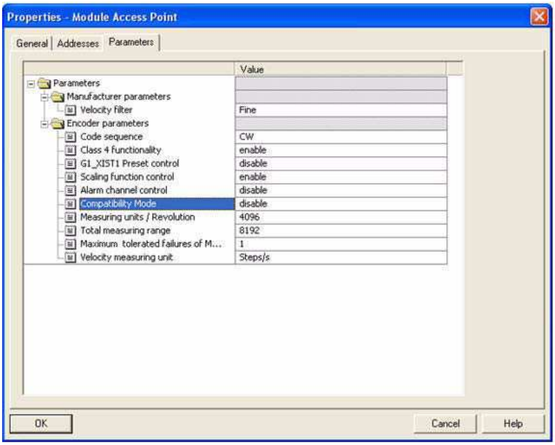
Watchdog Time

Number of accepted update cycles with missing IO data: 3

Watchdog time [ms]: 3.000

IRT- Sign-Of-Life in Dialog Module Access Point Slot 1 Subslot 1:

Only for IRT-top (High Performance) Synchronous Application



	Value
Parameters	
Manufacturer parameters	
Velocity filter	Fine
Encoder parameters	
Code sequence	CW
Class 4 functionality	enable
G1_XIST1 Preset control	disable
Scaling function control	enable
Alarm channel control	disable
Compatibility Mode	disable
Measuring units / Revolution	4096
Total measuring range	8192
Maximum tolerated failures of M...	1
Velocity measuring unit	Steps/s

IRT- Encoder interface X1 Tab Application:

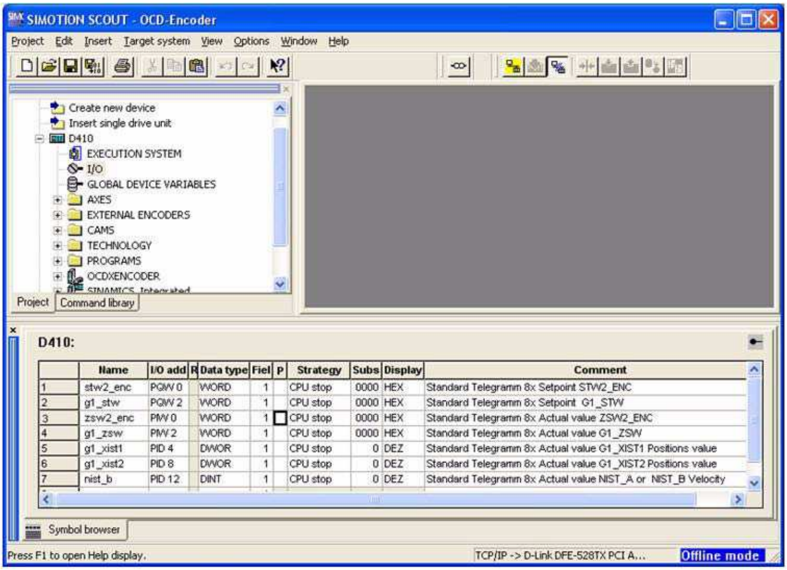
The minimum time for **Ti** is 125µs.

Controller Life Sign Monitoring:

- **IRT- Sign-Of-Life Monitoring active:** Compatibility mode disable
- **IRT- Sign-Of-Life Monitoring not active:** Compatibility mode enable

4. 7 SIMOTION SCOUT

IO- Create IO tabl



SIMOTION SCOUT - OCD-Encoder

D410:

	Name	I/O add	R	Data type	Fiel	P	Strategy	Subs	Display	Comment
1	stw2_enc	PQW 0		WORD	1		CPU stop	0000	HEX	Standard Telegramm 8x Setpoint STW2_ENC
2	g1_stw	PQW 2		WORD	1		CPU stop	0000	HEX	Standard Telegramm 8x Setpoint G1_STW
3	zsw2_enc	PIW 0		WORD	1	□	CPU stop	0000	HEX	Standard Telegramm 8x Actual value ZSW2_ENC
4	g1_zsw	PIW 2		WORD	1		CPU stop	0000	HEX	Standard Telegramm 8x Actual value G1_ZSW
5	g1_xist1	PID 4		DWOR	1		CPU stop	0	DEZ	Standard Telegramm 8x Actual value G1_XIST1 Positions value
6	g1_xist2	PID 8		DWOR	1		CPU stop	0	DEZ	Standard Telegramm 8x Actual value G1_XIST2 Positions value
7	nist_b	PID 12		DINT	1		CPU stop	0	DEZ	Standard Telegramm 8x Actual value NIST_A or NIST_B Velocity

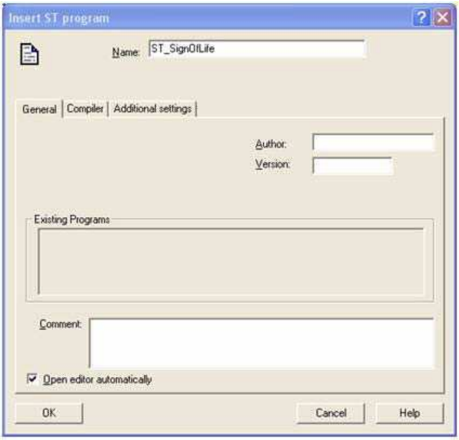
Press F1 to open Help display.

TCP/IP -> D-Link DFE-528TX PCI A...

Offline mode

SIMOTION SCOUT IRT-Top Setup:

Sign-Of-Life Monitoring for Motion synchronous Application



Insert ST program

Name: ST_SignOfLife

Author:

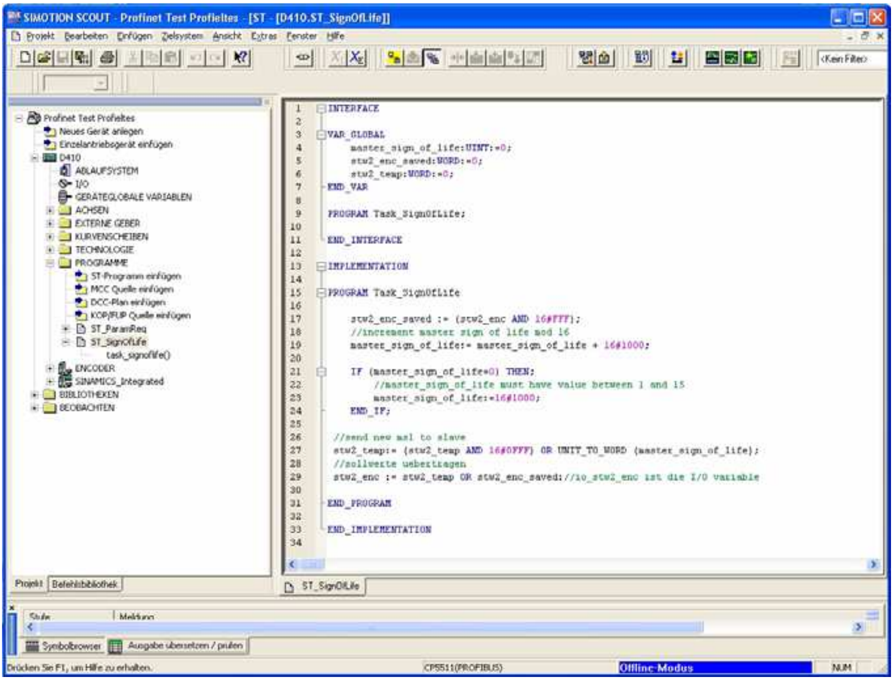
Version:

Existing Programs

Comment:

☑ Open editor automatically

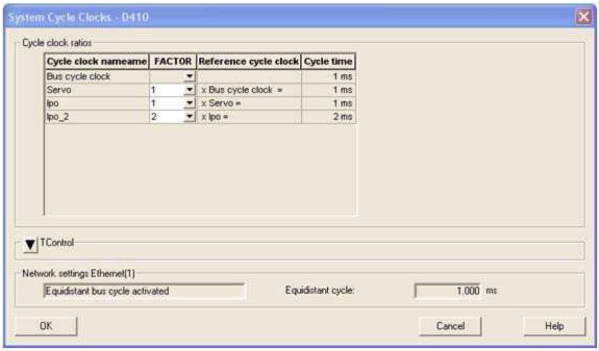
Creating Sign-Of-Life Program: Insert ST Program



```
INTERFACE

VAR_GLOBAL
    master_sign_of_life:UINT:=0;
    stw2_enc_saved:WORD:=0;
    stw2_temp:WORD:=0;
END_VAR

PROGRAM Task_SignOfLife;

END_INTERFACE

IMPLEMENTATION

PROGRAM Task_SignOfLife

    stw2_enc_saved := (stw2_enc AND 16#FFF);
    //increment master sign of life mod 16
    master_sign_of_life:= master_sign_of_life + 16#1000;

    IF (master_sign_of_life=0) THEN;
        //master_sign_of_life must have value between 1 and 15
        master_sign_of_life:=16#1000;
    END_IF;

 //send new msl to slave
 stw2_temp:= (stw2_temp AND 16#0FFF) OR UNIT_TO_WORD (master_sign_of_life);
 //sollwerte uebertragen
 stw2_enc := stw2_temp OR stw2_enc_saved;//io_stw2_enc ist die I/O variable

END_PROGRAM

END_IMPLEMENTATION
```

```
ST-SignOfLife Code edit  INTERFACE
 VAR_GLOBAL
        master_sign_of_life:UINT:=0;
        stw2_enc_saved:WORD:=0;
        stw2_temp:WORD:=0;
 END_VAR
 PROGRAM Task_SignOfLife;
 END_INTERFACE
 IMPLEMENTATION
 PROGRAM Task_SignOfLife
        stw2_enc_saved := (stw2_enc AND 16#0FFF);
        //increment master sign of life mod 16
        master_sign_of_life:= master_sign_of_life +  16#1000;
        IF (master_sign_of_life=0) THEN;
        //master_sign_of_life must have value between 1 and 15
        master_sign_of_life:=16#1000;
 END_IF;
        //send new msl to slave
        stw2_temp:= (stw2_temp AND 16#0FFF) OR UINT_TO_WORD
        (master_sign_of_life);
        // Sollwerte uebertragen
        stw2_enc := stw2_temp OR stw2_enc_saved;
        //io_stw2_enc ist die I/O variable
 END_PROGRAM
 END_IMPLEMENTATION
```

Simotion System clock setup:

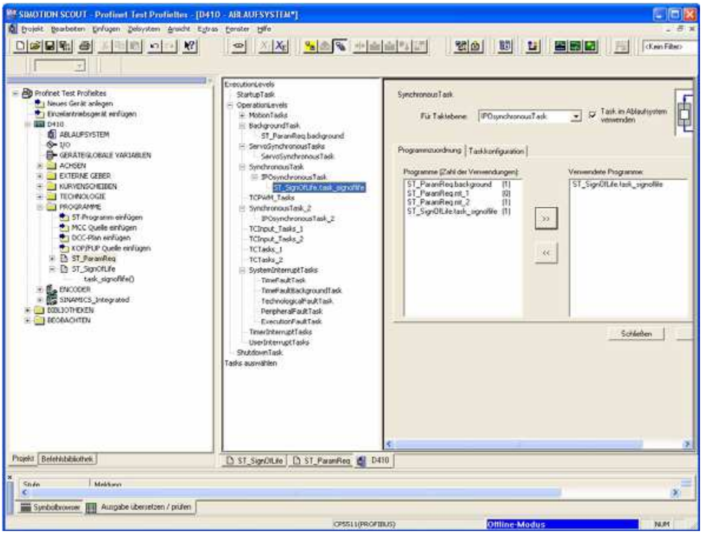


Cycle clock nameame	FACTOR	Reference cycle clock	Cycle time
Bus cycle clock			1 ms
Servo	1	x Bus cycle clock =	1 ms
Ipo	1	x Servo =	1 ms
Ipo_2	2	x Ipo =	2 ms

Equidistant bus cycle activated

Equidistant cycle: 1.000 ms

Append SignOfLife-Progran on IPOSynchronous task:



SynchronousTask

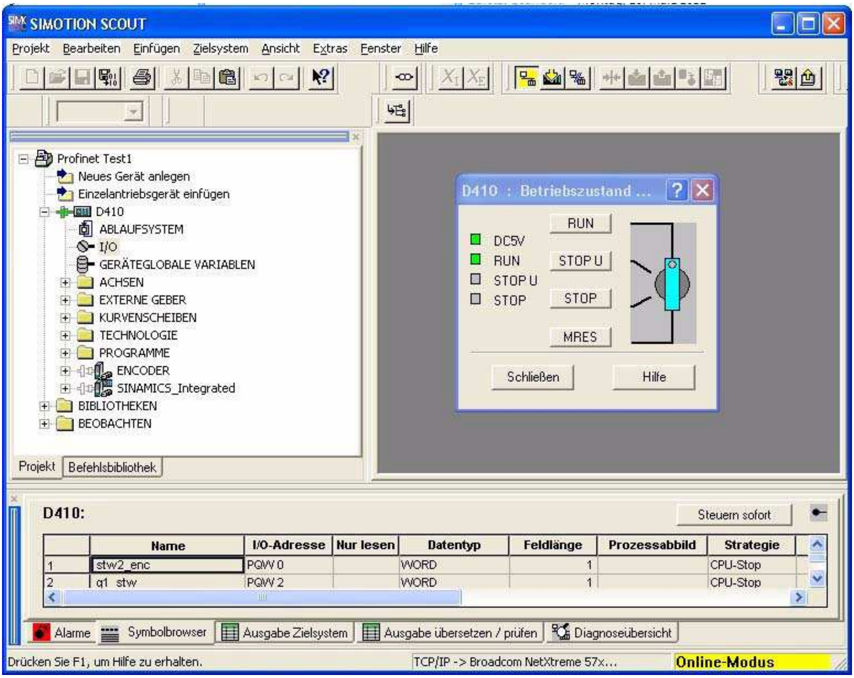
Für Taktebene: IPOsynchronousTask ☑ Task im Ablaufsystem verwenden

Programme (Zahl der Verwendungen):

ST_ParamReq.background	(1)
ST_ParamReq.nt_1	(0)
ST_ParamReq.nt_2	(1)
ST_SignOfLife.task_signoflife	(1)

Verwendete Programme:

ST_SignOfLife.task_signoflife



D410 : Betriebszustand

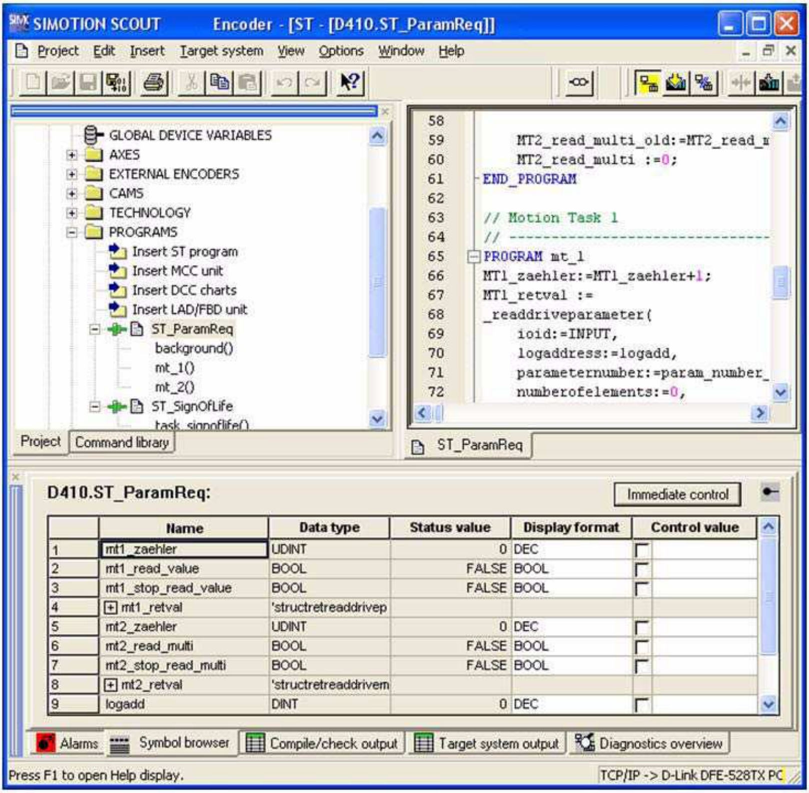
- 🟩 DC5V
- 🟩 RUN
- □ STOP U
- □ STOP

D410:

	Name	I/O-Adresse	Nur lesen	Datentyp	Feldlänge	Prozessabbild	Strategie
1	stw2_enc	PQW 0		WORD	1		CPU-Stop
2	q1_stw	PQW 2		WORD	1		CPU-Stop

Drücken Sie F1, um Hilfe zu erhalten. TCP/IP -> Broadcom NetXtreme 57x... Online-Modus

New ST_Program:



```
    MT2_read_multi_old:=MT2_read_m
    MT2_read_multi :=0;
END_PROGRAM

// Motion Task 1
// --------------------------------
PROGRAM mt_1
MT1_zaehler:=MT1_zaehler+1;
MT1_retval :=
_readdriveparameter(
    ioid:=INPUT,
    logaddress:=logadd,
    parameternumber:=param_number_
    numberofelements:=0,
```

D410.ST_ParamReq:

	Name	Data type	Status value	Display format	Control value
1	mt1_zaehler	UDINT	0	DEC	☐
2	mt1_read_value	BOOL	FALSE	BOOL	☐
3	mt1_stop_read_value	BOOL	FALSE	BOOL	☐
4	⊞ mt1_retval	'structretreaddrivep			
5	mt2_zaehler	UDINT	0	DEC	☐
6	mt2_read_multi	BOOL	FALSE	BOOL	☐
7	mt2_stop_read_multi	BOOL	FALSE	BOOL	☐
8	⊞ mt2_retval	'structretreaddrivem			
9	logadd	DINT	0	DEC	☐

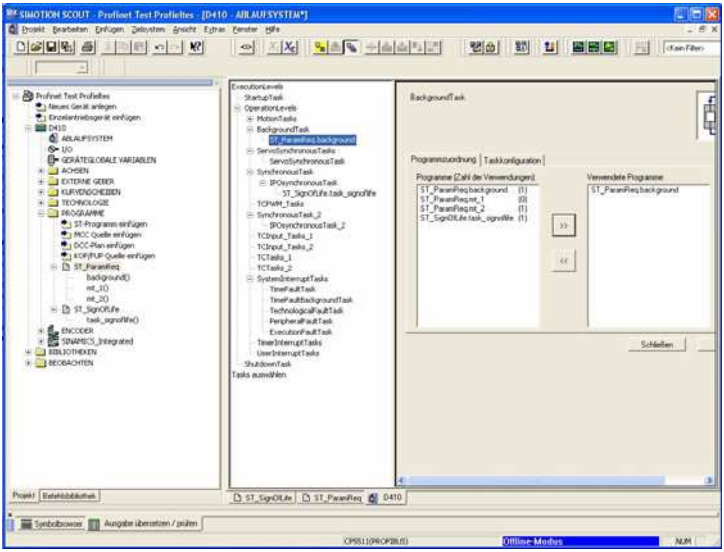
Samples :

// PROGRAM mt_1 Read Single parameter

// PROGRAM mt_2 Read Multi parameter

```
INTERFACE
        PROGRAM background;
        PROGRAM mt_1;
        PROGRAM mt_2;
END_INTERFACE
IMPLEMENTATION
VAR_GLOBAL
        //Parameter lesen MT1_zaehler:UDINT:=0;
        MT1_read_value:BOOL:=0;
        MT1_stop_read_value:BOOL:=0;
        MT1_retval:StructRetReadDriveParameter;
        MT2_zaehler:UDINT:=0;
        MT2_read_multi:BOOL:=0;
        MT2_stop_read_multi:BOOL:=0;
        MT2_retval:StructRetReadDriveMultiParameter;
        //Parameteraufträge allgemein logadd:DINT:=0;
        param_number_single:UDINT:=0;
        param_number_multi:ARRAY [0..38] OF UDINT;
        number_of_param:UDINT:=3;
END_VAR
PROGRAM Background
VAR
        MT1_read_value_old:BOOL:=0;
        MT2_read_multi_old:BOOL:=0;
END_VAR
IF (MT1_read_value=1 AND MT1_read_value_old=0) THEN
        MT1_stop_read_value:=0;
        _starttask(MotionTask_1);
END_IF;
        MT1_read_value_old:=MT1_read_value;
        number_of_param:=3;
        param_number_multi[0]:=927;
        param_number_multi[1]:=65000;
        param_number_multi[2]:=971;
IF (MT2_read_multi=1 AND MT2_read_multi_old=0) THEN
        MT2_stop_read_multi:=0;
        _starttask(MotionTask_2);
END_IF;
        MT2_read_multi_old:=MT2_read_multi;
        MT2_read_multi :=0;
END_PROGRAM
        // Motion Task 1
        // --------------------------------------------------------------
PROGRAM mt_1
        MT1_zaehler:=MT1_zaehler+1;
        MT1_retval :=
        _readdriveparameter(
        ioid:=INPUT,
        logaddress:=logadd,
        parameternumber:=param_number_single,
        numberofelements:=0,
        subindex:=0,
        nextcommand:=WHEN_COMMAND_DONE,
    commandid:=(_getCommandID())
);
IF MT1_stop_read_value=0 THEN
    _restarttask(MotionTask_1);
ELSE
  MT1_read_value:=0;
END_IF;
END_PROGRAM
    // Motion Task 2 ------------------------------------------------------------
PROGRAM mt_2
    MT2_zaehler:=MT2_zaehler+1;
MT2_retval :=
    _readdrivemultiparameter(
    ioid:=INPUT,
    logaddress:=logadd,
    numberofparameters:=number_of_param,
    parameternumber:=param_number_multi,
    nextcommand:=WHEN_COMMAND_DONE,
    commandid:=(_getCommandID())
);
    //MT2_read_multi:=0;
IF MT2_stop_read_multi=0 THEN
    _restarttask(MotionTask_2);
ELSE
    MT2_read_multi:=0;
END_IF;
END_PROGRAM
END_IMPLEMENTATION
```

Background task:

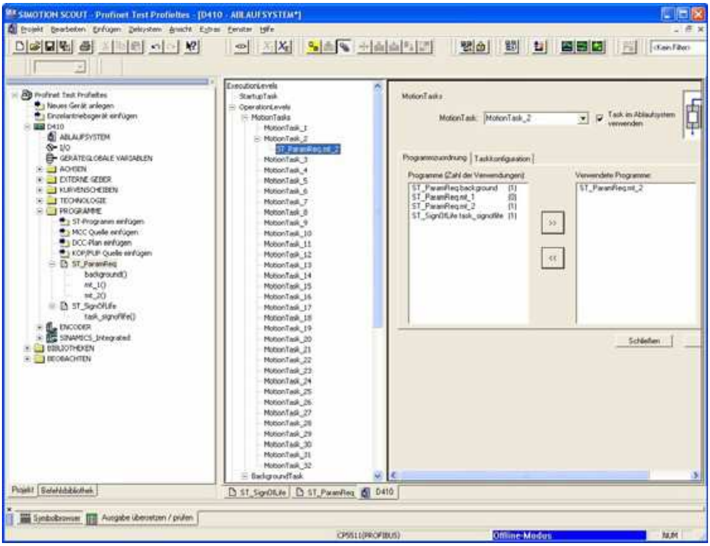


BackgroundTask

Programmzuordnung | Taskkonfiguration

Programme (Zahl der Verwendungen)		Verwendete Programme
ST_ParamReq.background	(1)	ST_ParamReq.background
ST_ParamReq.mt_1	(0)	
ST_ParamReq.mt_2	(1)	
ST_SignOfLife.task_signoflife	(1)	

Motiontask_2:



MotionTasks

MotionTask: MotionTask_2 ☑ Task im Ablaufsystem verwenden

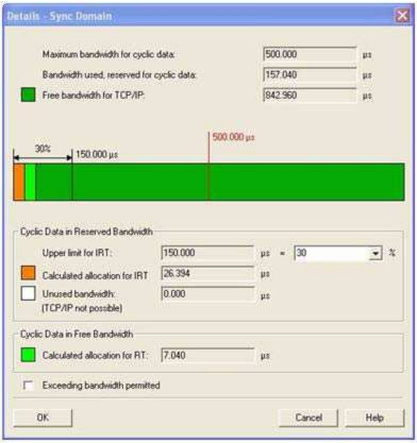
Programmzuordnung | Taskkonfiguration

Programme (Zahl der Verwendungen)		Verwendete Programme
ST_ParamReq.background	(1)	ST_ParamReq.mt_2
ST_ParamReq.mt_1	(0)	
ST_ParamReq.mt_2	(1)	
ST_SignOfLife.task_signoflife	(1)	

5 IRT communication

5. 1 IRT settings

It is possible to set the upper limit for IRT transmission. The smallest time



Details - Sync Domain

Maximum bandwidth for cyclic data: 500.000 µs

Bandwidth used, reserved for cyclic data: 157.040 µs

🟩 Free bandwidth for TCP/IP: 842.960 µs

Cyclic Data in Reserved Bandwidth

Upper limit for IRT: 150.000 µs = 30 %

🟧 Calculated allocation for IRT 26.394 µs

□ Unused bandwidth: (TCP/IP not possible) 0.000 µs

Cyclic Data in Free Bandwidth

🟩 Calculated allocation for RT: 7.040 µs

□ Exceeding bandwidth permitted

5. 2 User data reliability

5.2.1 General

For both transmission directions (Controller <-> DO), user data reliability is achieved using a Sign-Of-Life (4-bit counter).

The value range of the Sign-Of-Life is only 1 to 15 respectively (0 = invalid) since:

A DO that does not support the fail-safe mode receives a data telegram in the clear mode with the Output Data set to "0" (thus, failure of the Sign-Of-Life may be recognized only if LS = 0 is not permissible).

Through the DO's Sign-Of-Life, a maximum ratio of TMAPC/TDP of 14/1 is possible. Regardless of the ratio TMAPC/TDP, the counter is always incremented to the maximum value (15). In Multi-Axis Drive Units, the reaction to Sign-Of-Life failures is axial. Depending on the device, the reaction to one Drive Axis may affect more Drive Axis.

5.2.2 Controller's Sign-Of-Life (C-LS) Transmission (C-LS)

A 4-bit counter is used in Control Word 2 (refer to 3.4.3) as the Sign-Of-Life for the controller. This counter is incremented by the controller in each controller application cycle, and thus also identifies the computation of the position controller (first DP cycle in the TMAPC). The DO receives the new Sign-Of-Life of the controller together with the new setpoint at the time TO in the following DP-cycle.

Synchronization (C-LS)

The Controller application starts the Controller-LS with an arbitrary value between 1 and 15, at the earliest when changing from Preparation -> Synchronization.

Monitoring (C-LS)

If, in a Controller application cycle, the DO application does not recognize a correct count (i.e. a positive or a negative deviation is recognized), it initially processes with the old telegram data from the last valid controller telegram. For setpoint generation, a device-specific failure strategy may be used.

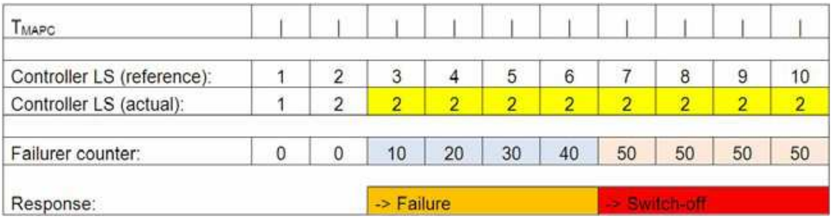
If the DO application does not recognize the expected numerical value after a parameterized number of controller application cycles (TMLS = n × TMAPC; n may be selected via profile parameter 925; also refer to chapter 5.1.4), the affected Drive Axis messages a fault. After fault acknowledgement, the DO application then attempts to automatically resynchronize itself to the Sign-Of-Life of the controller application. Depending on the particular application, a new start may be required.

If the Sign-Of-Life fails, it may be for the following reasons:

- Sign-Of-Life failure
- Failure of the controller application level (with DP transmission still operational)
- PLL failure
- The DP cycle TDP has been exceeded (through telegram repetition)

Example:

Permanent LS failure (see Figure 1), TMLS = 5 × TMAPC: the strategy of the Sign-Of- Life failure counter is explained in chapter 5.1.4:

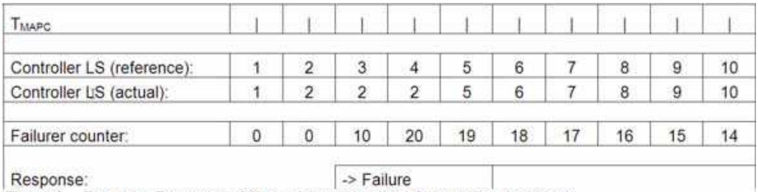


T_{MAPC}										
Controller LS (reference):	1	2	3	4	5	6	7	8	9	10
Controller LS (actual):	1	2	2	2	2	2	2	2	2	2
Failurer counter:	0	0	10	20	30	40	50	50	50	50
Response:			-> Failure				-> Switch-off			

Figure 1 - Example: Long term Sign-Of-Life failure of the controller

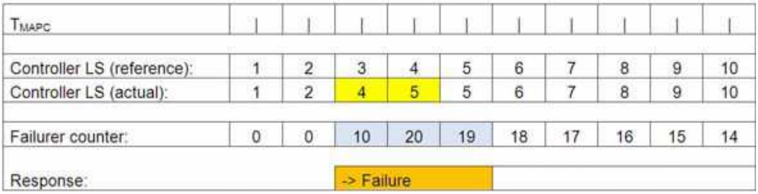
Example:

Temporary LS failure (see Figure 2 and Figure 3), TMLS = 5 × TMAPC: The strategy of the Sign-Of-Life failure counter is explained in chapter 5.2.4:



T_{MAPC}										
Controller LS (reference):	1	2	3	4	5	6	7	8	9	10
Controller LS (actual):	1	2	2	2	5	6	7	8	9	10
Failurer counter:	0	0	10	20	19	18	17	16	15	14
Response:			-> Failure							

Figure 2 – Example: Temporary failure of the controller LS (negative deviation)



T_{MAPC}										
Controller LS (reference):	1	2	3	4	5	6	7	8	9	10
Controller LS (actual):	1	2	4	5	5	6	7	8	9	10
Failurer counter:	0	0	10	20	19	18	17	16	15	14
Response:			-> Failure							

Figure 3 - Example: Temporary failure of the controller LS (positive deviation; double step)

5.2.3 DO's Sign-Of-Life (DO-LS) Transmission (DO-LS

A 4-bit counter in status word 2 is used as a Sign-Of-Life for the DO. The DO increments this counter with each DP cycle.

Synchronization (DO-LS)

The DO application starts the DO's Sign-Of-Life with an arbitrary value between 1 and 15:

after successful PLL synchronization and at the change (n -> n + 1) of the controller's Sign-Of-Life.

Monitoring (DO-LS)

If the controller application does not recognize a correct count in a controller application cycle (i.e. a positive or negative deviation has been recognized), it initially uses the old telegram data from the last valid DO telegram. To generate the actual value, a device-specific failure strategy may be implemented.

If the controller application does not recognize the expected numerical value after a parameterized time (TSLS = n × TDP; n may be parameterized or defined depending on the manufacturer of the controller application), the affected Drive Axis is shut down by the controller application (possibly also involved drives), and an appropriate fault is signaled to the user. The controller application then attempts to automatically re-synchronize itself to the Sign-Of-Life of the DO application. Depending on the particular application, a re-start may be required or it may be sufficient to acknowledge the fault.

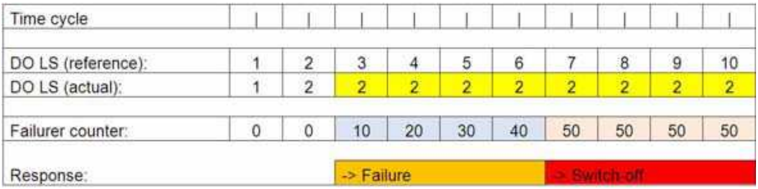
Example reasons for the Sign-Of-Life to fail may be:

- Sign-Of-Life failure
- Failure of the DO application level (while DP transmission is still functioning)
- PLL failure
- DO failure in the sense of DP (DO does not respond although telegram was repeated)

Example:

Permanent LS failure (see Figure 4), TSLS = 5 × TDP: the strategy of the Sign-Of-

Life failure is explained in chapter 5.1.4:

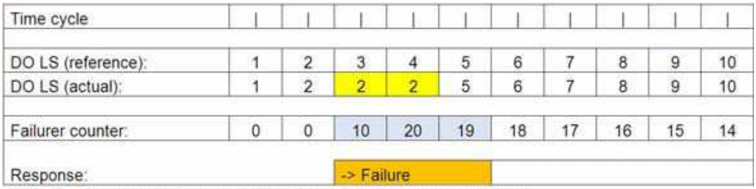


Time cycle	|	|	|	|	|	|	|	|	|	|
DO LS (reference):	1	2	3	4	5	6	7	8	9	10
DO LS (actual):	1	2	2	2	2	2	2	2	2	2
Failurer counter:	0	0	10	20	30	40	50	50	50	50
Response:			-> Failure				-> Switch-off			

Figure 4 - Example: Permanent failure of the DO LS

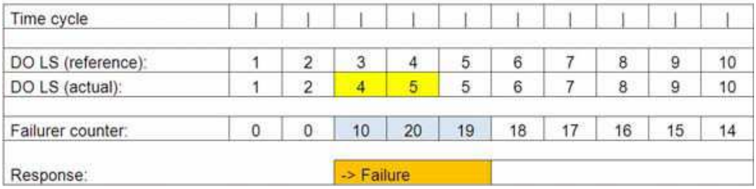
Example:

Temporary LS failure (see Figure 5 and Figure 6), TSLS = 5 × TDP: the strategy of the Sign-Of-Life failure is explained in chapter 5.1.4:



Time cycle	|	|	|	|	|	|	|	|	|	|
DO LS (reference):	1	2	3	4	5	6	7	8	9	10
DO LS (actual):	1	2	2	2	5	6	7	8	9	10
Failurer counter:	0	0	10	20	19	18	17	16	15	14
Response:			-> Failure							

Figure 5 – Example: Temporary failure of the DO LS (negative deviation)



Time cycle	|	|	|	|	|	|	|	|	|	|
DO LS (reference):	1	2	3	4	5	6	7	8	9	10
DO LS (actual):	1	2	4	5	5	6	7	8	9	10
Failurer counter:	0	0	10	20	19	18	17	16	15	14
Response:			-> Failure							

Figure 6 - Example: Temporary failure of the DO LS (positive deviation; double step)

5.2.4 Counting strategy for the Sign-Of-Life failure counter

The strategy which is applied in order to prevent fast shuntdown for a sporadically faulted control- ler or DO application is described in the following text. This strategy guarantees that at least a specific percentage of the telegrams shall be valid before a Drive Axis is powered down. A counter is defined on the DO side in which for each deviation (independently of whether it is a positive or negative deviation) between the expected and actually transferred value for the con- troller Sign-Of-Life, it is incremented by ten. For each additional deviation, the counter is again incremented by ten. If a deviation between the expected and received controller Sign-Of-Life is not recognized, the counter is decreased by one. The minimum value which may then be count- ed down to is zero. This is simultaneously the value from which counting is started. This method ensures that more than 90 % of the telegrams transferred in continuous operation originate from an undisturbed controller application.

Profile parameter 925 (axis-specific, data type Unsigned16) may be used to set a maximum on how many consecutive controller Sign-Of-Life failures may occur (for an initial counter value of zero and without any intermediate valid sequences) without failure of a Drive Axis.

Depending on the previous history, it is possible that just a few controller Sign-Of-Life failures are sufficient to cause a failure of a Drive Axis. If the Drive Axis is powered-down, the Sign-Of-Life failure counter maintains its value up to the start of the re-synchronization operation.

In the example in Figure 7, the Sign-Of-Life failure counter in the Drive Axis is viewed over time with respect to the transferred controller Sign-Of-Life. The maximum number of controller Sign-Of-Life failures which may be tolerated was set to three in parameter 925.

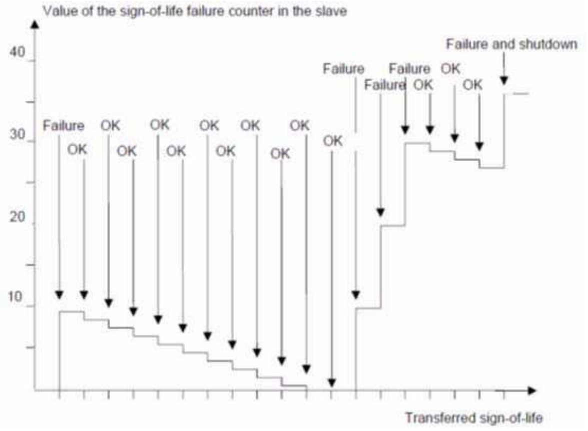


Figure 7 - Value of the DO Sign-Of-Life failure counter (axis-specific) with respect to the transferred controller Sign-Of-Life

The same strategy is recommended when monitoring the DO Sign-Of-Life in the controller. However, it has not been defined with which parameter the maximum number of tolerable DO Sign-Of-Life character failures may be parameterized.

5.2.5 Error codes in G1_XIST2

Error codes are sent in G1_XIST2 if an error occurs.

NOTE!

In Clock cycle synchronous applications the encoder additionally indicates the error described by error code 0x0F04 (Synchronization fault) by setting the encoder's Sign-Of-Life to zero (S-LS = 0)

G1_XIST2	Meaning	Explanation
0x0F04	Synchronization fault	The number of permissible failures for the bus cycle signal was exceeded.

5. 3 Base Mode Parameter Access

5.3.1 General

In this subclause, the access to parameters via the "Base Mode" is defined. A request language will be defined for the access. The requests and the replies are transmitted acyclically by use of the "Acyclic Data Exchange" mechanism of the Communication System.

The Base Mode Parameter Access exists because of compatibility reasons due to former PROFIdrive profile and every drive shall be able to handle the Base Mode Parameter Access (mandatory).

5.3.2 General characteristics

- 16-bit wide address each for parameter number and subindex.
- Transmission of complete arrays or parts of them, or the entire parameter description.
- Transmission of different parameters in one access (multi-parameter requests).
- Always just one parameter request is being processed at a time (no pipelining).
- A parameter request/parameter response shall fit in a data block (240 bytes default.) The requests/replies are not split-up over several data blocks. The maximum length of the data blocks may be less than 240 bytes depending on Device characteristics or bus configuration.
- No spontaneous messages will be transmitted.
- For optimized simultaneous access to different parameters (for example, operator interface screen contents), "multi-parameter" requests will be defined.
- There are no cyclic parameter requests.
- After run-up, the profile-specific parameters shall be at least readable in every state.

5.3.3 DO addressing modes

The Base Mode Parameter Access is defined with two different DO address modes according to the following definition:

- Base Mode Parameter Access - Local: In this address mode, only the local parameters of the DO are accessible, to which the CO, where the parameter access point is attached, is related. Access of all global parameters is also possible. The DO-ID in the parameter request header is of no significance.
- Base Mode Parameter Access - Global: In this address mode, all parameters of the Drive Unit are accessible, to which the CO, where the parameter access point is attached, is related. The DO-ID in the parameter request is used for accessing of local parameters inside the Drive Unit. For access of global parameters, the DO-ID 0 may also be used. This address mode serves for compatibility reasons (PROFIBUS) and should not be used by new PROFINET IO controller and Supervisor application processes.

5.3.4 Parameter requests and parameter responses

A parameter request consists of three segments:

Request header

ID for the request and number of parameters which are accessed. Multi-Axis and Modular drives, Addressing of one DO.

Parameter address

Addressing of a parameter. If several parameters are accessed, there are correspondingly many parameter addresses. The parameter address appears only in the request, not in the response.

Parameter value

Per addressed parameter, there is a segment for the parameter values. Depending on the request ID, parameter values appear only in either the request or in the reply.

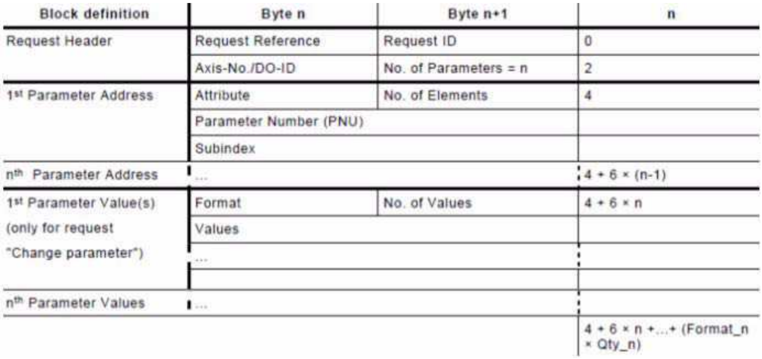
The following telegram contents are displayed in words (a word or 2 bytes per line). Words or double words will have the most significant byte being transmitted first (big endian) (see Figure 8). Words and double words:

Word:	Byte 1	Byte 2
Double word:	Byte 1	Byte 2
	Byte 3	Byte4

Figure 8 - Byte order for Words and Double words

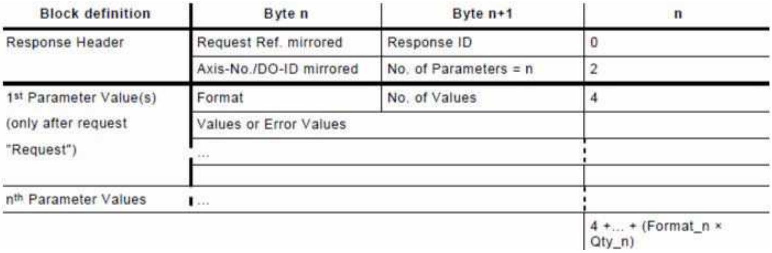
According to the Base Mode Parameter Access, the structure of the parameter request and parameter response is shown in the next tables.

Base mode parameter request:



Block definition	Byte n	Byte n+1	n
Request Header	Request Reference	Request ID	0
	Axis-No./DO-ID	No. of Parameters = n	2
1st Parameter Address	Attribute	No. of Elements	4
	Parameter Number (PNU)		
	Subindex		
nth Parameter Address	...		4 + 6 × (n-1)
1st Parameter Value(s) (only for request "Change parameter")	Format	No. of Values	4 + 6 × n
	Values		
	...		
nth Parameter Values	...		
			4 + 6 × n +...+ (Format_n × Qty_n)

Base mode parameter response:



Block definition	Byte n	Byte n+1	n
Response Header	Request Ref. mirrored	Response ID	0
	Axis-No./DO-ID mirrored	No. of Parameters = n	2
1st Parameter Value(s) (only after request "Request")	Format	No. of Values	4
	Values or Error Values		
	...		
nth Parameter Values	...		
			4 +... + (Format_n × Qty_n)

Request Header

- Request Reference Unique identification of the request/response pair for the master. The master changes the request reference with each new request (for example, modulo 255). The slave mirrors the request reference in the response.
- Request ID two IDs are defined:
  - Request parameter
  - Change parameter

  A parameter change may be stored either in volatile or non-volatile RAM according to the device. A changed parameter that is stored in volatile RAM may first be stored in ROM with parameter P971. The differentiation Value/Description/Text is added to the address as an attribute. The differentiation Word/Double Word is added to the parameter values as a format. For the differentiation Single/Array Parameter, refer to "No. of Elements" in the parameter address.
- Response ID

  Mirroring of the request ID with supplement information whether the request was executed positively or negatively.
  - Request parameter positive
  - Request parameter negative (it was not possible to execute the request, entirely or partially)
  - Change parameter positive
  - Change parameter negative (it was not possible to execute the request, entirely or partially)

If the response is negative, error numbers are entered per partial response instead of values.

- Axis-No./DO-ID For Base Mode Parameter Access - Local: irrelevant; In the parameter response, the DOID out of the request is mirrored.
- For Base Mode Parameter Access - Global: DO addressing information used for Multi-Axis or Modular drives. This enables various axes/DOs to be able to be accessed each with a dedicated parameter number space in the drive via the same PAP.
- No. of Parameters

  In the case of multi-parameter requests, specifying the number of the following Parameter Address and/or Parameter Value areas. For single requests the No. of parameters = 1. Default value range 1 to 39. The value range may be reduced or extended, which shall be indicated by P974. Notice, that for a multi-parameter request the PROFIdrive Drive Unit shall arrange the parameter value areas in the response message in the same order as in the corresponding multi-parameter request message.

Parameter Address

- **Attribute**

  Type of object which is being accessed. Value range:

  - Value
  - Description
  - Text
- **Number of Elements**

  Number of array elements that are accessed or length of string which is accessed.

  Default value range 0, 1 to 234. The value range may be reduced or extended which shall be indicated by P974.

  Special Case Number of Elements = 0:

  If values are accessed: recommended for non-indexed parameters.
- **Parameter Number**

  Addresses the parameter that is being accessed. Value range: 1 to 65535.
- **Subindex**

  Addresses the first array element of the parameter or the beginning of a string access or the text array, or the description element that is being accessed. Value range: 0 to 65 535.

Parameter Value

- Format

  Format and number specify the location in the telegram to which subsequent values are assigned.

  Value range:

  - Zero (without values as positive partial response to a change request)
  - Data type
  - Error (as negative partial response)
  - Instead of a data type, the following are possible:

- Byte (for description and texts)

- Word

- Double word

- **Number of Values**

  Number of the following values or number of the following data type elements (number of octets in case of OctetString). In case of write request of OctetString, the correct length shall be supplied otherwise the drive shall responds with error 0x18, "number of values are not consistent" (see Table 32).

- Values

  The values of the parameter

  If the values consist of an odd number of bytes, a zero byte is appended in order to secure the word structure of the telegrams.

  In the case of a **positive partial response**, the parameter value contains the following:

  - Format = (Data Type or Byte, Word, Double Word)
  - Number of values
  - the values

  In the case of a **negative partial response**, the parameter value contains the following:

  - Format = error
  - No. of values = 1
  - Value = error value = error number

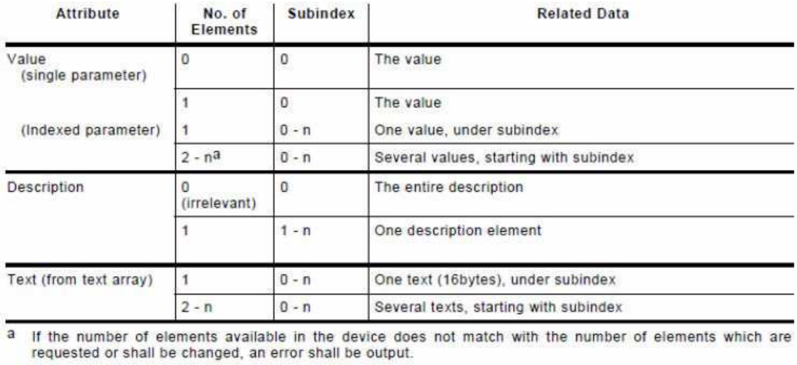
  In the case of a **negative response**, the parameter value may contain the following:

  - Format = error
  - No. of values = 2
  - Value 1 = Error Value 1: error number
  - Value 2 = Error Value 2: subindex of the first array element where the error occurs
  - Purpose: after a faulty write access to an array, not all values shall be repeated)

  In the case of a **positive partial response without values**, the parameter value contains the following:

  - Format = zero
  - Number of values = 0
  - (no values)

Not all combinations consisting of attribute, number of elements, and subindex are permitted (refer to next table). A parameter which is not indexed in the profile may be realized with indices in the Drive Unit, if the response to a Parameter Access is profile-specific.

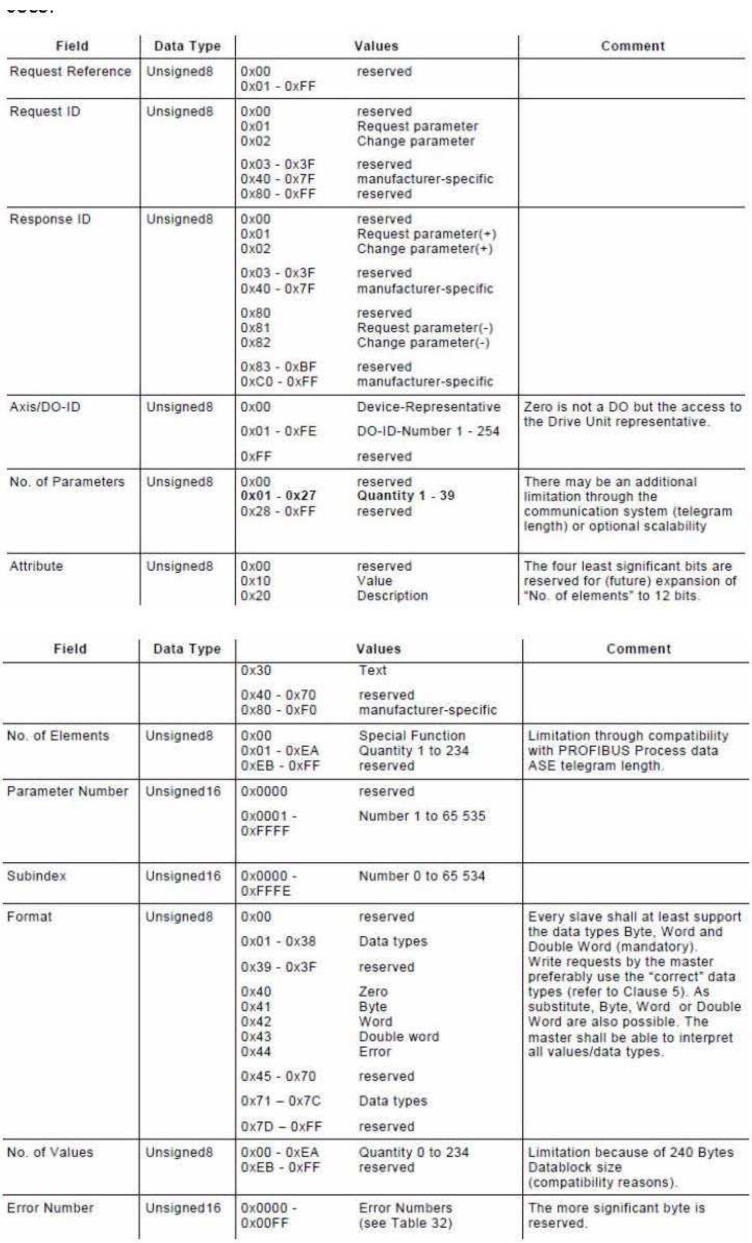


Attribute	No. of Elements	Subindex	Related Data
Value (single parameter)	0	0	The value
	1	0	The value
(Indexed parameter)	1	0 - n	One value, under subindex
	2 - n[a]	0 - n	Several values, starting with subindex
Description	0 (irrelevant)	0	The entire description
	1	1 - n	One description element
Text (from text array)	1	0 - n	One text (16bytes), under subindex
	2 - n	0 - n	Several texts, starting with subindex

[a] If the number of elements available in the device does not match with the number of elements which are requested or shall be changed, an error shall be output.

5.3.5 Coding

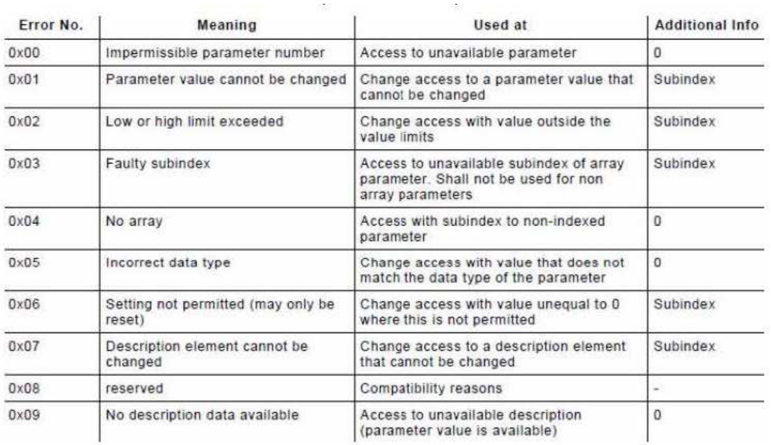
The codingof the fields in parameter request /parameter responseof Base IVbdeParameter Access:



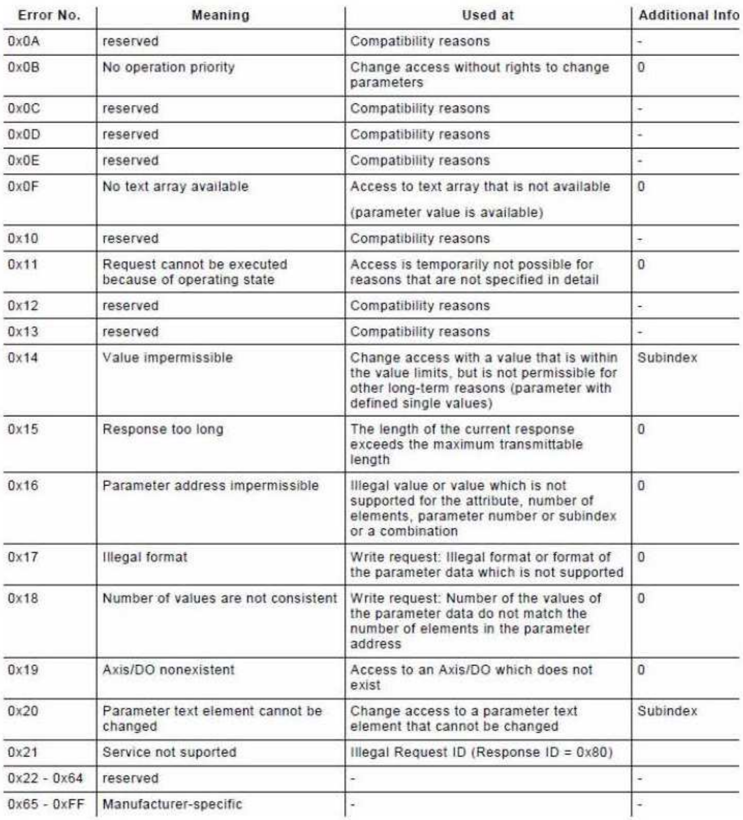
Field	Data Type	Values		Comment
Request Reference	Unsigned8	0x00 0x01 - 0xFF	reserved	
Request ID	Unsigned8	0x00 0x01 0x02 0x03 - 0x3F 0x40 - 0x7F 0x80 - 0xFF	reserved Request parameter Change parameter reserved manufacturer-specific reserved	
Response ID	Unsigned8	0x00 0x01 0x02 0x03 - 0x3F 0x40 - 0x7F 0x80 0x81 0x82 0x83 - 0xBF 0xC0 - 0xFF	reserved Request parameter(+) Change parameter(+) reserved manufacturer-specific reserved Request parameter(-) Change parameter(-) reserved manufacturer-specific	
Axis/DO-ID	Unsigned8	0x00 0x01 - 0xFE 0xFF	Device-Representative DO-ID-Number 1 - 254 reserved	Zero is not a DO but the access to the Drive Unit representative.
No. of Parameters	Unsigned8	0x00 **0x01 - 0x27** 0x28 - 0xFF	reserved **Quantity 1 - 39** reserved	There may be an additional limitation through the communication system (telegram length) or optional scalability
Attribute	Unsigned8	0x00 0x10 0x20 0x30 0x40 - 0x70 0x80 - 0xF0	reserved Value Description Text reserved manufacturer-specific	The four least significant bits are reserved for (future) expansion of "No. of elements" to 12 bits.
No. of Elements	Unsigned8	0x00 0x01 - 0xEA 0xEB - 0xFF	Special Function Quantity 1 to 234 reserved	Limitation through compatibility with PROFIBUS Process data ASE telegram length.
Parameter Number	Unsigned16	0x0000 0x0001 - 0xFFFF	reserved Number 1 to 65 535	
Subindex	Unsigned16	0x0000 - 0xFFFE	Number 0 to 65 534	
Format	Unsigned8	0x00 0x01 - 0x38 0x39 - 0x3F 0x40 0x41 0x42 0x43 0x44 0x45 - 0x70 0x71 – 0x7C 0x7D – 0xFF	reserved Data types reserved Zero Byte Word Double word Error reserved Data types reserved	Every slave shall at least support the data types Byte, Word and Double Word (mandatory). Write requests by the master preferably use the "correct" data types (refer to Clause 5). As substitute, Byte, Word or Double Word are also possible. The master shall be able to interpret all values/data types.
No. of Values	Unsigned8	0x00 - 0xEA 0xEB - 0xFF	Quantity 0 to 234 reserved	Limitation because of 240 Bytes Datablock size (compatibility reasons).
Error Number	Unsigned16	0x0000 - 0x00FF	Error Numbers (see Table 32)	The more significant byte is reserved.

The device shall output an error, if reserved values are accessed.

The error numbers in Base Mode parameter responses:



Error No.	Meaning	Used at	Additional Info
0x00	Impermissible parameter number	Access to unavailable parameter	0
0x01	Parameter value cannot be changed	Change access to a parameter value that cannot be changed	Subindex
0x02	Low or high limit exceeded	Change access with value outside the value limits	Subindex
0x03	Faulty subindex	Access to unavailable subindex of array parameter. Shall not be used for non array parameters	Subindex
0x04	No array	Access with subindex to non-indexed parameter	0
0x05	Incorrect data type	Change access with value that does not match the data type of the parameter	0
0x06	Setting not permitted (may only be reset)	Change access with value unequal to 0 where this is not permitted	Subindex
0x07	Description element cannot be changed	Change access to a description element that cannot be changed	Subindex
0x08	reserved	Compatibility reasons	-
0x09	No description data available	Access to unavailable description (parameter value is available)	0



Error No.	Meaning	Used at	Additional Info
0x0A	reserved	Compatibility reasons	-
0x0B	No operation priority	Change access without rights to change parameters	0
0x0C	reserved	Compatibility reasons	-
0x0D	reserved	Compatibility reasons	-
0x0E	reserved	Compatibility reasons	-
0x0F	No text array available	Access to text array that is not available (parameter value is available)	0
0x10	reserved	Compatibility reasons	-
0x11	Request cannot be executed because of operating state	Access is temporarily not possible for reasons that are not specified in detail	0
0x12	reserved	Compatibility reasons	-
0x13	reserved	Compatibility reasons	-
0x14	Value impermissible	Change access with a value that is within the value limits, but is not permissible for other long-term reasons (parameter with defined single values)	Subindex
0x15	Response too long	The length of the current response exceeds the maximum transmittable length	0
0x16	Parameter address impermissible	Illegal value or value which is not supported for the attribute, number of elements, parameter number or subindex or a combination	0
0x17	Illegal format	Write request: Illegal format or format of the parameter data which is not supported	0
0x18	Number of values are not consistent	Write request: Number of the values of the parameter data do not match the number of elements in the parameter address	0
0x19	Axis/DO nonexistent	Access to an Axis/DO which does not exist	0
0x20	Parameter text element cannot be changed	Change access to a parameter text element that cannot be changed	Subindex
0x21	Service not suported	Illegal Request ID (Response ID = 0x80)	
0x22 - 0x64	reserved	-	-
0x65 - 0xFF	Manufacturer-specific	-	-

In general, every PROFIdrive Drive Unit shall support Base Mode parameter read and write requests with the data types, Byte, Word and Double Word (mandatory). If the PROFIdrive Drive Unit also supports additional data types, it shall behave in the following manner:

- In case of a parameter read request, it shall signal the corresponding data type in the read response.
- In case of a parameter write request it shall check the data type and signal an error if parameter types do not match.

If the PROFIdrive Drive Unit does not support additional data types, it shall behave in the following manner:

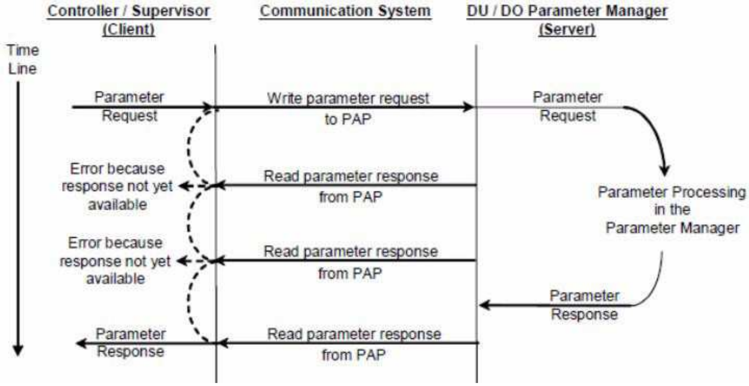
- "It rejects the parameter write request with an error response if data types do not match.

The error numbers 0x00 - 0x13 are taken from PROFIdrive Profile, Version 2. Values that cannot be assigned are reserved for future use. If an error with error number 0x05, 0x16, 0x17 or 0x18 occurs while processing a multi parameter change value request, all further parameter requests in the multi parameter request shall be aborted.

5.3.6 Data flow

The transfer of the Base Mode Parameter Access request to the DO/DU parameter manager is done by writing the request data structure onto the Parameter Access Point (PAP) data record. When the write operation finishes, the parameter manager state machine is triggered according to the next Figure.

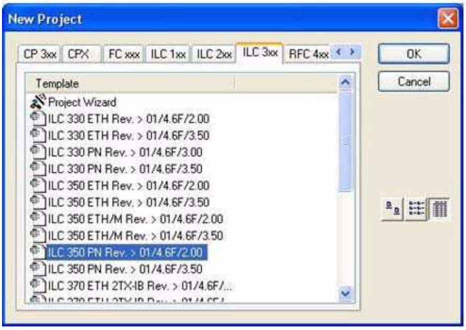
The transfer of the Base Mode Parameter Access response from the DO/DU parameter manager back to the client is done by reading the response data structure out of the Parameter Access Point (PAP) data record. The response to the read access is dependent on the internal state of the parameter manager according to the next Figure.


Controller / Supervisor (Client)
Communication System
DU / DO Parameter Manager (Server)
Time Line
Parameter Request
Write parameter request to PAP
Parameter Request
Error because response not yet available
Read parameter response from PAP
Parameter Processing in the Parameter Manager
Error because response not yet available
Read parameter response from PAP
Parameter Response
Parameter Response
Read parameter response from PAP

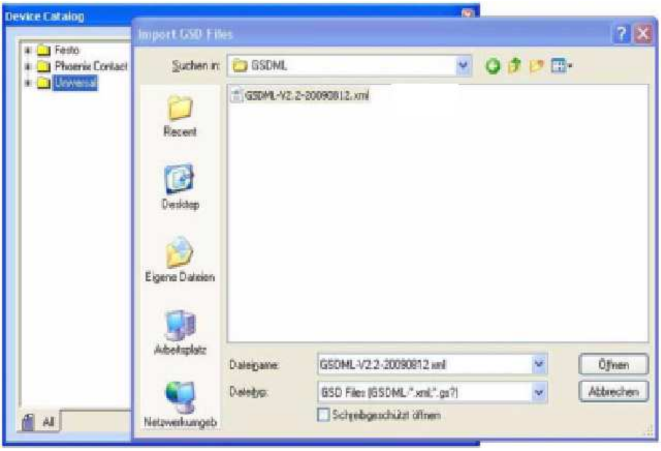
6 Configuring with PC Worx

In the following chapter the configuration of the Hohner encoder with the configuration tool is shown exemplarily. In this example PC Worx Version 6.00.25 SP2.56 with workaround for GSDML import are used. If there are questions about details please contact the manufactur- er.

Creating a New PNIO Project:


New Project
CP 3xx
CPX
FC xxx
ILC 1xx
ILC 2xx
ILC 3xx
RFC 4xx
OK
Cancel
Template
Project Wizard
ILC 330 ETH Rev. > 01/4.6F/2.00
ILC 330 ETH Rev. > 01/4.6F/3.50
ILC 330 PN Rev. > 01/4.6F/3.00
ILC 330 PN Rev. > 01/4.6F/3.50
ILC 350 ETH Rev. > 01/4.6F/2.00
ILC 350 ETH Rev. > 01/4.6F/3.50
ILC 350 ETH/M Rev. > 01/4.6F/2.00
ILC 350 ETH/M Rev. > 01/4.6F/3.50
ILC 350 PN Rev. > 01/4.6F/2.00
ILC 350 PN Rev. > 01/4.6F/3.50
ILC 370 ETH 2TX-IB Rev. > 01/4.6F/...

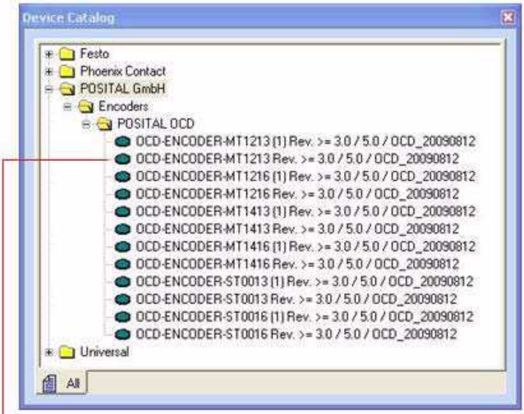
Installing the GSDML file



Insert the PROFINET IO Encoder below the PROFINET IO controller node.

- If the device catalog is hidden, show it by selecting the "View/Device Catalog" menu.
- Open the "Hohner" device catalog.
  (MT = Multi-Turn, ST = Single-Turn, (1) without PDev = no IRT)
  PDev necessary for extended setup (AutoCrossing, AutoNegoiation, FastStartUp, Topology

for IRT (neighborhood detection, port setup)



Device Catalog

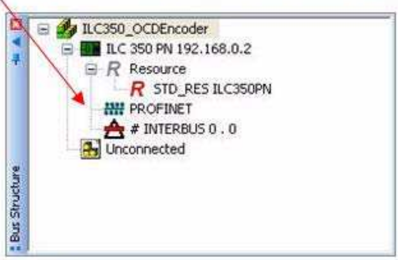
- Festo
- Phoenix Contact
- POSITAL GmbH
  - Encoders
    - POSITAL OCD
      - OCD-ENCODER-MT1213 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1213 Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1216 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1216 Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1413 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1413 Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1416 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-MT1416 Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-ST0013 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-ST0013 Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-ST0016 (1) Rev. >= 3.0 / 5.0 / OCD_20090812
      - OCD-ENCODER-ST0016 Rev. >= 3.0 / 5.0 / OCD_20090812
- Universal

Choose your Encoder type from Device Catalog list and insert it to Profinet Network:

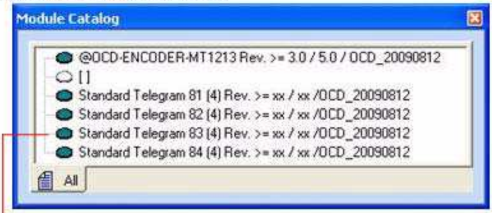
Step 1:

Step 2: Open Module Catalog and select device in device catalog

Step 3: Select one of the Standard telegram and insert it per drag and drop:

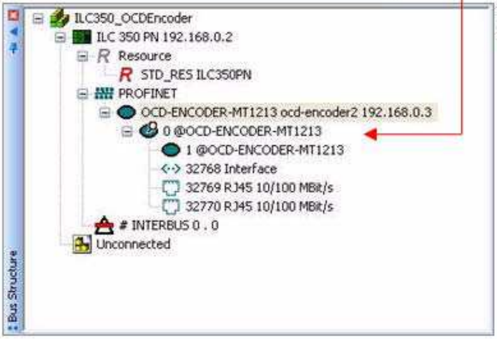


- ILC350_OCDEncoder
  - ILC 350 PN 192.168.0.2
    - Resource
      - STD_RES ILC350PN
    - PROFINET
    - # INTERBUS 0 . 0
  - Unconnected



Module Catalog

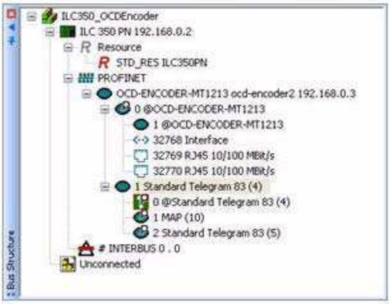
- @OCD-ENCODER-MT1213 Rev. >= 3.0 / 5.0 / OCD_20090812
- [ ]
- Standard Telegram 81 (4) Rev. >= xx / xx /OCD_20090812
- Standard Telegram 82 (4) Rev. >= xx / xx /OCD_20090812
- Standard Telegram 83 (4) Rev. >= xx / xx /OCD_20090812
- Standard Telegram 84 (4) Rev. >= xx / xx /OCD_20090812



- ILC350_OCDEncoder
  - ILC 350 PN 192.168.0.2
    - Resource
      - STD_RES ILC350PN
    - PROFINET
      - OCD-ENCODER-MT1213 ocd-encoder2 192.168.0.3
        - 0 @OCD-ENCODER-MT1213
          - 1 @OCD-ENCODER-MT1213
          - 32768 Interface
          - 32769 RJ45 10/100 MBit/s
          - 32770 RJ45 10/100 MBit/s
    - # INTERBUS 0 . 0
  - Unconnected

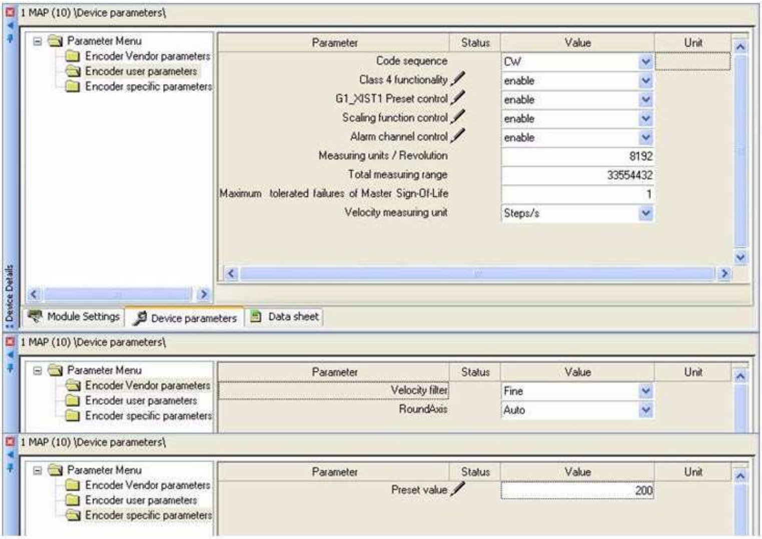
IP-Address will set automatically, but can be changed manual by user.

Hardcopy version with PDev:



- ILC350_OCDEncoder
  - ILC 350 PN 192.168.0.2
    - Resource
      - STD_RES ILC350PN
    - PROFINET
      - OCD-ENCODER-MT1213 ocd-encoder2 192.168.0.3
        - 0 @OCD-ENCODER-MT1213
          - 1 @OCD-ENCODER-MT1213
          - 32768 Interface
          - 32769 RJ45 10/100 MBit/s
          - 32770 RJ45 10/100 MBit/s
        - 1 Standard Telegram 83 (4)
          - 0 @Standard Telegram 83 (4)
          - 1 MAP (10)
          - 2 Standard Telegram 83 (5)
    - # INTERBUS 0 . 0
  - Unconnected

Setting Encoder Parameters in Device Details dialog:



1 MAP (10) \Device parameters\

Parameter Menu
- Encoder Vendor parameters
- Encoder user parameters
- Encoder specific parameters

Parameter	Status	Value	Unit
Code sequence		CW	
Class 4 functionality		enable	
G1_XIST1 Preset control		enable	
Scaling function control		enable	
Alarm channel control		enable	
Measuring units / Revolution		8192	
Total measuring range		33554432	
Maximum tolerated failures of Master Sign-Of-Life		1	
Velocity measuring unit		Steps/s	

1 MAP (10) \Device parameters\

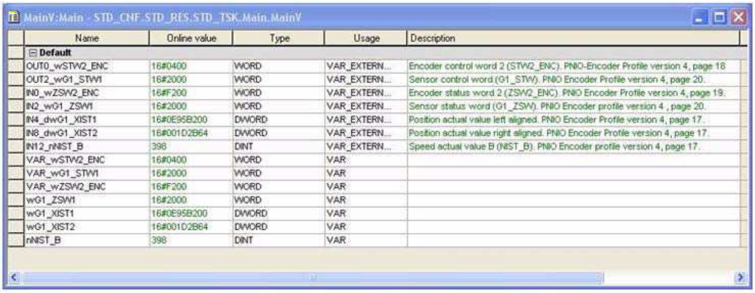
Parameter	Status	Value	Unit
Velocity filter		Fine	
RoundAxis		Auto	

1 MAP (10) \Device parameters\

Parameter	Status	Value	Unit
Preset value		200	

Mapping Variable to the Standard telegram (I/O Data)

----> Create new parameter table:

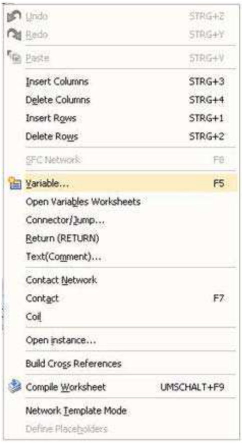


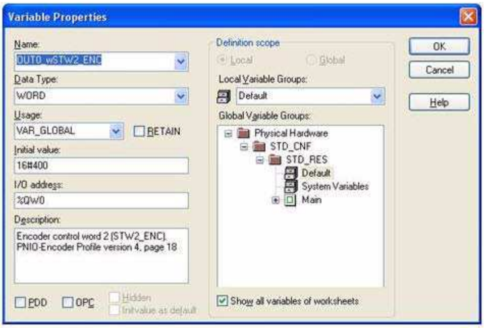
MainV:Main - STD_CNF.STD_RES.STD_TSK.Main.MainV

Name	Online value	Type	Usage	Description
Default				
OUT0_wSTW2_ENC	16#0400	WORD	VAR_EXTERN...	Encoder control word 2 (STW2_ENC). PNIO-Encoder Profile version 4, page 18
OUT2_wG1_STW1	16#2000	WORD	VAR_EXTERN...	Sensor control word (G1_STW). PNIO Encoder Profile version 4, page 20.
IN0_wZSW2_ENC	16#F200	WORD	VAR_EXTERN...	Encoder status word 2 (ZSW2_ENC). PNIO Encoder Profile version 4, page 19.
IN2_wG1_ZSW1	16#2000	WORD	VAR_EXTERN...	Sensor status word (G1_ZSW). PNIO Encoder profile version 4 , page 20.
IN4_dwG1_XIST1	16#0E95B200	DWORD	VAR_EXTERN...	Position actual value left aligned. PNIO Encoder Profile version 4, page 17.
IN8_dwG1_XIST2	16#001D2B64	DWORD	VAR_EXTERN...	Position actual value right aligned. PNIO Encoder Profile version 4, page 17.
IN12_nNIST_B	398	DINT	VAR_EXTERN...	Speed actual value B (NIST_B). PNIO Encoder profile version 4, page 17.
VAR_wSTW2_ENC	16#0400	WORD	VAR	
VAR_wG1_STW1	16#2000	WORD	VAR	
VAR_wZSW2_ENC	16#F200	WORD	VAR	
wG1_ZSW1	16#2000	WORD	VAR	
wG1_XIST1	16#0E95B200	DWORD	VAR	
wG1_XIST2	16#001D2B64	DWORD	VAR	
nNIST_B	398	DINT	VAR	

Sample:

Right click and insert new Global variable and map to the I/O Address:




Variable Properties

Name: OUT0_wSTW2_ENC

Data Type: WORD

Usage: VAR_GLOBAL □ RETAIN

Initial value: 16#400

I/O address: %QW0

Description: Encoder control word 2 (STW2_ENC). PNIO-Encoder Profile version 4, page 18

□ PDD □ OPC □ Hidden □ Initvalue as default

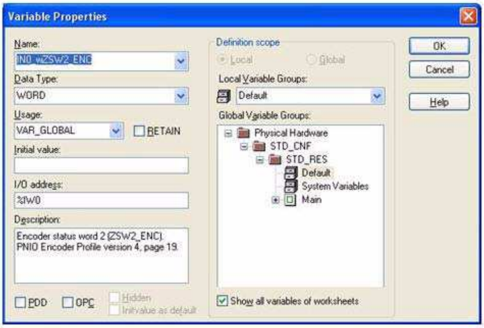
Definition scope: ● Local ○ Global

Local Variable Groups: Default

Global Variable Groups:

- Physical Hardware
  - STD_CNF
    - STD_RES
      - Default
      - System Variables
    - Main

☑ Show all variables of worksheets


Variable Properties

Name: IN0_wZSW2_ENC

Data Type: WORD

Usage: VAR_GLOBAL □ RETAIN

Initial value:

I/O address: %IW0

Description: Encoder status word 2 (ZSW2_ENC). PNIO Encoder Profile version 4, page 19.

□ PDD □ OPC □ Hidden □ Initvalue as default

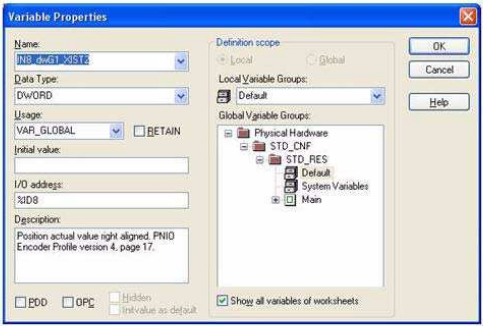
Definition scope: ● Local ○ Global

Local Variable Groups: Default

Global Variable Groups:

- Physical Hardware
  - STD_CNF
    - STD_RES
      - Default
      - System Variables
    - Main

☑ Show all variables of worksheets


Variable Properties

Name: IN8_dwG1_XIST2

Data Type: DWORD

Usage: VAR_GLOBAL □ RETAIN

Initial value:

I/O address: %ID8

Description: Position actual value right aligned. PNIO Encoder Profile version 4, page 17.

□ PDD □ OPC □ Hidden □ Initvalue as default

Definition scope: ● Local ○ Global

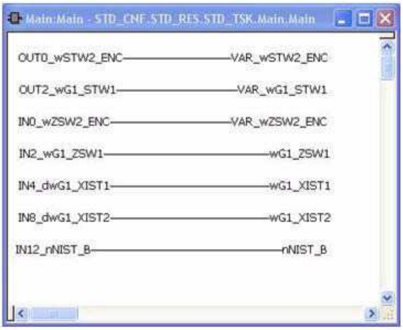
Local Variable Groups: Default

Global Variable Groups:

- Physical Hardware
  - STD_CNF
    - STD_RES
      - Default
      - System Variables
    - Main

☑ Show all variables of worksheets

Create new Variable as Local and connect to the Mapped I/O Variable with drag and drop:



Main:Main - STD_CNF.STD_RES.STD_TSK.Main.Main

OUT0_wSTW2_ENC — VAR_wSTW2_ENC

OUT2_wG1_STW1 — VAR_wG1_STW1

IN0_wZSW2_ENC — VAR_wZSW2_ENC

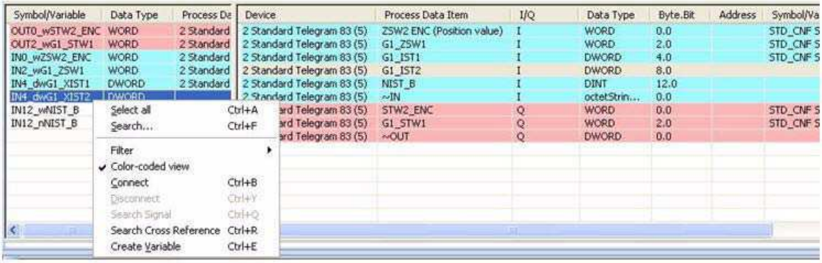
IN2_wG1_ZSW1 — wG1_ZSW1

IN4_dwG1_XIST1 — wG1_XIST1

IN8_dwG1_XIST2 — wG1_XIST2

IN12_nNIST_B — nNIST_B

Assigning the Variables to the Encoder I/O in dialog Process Data assignment:

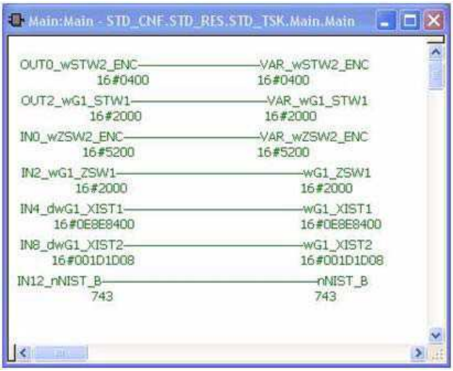


Symbol/Variable	Data Type	Process Da
OUT0_wSTW2_ENC	WORD	2 Standard
OUT2_wG1_STW1	WORD	2 Standard
IN0_wZSW2_ENC	WORD	2 Standard
IN2_wG1_ZSW1	WORD	2 Standard
IN4_dwG1_XIST1	DWORD	2 Standard
IN4_dwG1_XIST2	DWORD	
IN12_wNIST_B		
IN12_nNIST_B		

Device	Process Data Item	I/Q	Data Type	Byte.Bit	Address	Symbol/Va
2 Standard Telegram 83 (5)	ZSW2 ENC (Position value)	I	WORD	0.0		STD_CNF S
2 Standard Telegram 83 (5)	G1_ZSW1	I	WORD	2.0		STD_CNF S
2 Standard Telegram 83 (5)	G1_IST1	I	DWORD	4.0		STD_CNF S
2 Standard Telegram 83 (5)	G1_IST2	I	DWORD	8.0		
2 Standard Telegram 83 (5)	NIST_B	I	DINT	12.0		
2 Standard Telegram 83 (5)	~IN	I	octetStrin...	0.0		
ard Telegram 83 (5)	STW2_ENC	Q	WORD	0.0		STD_CNF S
ard Telegram 83 (5)	G1_STW1	Q	WORD	2.0		STD_CNF S
ard Telegram 83 (5)	~OUT	Q	DWORD	0.0		

Mark the Variable and start to connect.

Sample: Online debugging mode



Main:Main - STD_CNF.STD_RES.STD_TSK.Main.Main

OUT0_wSTW2_ENC 16#0400 — VAR_wSTW2_ENC 16#0400

OUT2_wG1_STW1 16#2000 — VAR_wG1_STW1 16#2000

IN0_wZSW2_ENC 16#5200 — VAR_wZSW2_ENC 16#5200

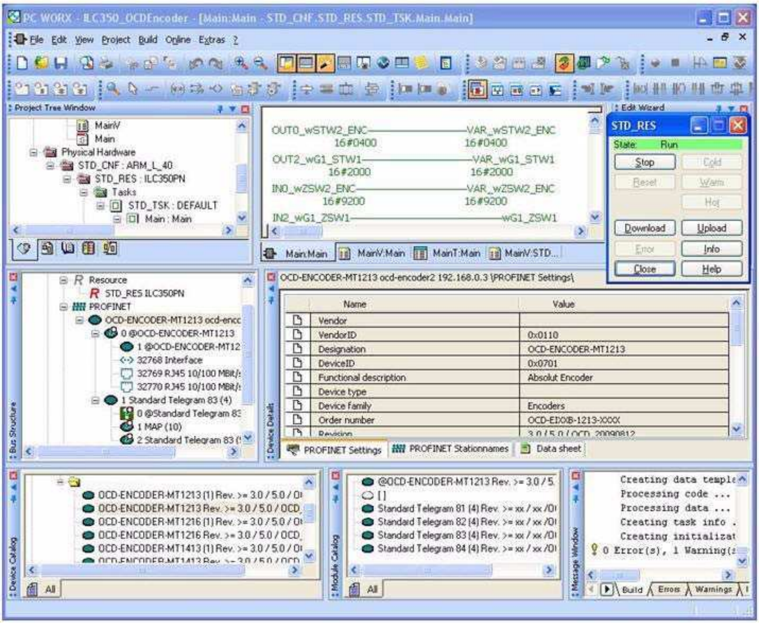
IN2_wG1_ZSW1 16#2000 — wG1_ZSW1 16#2000

IN4_dwG1_XIST1 16#0E8E8400 — wG1_XIST1 16#0E8E8400

IN8_dwG1_XIST2 16#001D1D08 — wG1_XIST2 16#001D1D08

IN12_nNIST_B 743 — nNIST_B 743

In the next hardcopy is available the complete running project:


PC WORX - ILC350_OCDEncoder - [Main:Main - STD_CNF.STD_RES.STD_TSK.Main.Main]
File Edit View Project Build Online Extras ?
Project Tree Window
MainV
Main
Physical Hardware
STD_CNF : ARM_L_40
STD_RES : ILC350PN
Tasks
STD_TSK : DEFAULT
Main : Main
Main:Main
MainV:Main
MainT:Main
MainV:STD...
Edit Wizard
STD_RES
State: Run
Stop
Cold
Reset
Warm
Hot
Download
Upload
Error
Info
Close
Help
Resource
STD_RES ILC350PN
PROFINET
OCD-ENCODER-MT1213 ocd-encc
0 @OCD-ENCODER-MT1213
1 @OCD-ENCODER-MT12
32768 Interface
32769 RJ45 10/100 MBit/
32770 RJ45 10/100 MBit/
1 Standard Telegram 83 (4)
0 @Standard Telegram 83
1 MAP (10)
2 Standard Telegram 83 (
Bus Structure
Device Details
PROFINET Settings
PROFINET Stationnames
Data sheet
Device Catalog
OCD-ENCODER-MT1213 (1) Rev. >= 3.0 / 5.0 / OI
OCD-ENCODER-MT1213 Rev. >= 3.0 / 5.0 / OCD_
OCD-ENCODER-MT1216 (1) Rev. >= 3.0 / 5.0 / OI
OCD-ENCODER-MT1216 Rev. >= 3.0 / 5.0 / OCD_
OCD-ENCODER-MT1413 (1) Rev. >= 3.0 / 5.0 / OI
OCD-ENCODER-MT1413 Rev. >= 3.0 / 5.0 / OCD
All
Module Catalog
@OCD-ENCODER-MT1213 Rev. >= 3.0 / 5.
[ ]
Standard Telegram 81 (4) Rev. >= xx / xx /OI
Standard Telegram 82 (4) Rev. >= xx / xx /OI
Standard Telegram 83 (4) Rev. >= xx / xx /OI
Standard Telegram 84 (4) Rev. >= xx / xx /OI
All
Message Window
Build
Errors
Warnings

```
OUT0_wSTW2_ENC——————VAR_wSTW2_ENC
     16#0400            16#0400
OUT2_wG1_STW1———————VAR_wG1_STW1
     16#2000            16#2000
IN0_wZSW2_ENC———————VAR_wZSW2_ENC
     16#9200            16#9200
IN2_wG1_ZSW1————————wG1_ZSW1
```

OCD-ENCODER-MT1213 ocd-encoder2 192.168.0.3 \PROFINET Settings\

Name	Value
Vendor	
VendorID	0x0110
Designation	OCD-ENCODER-MT1213
DeviceID	0x0701
Functional description	Absolut Encoder
Device type	
Device family	Encoders
Order number	OCD-EIXXB-1213-XXXX
Revision	3.0 / 5.0 / OCD_20090812

```
    Creating data templ
    Processing code ...
    Processing data ...
    Creating task info .
    Creating initializat
0 Error(s), 1 Warning(s
```

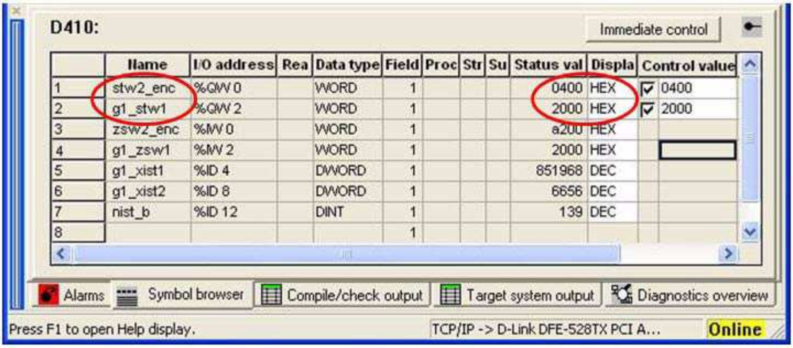
NOTE:

If some encoder parameter (i.e. Totalresolution) in the table 1 MAP device parameter missing, then contact PhoenixContact for an additional workaround.

7 FAQ

1. **Question:** Why don't I get back positions values in g1_xist2?

   Answer: According the encoder profile it is necessary to set Bit 10 to "1" in stw2 and bit 13 in g1_stw1. See the next hardcopy. Or an error is given and is not confirmed.



D410:

	Name	I/O address	Rea	Data type	Field	Proc	Str	Su	Status val	Displa	Control value
1	stw2_enc	%QW 0		WORD	1				0400	HEX	☑ 0400
2	g1_stw1	%QW 2		WORD	1				2000	HEX	☑ 2000
3	zsw2_enc	%IW 0		WORD	1				a200	HEX	
4	g1_zsw1	%IW 2		WORD	1				2000	HEX	
5	g1_xist1	%ID 4		DWORD	1				851968	DEC	
6	g1_xist2	%ID 8		DWORD	1				6656	DEC	
7	nist_b	%ID 12		DINT	1				139	DEC	
8					1						

Press F1 to open Help display.

TCP/IP -> D-Link DFE-528TX PCI A...

Online

2. **Question:** Why don't work the neighboring detection?

   Answer: The encoder supports the LLDP protocol. But it is necessary to use the newest version of Step 7 or Simotion Scout. The flag "Device replacement without replacement medium" must be active in the Properties window under General.

3. **Question:** What is to do if one encoder has to replace by a new one?

   Answer: See answer 2 or chapter 4.3.

4. **Question:** In the application is a single-turn encoder in use. Can this replaced by a multi-turn encoder too and what is to do?

   Answer: There is nothing to do. A multi-turn can substitute a single-turn automatically.

5. **Question:** Why don't work the communication between encoder and PLC correct?

   Answer: The Firmware of the PLC and the STEP 7 (with minimum Hot fix 6) or Simotion Scout has to use the newest firmware that support IRT 2.2 or Stack version 3.1 for Ertec devices.

6. **Question:** What is the easiest way to set the preset value?

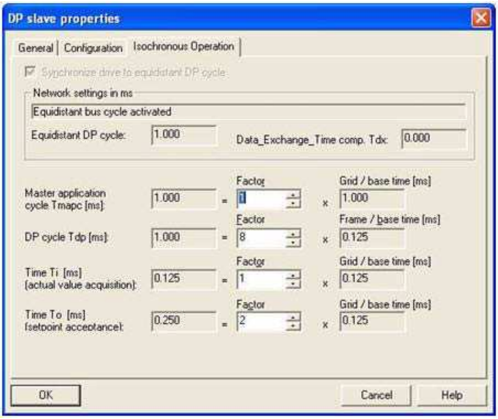
   Answer: Use Telegram 860. See chapter about Preset setting.

7. **Question:** Why can I not set the preset value or the other parameters?

   Answer: Only in class 3 with activated class 4 functionality or class 4 is it possible to set the parameters. If necessary it is important to use class 4 or to activate the class 4 functionality in the Hardware Manager.

8. **Question**: On using the D410 the error "Synchronization error between Profibus and Profinet" popped up. What is to do?

   Answer: Both systems have to use the same cycle time. If the Profinet cycle time amounts 1 ms then must use the Profibus the same time. See the next Hardcopy with the settings for 1 ms.



☑ Synchronize drive to equidistant DP cycle

Network settings in ms

Equidistant bus cycle activated

Equidistant DP cycle: 1.000

Data_Exchange_Time comp. Tdx: 0.000

			Factor		Grid / base time [ms]
Master application cycle Tmapc [ms]:	1.000	=	1	x	1.000
			Factor		Frame / base time [ms]
DP cycle Tdp [ms]:	1.000	=	8	x	0.125
			Factor		Grid / base time [ms]
Time Ti [ms] (actual value acquisition):	0.125	=	1	x	0.125
			Factor		Grid / base time [ms]
Time To [ms] (setpoint acceptance):	0.250	=	2	x	0.125

9. **Question**: What is the different between Encoder Profil 4.0 and 4.1?

   Answer:

	4.0	4.1
G_XIST1	Position value, left alligned	Counter value, right aligned
GSDML		
MAP Parameter	Inclusive Telegrams	Separate Telegrams