User's guide EM58 PT HS58, HM58 PT PICE VIEW





Smart encoders & actuators

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Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects of both Lika device and interface are coloured in ORANGE;
- alarms are coloured in **RED**;
- states are coloured in FUCSIA.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

	This icon, followed by the word WARNING , is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment.
i	This icon, followed by the word NOTE , is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence.
i	This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word EXAMPLE when instructions for setting parameters are accompanied by examples to clarify the explanation.

Preliminary information

This guide is designed to provide the most complete information the operator needs to correctly and safely install and operate the following encoders **fitted with Profinet interface**:

EMxxx13/16384PT-xx	(DAP 1 : multiturn encoder 13 +14 bits)
HSxxx18/PT-xx	(DAP 2 : singleturn encoder 18 bits)
HMxxx16/16384PT-xx	(DAP 3 : multiturn encoder 16 +14 bits)

To make it easier to read the text, this guide can be divided into some main sections.

In the first section (from chapter 1 to chapter 4) general information concerning the safety, the mechanical installation and the electrical connection.

In the second section (chapter 5) information on how to install and configure the encoder in the STEP 7 development environment as well as tips for setting up and running properly and efficiently the unit are provided.

In the third section (from chapter 6 to chapter 12) both general and specific information is given on the Profinet interface. In this section the interface features and the parameters implemented in the unit are fully described.

In the last section (from chapter 13 to chapter 15) some examples of programming and advanced maintenance information are explained.



Lika Electronic Profinet encoder documentation is complete with an **example project** provided free of charge. This program is designed to make your own project planning, programming, communication and diagnostics with the STEP 7 V5.5 + SP1 development environment user-friendly and reliable. You can find it in the Lika Step 7 Profinet example project.zip compressed file contained in the SW Hx58x PT.zip file.

Profinet certificates



Glossary of Profinet terms

PROFINET IO, like many other networking systems, has a set of unique terminology. Table below contains a few of the technical terms used in this guide to describe the PROFINET IO interface. Sometimes they also refer more specifically to the S7 programming environment. They are listed in alphabetical order.

Acyclic Communications	Unscheduled, on demand communications. Diagnostic messages from an IO Supervisor to an IO Device are Acyclic. Refer to page 79.
AP	Application Process - The application process running in the device. PROFINET supports a default Application Processes and additional profile specific application processes.
API	The value of the API (Application Process Identifier) parameter specifies the application that is processing the IO data. PROFINET standard IEC 61158 assigns profiles to certain APIs (PROFIdrive, PROFIslave) which are defined by the PROFINET User Organization. The standard API is 0.
Application class	An application class specifies a number of mandatory functions and addition optional functions to be supported by an IO device. The Profinet encoders can be configured as CLASS 3 and CLASS 4 PROFINET IO devices according to the encoder profile. Refer to page 64.
AR	Application Relation - The relationship between a PROFINET IO Controller and an IO device. A PROFINET IO device can support more than one Application Relationship.
Bus	A bus is a communication medium connecting several nodes. Data can be transferred via serial or parallel circuits, that is, via electrical conductors or fiber optic.
Channel	A single IO point. A Channel can be discrete or analog.
Consumer Status	The Status an IO device provides to an IO Controller for the data it consumes from IO Controller.
CR	Communication Relationship - A virtual communication channel within an AR.
Cyclic Communications	Scheduled, repetitive communications. IO data and alarm transfers are cyclic.
Data block	In contrast to code blocks, data blocks (DB) do not contain Step 7 statements. They are used to save data, i.e. variable data which are processed by the user program. Global data blocks serve to accommodate user data which can be used by all other blocks.
DCP	Discovery Control Protocol - A communications protocol with PROFINET IO that allows an IO Controller or Supervisor to find every PROFINET IO device on a subnet.

Determinism	Determinism means that a system responds in a predictable (deterministic) manner.
Device name	Before an IO device can be addressed by an IO controller, it must have a device name. In PROFINET, this method was selected because it is simpler to work with names than with complex IP addresses. Refer to page 40.
Encoder Profile	The PROFINET profile for Encoders is intended to define a standard application interface for encoders. The profile is a supplement to the PROFIdrive profile, so it is mandatory to read the PROFIdrive profile before implementing the encoder profile. Profinet encoders from Lika Electronic comply with the Encoder Profile Specifications V4.1 version 3.162. See also "Profile".
Function	Functions (FC) are code blocks which can be programmed by the user. A FC does not have a "memory". Temporary variables as well as parameters transferred to the function when the latter is called are saved in a L stack. They are lost following processing of the FC.
Function block	Function blocks (FB) are code blocks with a "memory" which are programmed by the user. They have an assigned instance data block (instance DB) as memory. Parameters transferred to a FB as well as the static variables are saved in this data block. An FB contains a program which is always executed when the FB is called by another code block. Function blocks facilitate the programming of frequently repeated, complex functions.
Frame ID	The two-byte field in the Ethernet frame which defines the type of PROFINET IO message.
GSD	The properties of a PROFINET device are described in a GSD file (General Station Description) that contains all the information required for configuration. In PROFINET IO, the GSD file is in XML format. The structure of the GSD file conforms to ISO 15734, which is the world-wide standard for device descriptions. Refer to page 33.
GSDML	General Station Description Markup Language – The file containing the XML description of the PROFINET IO device. Refer to page 33.
IO Controller	Device used to address the connected IO devices. This means that the IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller on which the automation program runs. Refer to page 62.
IO Device	A decentralized field device that is assigned to one of the IO controllers (e.g. remote IO, encoders, valve terminals, frequency converters, switches, etc.). Refer to page 62.
IO Parameter Server	An IO Parameter Server is a server station, usually a PC, for loading and saving the configuration data (records) of IO Devices.
10 Supervisor	Programming device, PC or HMI device used for

	commissioning and diagnostics of IO Controllers and IO Devices. Refer to page 62.				
IP address	The IP address is the name of the unit in a network using the Internet protocol. Refer to page 30.				
IRT	Synchronized transmission procedure for the cyclic exchange of IRT data between PROFINET devices. A reserved bandwidth within the send clock is available for the IRT IO data. The reserved bandwidth ensures that the IRT data can be transmitted at reserved, synchronized intervals whilst remaining uninfluenced even by other greater network loads (e.g. TCP/IP communication or additional real time communication). The "high flexibility" enables simple planning and expansion of the system. A topological configuration is not required. Refer to page 97.				
MAC address	The MAC address is an identifier unique wordlwide consisting of two parts: the first 3 bytes are the manufacturer ID and are provided by IEE standard autority; the last three bytes represent a consecutive number of the manufacturer. Refer to page 30.				
Module	Modules are user defined components that plug into slots. Modules can be real or virtual.				
NRT	Non Real Time - The non Real Time PROFINET IO Channel. Configuration and diagnostic messages are transferred over the NRT Channel.				
Organization block	A range of organization blocks (OB) are designed to execute the user program. OBs are the interface interface between the user program and the operating system of a CPU. They permit event-controlled processing of special program components within the user program. The order in which the user program is executed is defined in the organization blocks.				
Profile	Profiles define application-specific functionality to ensure the openness of PROFIBUS and PROFINET is utilized consistently. PI Profiles can cover simple devices such as encoders by defining how signals are used and how they are physically connected. However, profiles are increasingly covered more complex systems or requirements. Profiles such as PROFIdrive and PROFIsafe deliver active functionality as well. An advanced profile covering active power management for end devices like lasers and robots is now under development with the aim of bringing significant reductions in energy consumption for the automotive industry. Profiles guarantee quicker system design and they support faster device interchange, promoting competition amongst vendors, increased choice for users and full interoperability.				
Provider Status	The Status an IO device provides to an IO Controller with the data transferred to the Controller.				
Proxy	A device which maps non PROFINET IO data to PROFInet.				

Real-time	Real-time means that a system processes external events within a defined time. If the reaction of a system is predictable, one speaks of a deterministic system. The general requirements for real-time are therefore: deterministic response and defined response time. Refer to page 97.		
RT	Real Time - The Real Time PROFINET IO Channel. I/O and Alarm Data are transferred over the RT Channel. Refer to page 97.		
Slot	A group of one or more Subslots. Slots can be real or virtual.		
Standard signal	The encoder profile defines a series of standard signals which are used to configure the IO data. Refer to page 69.		
Submodule	A component of a module that is plugged into a subslot. A submodule is real or virtual.		
Subslot	A group of one or more channels. Subslots can be real or virtual.		
Sync domain	All PROFINET devices that are to be synchronized via PROFINET IO with IRT must belong to a sync domain. The sync domain consists of precisely one sync master and at least one sync slave. IO controllers and switches can hold the role of a sync master or sync slave. Other IO devices support only the role as sync slave. Refer to page 114.		
System function	System functions (SFC) are integral functions in the operating system of a S7 CPU. In addition, SFCs are frequently called implicitly by SFBs. SFCs can be called by the user program like normal functions. SFCs are used to implement a number of important system functions for Profinet IO.		
System function block	System function blocks (SFB) are integral functions in the operating system of a S7 CPU. SFBs can be called by the user program like normal function blocks. SFBs are used to implement a number of important system functions for Profinet IO.		
TCP/IP	 The Ethernet system is designed solely to carry data. It is comparable to a highway as a system for transporting goods and passengers. The data is actually transported by protocols. This is comparable to cars and commercial vehicles transporting passengers and goods on the highway. Tasks handled by the basic Transmission Control Protocol (TCP) and Internet Protocol (IP) (abbreviated to TCP/IP): The sender splits the data into a sequence of packets. The packets are transported over the Ethernet to the correct recipient. The recipient reassembles the data packets in the correct order. Faulty packets are sent again until the recipient acknowledges that they have been transferred successfully. 		
Telegram	A telegram is a rigidly defined bit stream carrying data. A telegram specifies the data length and the type of data which		

	is sent to and from the IO controller. The encoder profile supports Standard Telegrams 81, 82, 83 and 84. Refer to page 67.		
Topology	 Network structure. Commonly used structures: Line topology; Ring topology; Star topology; Tree topology. Refer to page 118. 		
Transmission rate	Data transfer rate (in bps).		
User program	The user program contains all instructions, declarations and data for signal processing required to control a plant or a process. It is assigned to a programmable module (for example CPU) and can be structured in smaller units (blocks).		

List of abbreviations

Table below contains a list of abbreviations (in alphabetical order) which may be used in this guide to describe the PROFINET IO interface. Sometimes they also refer more specifically to the S7 programming environment.

AR	Application Relation		
API	Application Process Identifier		
C-LS	Controller's Sign-Of-Life		
CR	Communication Relation		
DB	Data block		
DO	Drive Object		
DO-LS	Driver Object Sign-Of-Life		
DU	Drive Unit		
EO	Encoder Object		
EU	Encoder Unit		
FB	Function block		
FC	Function		
I&M	Identification & Maintenance		
IRT	Isochronous Real Time Ethernet		
IRT Flex	IRT "High Flexibility"		
IRT Top	IRT "High Performance"		
GSDML	General Station Description Markup Language		
10	Input/Output		
IP	Internet Protocol		
LLDP	Link Layer Discovery Protocol		
LS	Sign-Of-Life		
MAC	Media Access Control		
МАР	Module Access Point		
MLS	Master Sign-Of-Life		
ОВ	Organization block		
РАР	Parameter Access Point		
РІ	PROFIBUS and PROFINET International		
RT	Real Time Ethernet		

SFB	System function block	
SFC	System function	
ТСР	Transmission Control Protocol	
Т _{МАРС}	Master Application Cycle Time	

References

1– <u>Profile encoder. Technical Specification for PROFIBUS and PROFINET related to PROFIdrive</u> Version 4.1 December 2008 Order No: 3.162

2- <u>Profile Drive Technology PROFIdrive. Technical Specification for PROFIBUS and PROFINET</u> Version 4.1 May 2006 Order No: 3.172

3- <u>Profile Guidelines Part 1: Identification & Maintenance Functions. Guideline for PROFIBUS and</u> <u>PROFINET</u> Version 1.2 October 2009 Order No: 3.502

4- Profibus Guidelines: Profibus Interconnection Technology Version V1.4 Order No: 2.142

5- Profinet Guidelines: Profinet Cabling and Interconnection Version V1.8 Order No: 2.252

1 Safety summary

1.1 Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic s.r.l. assumes no liability for the customer's failure to comply with these requirements.



1.2 Electrical safety

- Turn OFF power supply before connecting the device;
- connect according to explanation in section "Electrical connections" on page 29;
- in compliance with 2004/108/EC norm on electromagnetic compatibility, following precautions must be taken:



- before handling and installing the equipment, discharge electrical charge from your body and tools which may come in touch with the device;
- power supply must be stabilized without noise; install EMC filters on device power supply if needed;
- always use shielded cables (twisted pair cables whenever possible);
- avoid cables runs longer than necessary;
- avoid running the signal cable near high voltage power cables;
- mount the device as far as possible from any capacitive or inductive noise source; shield the device from noise source if needed;
- to guarantee a correct working of the device, avoid using strong magnets on or near by the unit;
- minimize noise by connecting the shield and/or the connector housing and/or the frame to ground. Make sure that ground is not affected by

noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user. Provide the ground connection as close as possible to the encoder. We suggest using the ground point provided in the cap, use one TCEI M3 x 6 cylindrical head screw with two tooth lock washers.



1.3 Mechanical safety

- Install the device following strictly the information in the section "Mechanical installation" on page 24;
- mechanical installation has to be carried out with stationary mechanical parts;
- do not disassemble the unit;
- do not tool the unit or its shaft;
- delicate electronic equipment: handle with care; do not subject the device and the shaft to knocks or shocks;
- respect the environmental characteristics of the product;
- unit with solid shaft: in order to guarantee maximum reliability over time of mechanical parts, we recommend a flexible coupling to be installed to connect the encoder and user's shaft; make sure the misalignment tolerances of the flexible coupling are respected;
- unit with hollow shaft: the encoder can be mounted directly on a shaft whose diameter has to respect the technical characteristics specified in the purchase order and clamped by means of the collar and, when requested, the anti-rotation pin.

2 Identification

Device can be identified through the **ordering code**, the **serial number** and the **MAC address** printed on the label applied to its body. Information is listed in the delivery document too. Please always quote the ordering code, the serial number and the MAC address when reaching Lika Electronic s.r.l. for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product <u>refer to the technical catalogue</u>.



Warning: encoders having ordering code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

3 Mechanical installation



WARNING

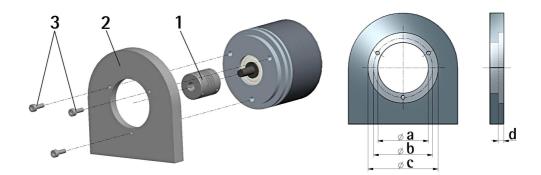
Installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected. Shaft and mechanical components must be in stop.

For any information on the mechanical data and the electrical characteristics of the encoder please <u>refer to the technical catalogue</u>.

3.1 Solid shaft encoders

- Mount the flexible coupling 1 on the encoder shaft;
- fix the encoder to the flange **2** (or to the mounting bell) by means of the screws **3**;
- secure the flange 2 to the support (or the mounting bell to the motor);
- mount the flexible coupling 1 on the motor shaft;
- make sure the alignment tolerances of the flexible coupling **1** are respected.

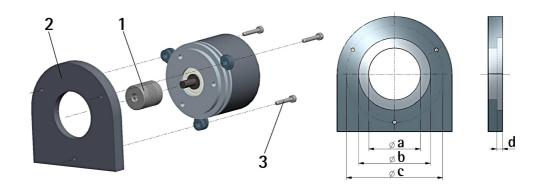
3.1.1 Customary installation



	a [mm]	b [mm]	c [mm]	d [mm]
EM58, Hx58	-	42	50 F7	4
EM58S, Hx58S	36 H7	48	-	-

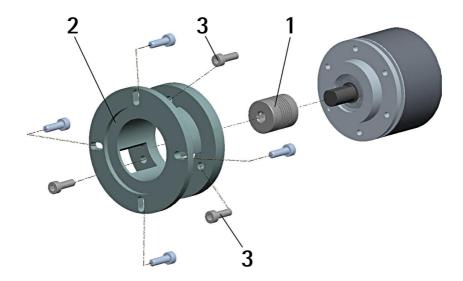


3.1.2 Installation using fixing clamps (code LKM-386)



	a [mm]	b [mm]	c [mm]	d [mm]
EM58, Hx58	-	50 F7	67	4
EM58S, Hx58S	36 H7	-	67	-

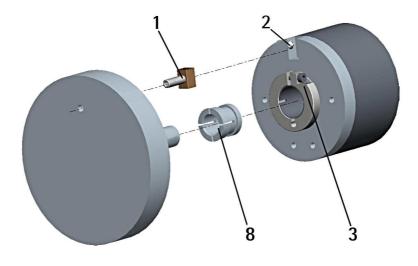
3.1.3 Installation using a mounting bell (code PF4256)

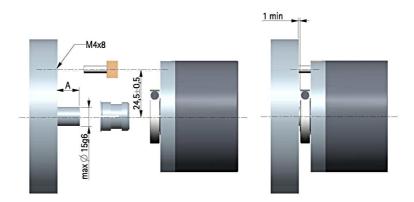


3.2 Hollow shaft encoders

3.2.1 EMC58, HxC58

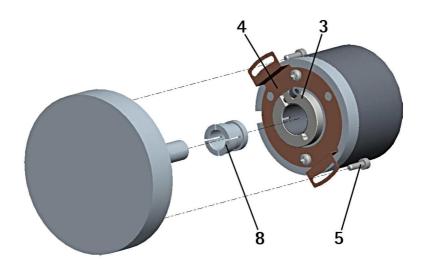
- Fasten the anti-rotation pin 1 to the rear of the motor (secure it using a locknut);
- mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- insert the anti-rotation pin 1 into the slot on the flange of the encoder; this secures it in place by grub screw 2, preset at Lika;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).

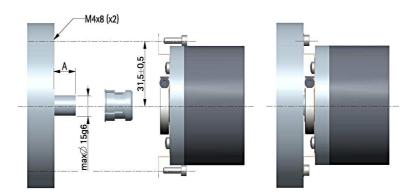




3.2.2 EMC59, HxC59

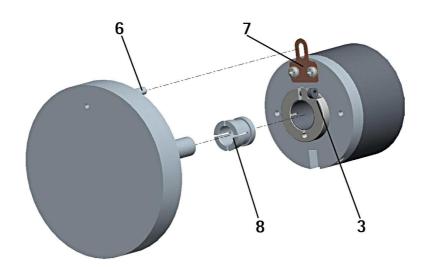
- Mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- fasten the fixing plate **4** to the rear of the motor using two M3 cylindrical head screws **5**;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).

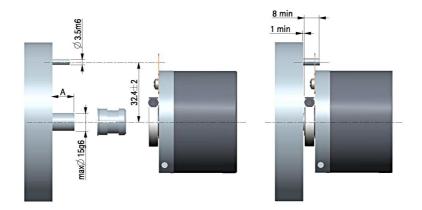




3.2.3 EMC60, HxC60

- Fix the tempered pin **6** to the rear of the motor;
- mount the encoder on the motor shaft using the reducing sleeve **8** (if supplied). Avoid forcing the encoder shaft;
- make sure the anti-rotation pin 6 is inserted properly into the fixing plate 7;
- fix the collar **3** to the encoder shaft (apply threadlocker to screw **3**).





4 Electrical connections



WARNING

Power supply must be turned off before performing any electrical connection! Never force manually the rotation of the shaft not to cause permanent damages!

For any information on the mechanical and electrical characteristics of the encoder please <u>refer to the technical catalogue</u>.

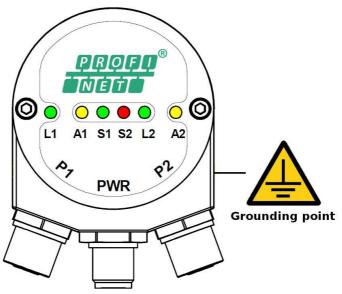


Figure 1 - Connectors and diagnostic LEDs

4.1 PWR Power supply connector (Figure 1)

M12 4-pin male connector with A coding is used for power supply.

	Description	Pin
3	+10VDC +30VDC	1
	n.c.	2
0 1 2	0VDC	3
	n.c.	4

40

4.2 P1 Port 1 and P2 Port 2 connectors (Figure 1)

Two M12 4-pin female connectors with D coding are used for Ethernet connection through port 1 and port 2.

~~	Description	Pin
~ 3	Tx Data +	1
3	Rx Data +	2
· •/	Tx Data -	3
	Rx Data -	4

4.3 Ground connection (Figure 1)

To minimize noise connect properly the shield and/or the connector housing and/or the frame to ground. Connect properly the cable shield to ground on user's side. Lika's EC- pre-assembled cables are fitted with shield connection to the connector ring nut in order to allow grounding through the body of the device. Lika's E- connectors have a plastic gland, thus grounding is not possible. If metal connectors are used, connect the cable shield properly as recommended by the manufacturer. Anyway make sure that ground is not affected by noise. It is recommended to provide the ground connection as close as possible to the device. We suggest using the ground point provided in the cap (see Figure 1, use 1 TCEI M3 x 6 cylindrical head screw with 2 tooth lock washers).

4.4 MAC address and IP address

The unit can be identified in the network through the **MAC address** and the **IP address**. MAC address has to be intended as a permanent and globally unique identifier assigned to the unit for communication on the physical layer; while the IP address is the name of the unit in a network using the Internet protocol. MAC address is 6-byte long and cannot be modified. It consists of two parts, numbers are expressed in hexadecimal notation: the first three bytes are used to identify the manufacturer (OUI, namely Organizationally Unique Identifier), while the last three bytes are the specific identifier of the unit. The MAC address can be found on the label applied to the encoder. The IP address (and the subnet mask) must be assigned by the user to each interface of the unit to be connected in the network. For additional information on the MAC address refer to the section "5.2 Mac address" on page 32. For additional information on the IP address refer to the section "5.3.7 Setting the IP address" on page 50.



4.5 Diagnostic LEDs (Figure 1)

Six LEDs located in the cap of the encoder (see Figure 1) are meant to show visually the operating or fault status of the encoder and the Profinet interface. The meaning of each LED is explained in the following tables.

LED	Description		
L1 (green)	Link 1: link to another Ethernet component through port 1		
A1 (yellow)	Activity 1: incoming and outgoing traffic through port 1		
S1 (green)	Status 1: see table below		
S2 (red)	Status 2: see table below		
L2 (green)	Link 2: link to another Ethernet component through port 2		
A2 (yellow)	Activity 2: incoming and outgoing traffic through port 2		

S1 Status 1 green	S2 Status 2 red	Meaning	Cause
OFF	OFF	No power	Unit switched off Cable disconnected
ON	ON	No connection to another device Criteria: no data exchange	 Bus disconnected Master not available or switched off
ON	Blinking at 1 Hz	Parametrization fault, no data exchange Criteria: data exchange is correct but the encoder does not switch to the data exchange mode	 Slave not configured yet or wrong configuration A wrong address has been assigned to the unit Actual configuration of the slave differs from the nominal configuration
OFF	ON	System failure	Diagnostic data exists, slave in data exchange mode
ON	OFF	Data exchange, the encoder is working properly	Correct operation
Blinking at 1 Hz	OFF	Flash memory upgrade process is active (see on page 144)	The user is upgrading the flash memory
OFF	Blinking Elash memory ungrade process		 Cable disconnected Power switched off Internal error Flash memory damaged Upgrade process aborted before completion



5 Getting started

5.1 Configuring the encoder with Siemens SIMATIC STEP 7

In this manual some screenshots are shown to explain how to install and configure the encoder in a supervisor. In the specific example the development environment is STEP 7 V5.5 + SP1 with SIEMENS PLC CPU 315-2 PN / DP. Therefore, the installation of the GSDML file, the assignement of the IP address and the device name, the configuration of the encoder in the network, topology, diagnostics, etc. will always refer to the aforementioned development tools. If you need to install the encoder using a different configuration tool, please read and follow carefully the instructions given in the documentation provided by the manufacturer.



Lika Electronic Profinet encoder documentation is complete with an **example project** provided free of charge. This program is designed to make your own project planning, programming, communication and diagnostics with the STEP 7 V5.5 + SP1 development

environment user-friendly and reliable. You can find it in the Lika Step 7 Profinet example project.zip compressed file contained in the SW Hx58x PT.zip file.

5.2 Mac address

The MAC address is an identifier unique wordlwide.

The MAC-ID consists of two parts: the first 3 bytes are the manufacturer ID and are provided by IEE standard autority; the last three bytes represent a consecutive number of the manufacturer.



NOTE

The MAC address is always printed on the encoder label for commissioning purposes.

The MAC address has the following structure:

Bit value 47 24		Bi	t value 23	0	
10	B9	FE	Х	Х	Х
Company code (OUI)			Con	secutive nun	nber

5.3 Encoder installation under STEP 7 environment

5.3.1 Description of the GSDML file

The functionality of a PROFINET IO device is always described in a GSDML file. This file contains all data that are relevant for engineering as well as for data exchange with the IO device.

PROFINET IO devices can be described using XML-based GSD. The description language of the GSD file, i.e. GSDML (General Station Description Markup Language) is based on international standards. As the name suggests, the GSD file is a language-independent XML file (Extensible Markup Language).

Profinet encoders from Lika Electronic are supplied with their own GSDML file GSDML-V2.25-LIKA-0239-ROTACOD-XXXXXXXXXML where XXXXXXX is the release date of the file in a 8-digit format encompassing information about year (4 digits), month (2 digits) and day (2 digits): 20131024 is the first GSDML file released by Lika Electronic for Profinet encoders. See the enclosed documentation or click www.lika.biz > ROTARY ENCODERS > ABSOLUTE ENCODERS > PROFINET to get the GSDML file.



WARNING

Please always comply with the specifications indicated in the following table:

GSDML file	Encoder HW	Encoder SW	User's guide
version	version	version	version
From release 20131024 to	1	1.0.1 1.0.2 1.0.3 1.0.4	1.0, 1.1 1.2 1.3 1.4



5.3.2 Installing the GSDML file

In the menu bar of the **HW Config** window, press **Options** and then **Install GSD File** ... command.

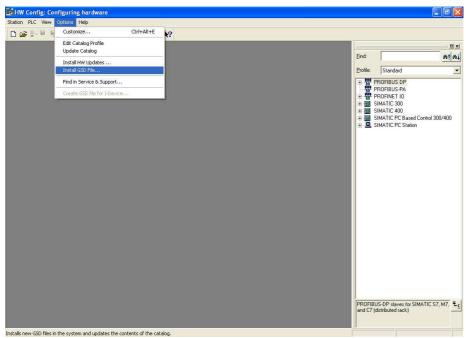


Figure 2 - Installing the GSDML file

The **Install GSD Files** dialog box will appear. Press the **Browse** ... button to choose the folder where the GSDML file is located. Please make sure that the bitmap file representing the encoder is located in the same folder as the GSDML file. Select the file and press the **Install** button to install it.

stall GSD Files:	from the c			
\TEMP				Browse
ile ISDML-V2:25-LIKA-0239-RI	0TACOD-20131024.xml	Release 10/24/2013 12:00:00 AM	Version 1 V2.25	Languages English
Install	how Log Se	elect All Deselec		

Figure 3 - Selecting the GSDML file

As soon as the operation is carried out, a confirmation dialog box will appear on the screen.

	from the	e directory		
TEMP				Browse
ile		Release	Version	Languages
SDML-V2.25-LIKA-0239-R	OTACOD-20131024.xr	nl 10/24/2013 12:00:00 AM	V2.25	English
Insta	II GSD File (13:49	86)		1
i	Installation was	completed successfully,		
4	·			
				-
	OK			
	and the second sec	Select All Deselect A	sa l	
Install 9	ihow Log	Select All Deselect A	- U	

Figure 4 - GSDML file installation

Now scroll through the directory tree in the left pane of the **HW Config** window and select the path **Catalog \ PROFINET IO \ Additional Field Devices \ Encoders**: the **LIKA ROTACOD** family can be found inside the folder. The installation modules are contained in the directories MULTITURN (for multiturn version encoders) and SINGLETURN (for singleturn version encoders).

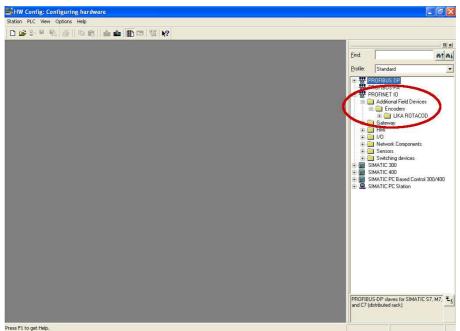


Figure 5 – Scrolling through Profinet families and categories



5.3.3 Inserting the module in the Profinet-IO system

Now we need to install the module of the desired model. For instance, we want to configure the HMx16/16384PT model.

In the right pane open the LIKA ROTACOD directory and then choose the MULTITURN directory. Drag the required module LIKA HMx16/16384PT to the window on the left and drop it on the PROFINET-IO system.

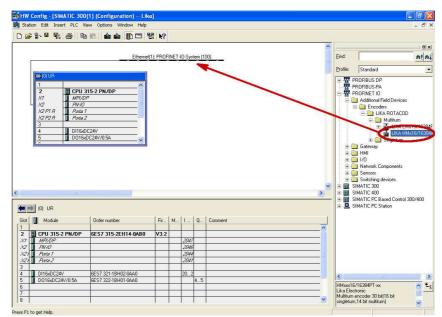


Figure 6 - Inserting a module in the Profinet-IO system



The inserted module will appear as shown in the following screenshot:

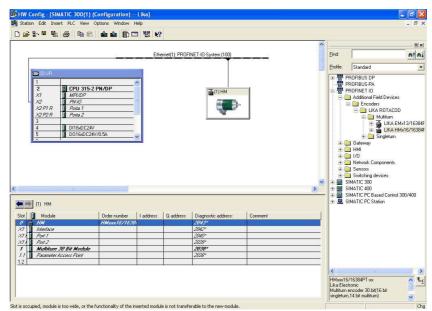


Figure 7 - Inserted module

<u>lika</u>

Now we need to choose the data length and the type of data that should be sent to and from the IO controller, thus we need to install a Standard Telegram. Four types of telegrams with different characteristics are available: Standard Telegram 81, Standard Telegram 82, Standard Telegram 83 and Standard Telegram 84. For detailed information on the Standard Telegrams refer to the section "7.1 Telegrams" on page 67.

For instance we need to install the Standard Telegram 83. To do this select the desired Telegram available for the LIKA HMx16/16384PT module (it can be found under LIKA HMx16/16384PT\MULTITURN 30 bit MODULE) and drag and drop it onto the variables table in the bottom left, as shown in the Figure.

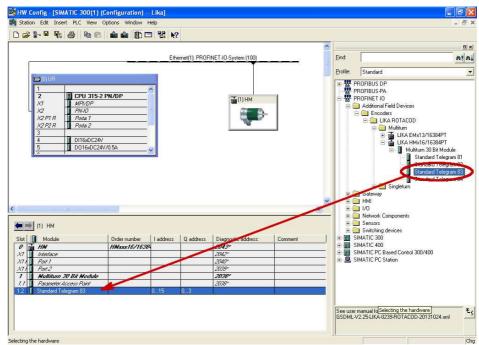


Figure 8 - Adding the Standard Telegram

5.3.4 Device name and IP address at delivery

In a Profinet network it is mandatory that each IO device is provided with its own Device name and IP address. By default, before delivery the device name of the encoder is set to a **blank string** and its IP address is set to **0.0.0.0**. When the system boots up, the IO controller assigns the IP address to the IO device. Please make sure that the **Assign IP address via IO controller** check box in the **Properties** dialog box is selected if the IP address has to be assigned to the encoder via the IO controller. Anyway the assignment of the IP Address can be disabled by deselecting the **Assign IP address via IO controller** check box. In this case the IP address set in the IO device is used (the IP address is uploaded from the internal memory). You are required to enter the Device name first and then the IP address.

5.3.5 Setting the device name

Before the PROFINET IO controller can address a PROFINET IO device, a name has to be assigned to the PROFINET IO device. PROFINET uses this method because names are easier to use and recall than complex IP addresses. Devices on an Ethernet subnet must have unique names.



NOTE

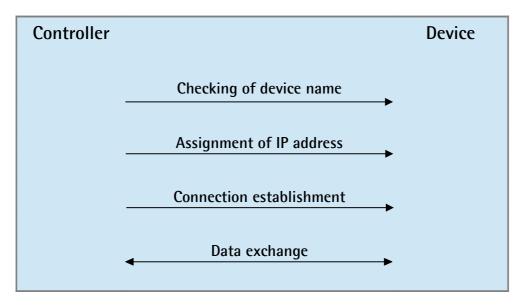
An IO Device does not have a device name when delivered. By default, the device name of Lika's Profinet encoders is set to a **blank string**.

The device names must satisfy DNS (Domain Name System) conventions:

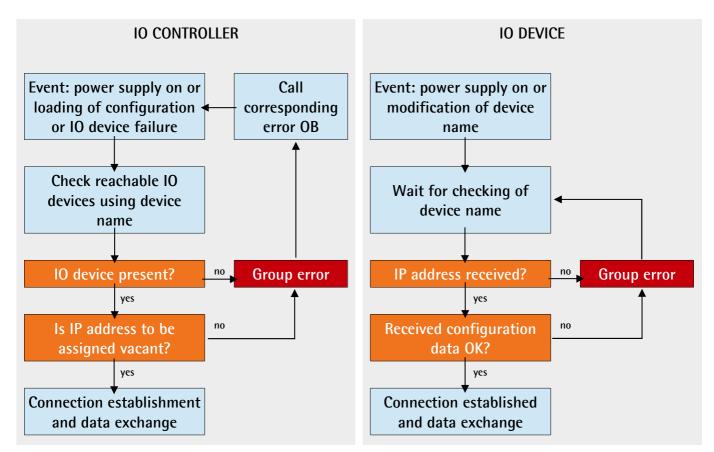
- Names are limited to a total of 127 characters (letters, numbers, dashes or dots).
- Any component part (that is, a character string between two dots) of the device name may only be up to 63 characters long.
- Names cannot contain any special character such as umlauts, parentheses, underscores, forward or backward slashes, empty spaces, etc. The dash is the only special character allowed.
- Names must neither start nor end with the minus "-" sign.

There are a couple of ways to assign the device name to the encoder. The steps are described in the following tables.

Steps for system startup



Startup response



Mode 1

Enter the **Properties** dialog box by double clicking the encoder icon in the **HW Config** window and set the device name in the **Device name** field. Check that the **Assign IP address via IO controller** check box is selected if you want the IP address being assigned by the IO controller; otherwise deselect it if you want it to be uploaded from the internal memory of the IO device.

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ļ.				Multiturn er	coder 30 bit(16	bit singletum,14 bit multitum) ROTACOD-20131024.xml
						1.00

Figure 9 - Assigning the device name



NOTE

The device name default setting is the name from the GSD file. With integral Profinet interfaces, the device name is derived from the short description. If several devices of the same type are arranged in the same Profinet IO system, Step 7 automatically supplements the name from the GSD file with a serial number. The second device is assigned the extension "-1", the third device the extension "-2", etc.

Press the **Ethernet...** button in the **Node in PROFINET IO system** group if you want to assign an IP address different from the one suggested by the system.

HW Config - [SIMATIC 300(1)			_ 2
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X2 P1 R Porta 1 X2 P2 R Porta 2	Family: LIKA ROTAG		
3			
4 DI16xDC24 5 D016xDC2			
	GSD file: GSDML-V22	25-LIKA-0239- IP address: 192.169.20.197 Gateway	
		25-LIKA-0239 Subnet mask: 255.255.256.0 C Use router	
	(cridige right	Address:	
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KT Fort 1			Delete
Fort 2 1 Multitum 30 Bit Module	Comment:		
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1.2			
	OK	Cancel Help	
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		GSDML-V2.25-LIKA-0239-R0TACOD-2013102	24. sml
s E1 to get Help.			

Figure 10 - Assigning the IP address



Download data to the PLC pressing the **Download** button in the Toolbar.

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X7 Chrotecher 274/P* X7 Part 7 .2040* X7 Part 7 .2040* X7 Part 7 .2040* X1 Part 7 .2029* X1 Multitum 30 Bit Module .2029* 1 Parameter Access Paint .2029* 1.2 .2029*			T GGGIGGG	de dadalesta		0	
Arh Ever / Image: Control 300/400 XP/I Pare / 2203° Y Pare / 2203° 1 Parameter Access Plant 2203° 12 Parameter Access Plant 2203° 12 Image: Control 300/400 Image: Control 300/400 Image: Control 300/400 Image: Contret 300 Image: Contret 300/400				-			
Al Constraints and the constraint of the co							
Image: Control of the image	XIN Fort2				2039*	1	
12 HMxx16/1634PT-xx Like Electronic Multure encoder 30 birl 5 bit sindeture 14 bit multiture)			1				E SIMATIC PC Station
HMoxt16/16384PT-xx Lika Electronic Multium encoder 30 bit15 bit sindetum 14 bit multitum)				i i	2036*		
Lka Electronic Multure encoder 30 bit16 bit sindeturn 14 bit multiturn)	1.2		1				
Lika Electronic Multuru encoder 30 bit16 bit sindeturn 14 bit multiturn)							
Lika Electronic Multurn encoder 30 bil16 bit sindeturn 14 bit multiturn)							
Lka Electronic Multure encoder 30 bit16 bit sindeturn 14 bit multiturn)							
Multiturn encoder 30 bit/16 bit singleturn 14 bit multiturn)							
GSDML-V2.25-LIKA-0239-R0TACOD-20131024.xml							Multiturn encoder 30 bit/16 bit singleturn 14 bit multiturn)
							GSDML-V2.25-LIKA-0239-ROTACOD-20131024.xml
ds the current station into the load memory of the current module.	de the current station into the load mer	mony of the current module.					

Figure 11 - Downloading data to the PLC



Now press **PLC**, **Ethernet** and then **Assign Device Name...** command in the menu bar of the **HW Config** window.

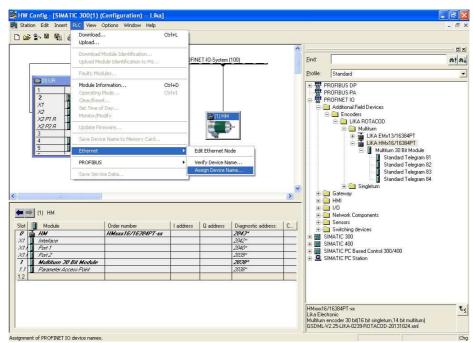


Figure 12 - Assigning the device name

<u>lika</u>

Choose the device you need to change the name in the **Device name** drop box and then press the **Assign name** button.

💐 HW Config - [SIMATIC 300(1) (Configuration) Lika]			a ×
🙀 Station Edit Insert PLC View Options Window Help			- 6 X
	Assign name Lode flashing test Duration (seconds): 3	ices COD A EMX13/16384PT A HMX15/16384PT Multitum 30 Bit Module Standard Telegram 81 Standard Telegram 82	<u>ntai</u>
	Flashing on Flashing off	Standard Telegram 83 m m ta htrol 300/400	
11.1 Resembler Accesor Point 2028"	HMxxx16/16384PT-xx Lika Electronic Multium encoder 30 bit(16 bi GSDML-V2.25-LIKA-0239-RC	t singleturn, 14 bit multiturn) TTACDD-20131024.xml	₹₹
Press F1 to get Help.			Chq

Figure 13 - Confirming the device name

Mode 2

As explained for the Mode 1, first of all enter the **Properties** dialog box by double clicking the encoder icon in the **HW Config** window and set the device name in the **Device name** field. Then press **PLC**, **Ethernet** and then **Edit Ethernet node** command in the menu bar of the **HW Config** window. Press the **Browse...** button to find all the nodes connected to the network. Select the IO device you want to assign the Device name to. The MAC address of the encoder is written on the encoder label. In the **Assign device name** group below in the dialog box, enter the desired name in the **Device name** field. Press the **Assign Name** button to confirm.

🛤 Station Edit Insert PLC View Options Wir		X
Image: Second	Ethernet node MAC address: 10/89/FE-00:00.04 Nodes accessible online Browse Set IP configuration C Use IP parameters IP address: 192:168:20:187 C Do not use router Subnet mask: 255:255:255.0 C Use router Address: 192:168:20:187 C Obtain IP address from a DHCP server Identified by	Standard OFRUS PP OFRUS PP OFRUS PA OFRUS
II) HM Ito Mode Index Ito Mode Index Index Index Index Index Inde	Client ID C MAC address C Device name Client ID: Assign IP Configuration Assign device name Device name: HM Assign Name Reset to factory settings Reset Close Help	T10-System £

Figure 14 - Edit Ethernet Node dialog box



NOTE

The device name default setting is the name from the GSD file. With integral Profinet interfaces, the device name is derived from the short description. If several devices of the same type are arranged in the same Profinet IO system, Step 7 automatically supplements the name from the GSD file with a serial number. The second device is assigned the extension "-1", the third device the extension "-2", etc.

The following	confirmation	message will appear	on the screen.
ine ronoring			on the beneeth

Image: Server Server Server Server Variable Image: Server Server Variable Image: Server Variable Image: Server Variable	Image:	B HW Config - [SIMATIC 300(1) (Configura		_ # X
Image: Standard Telegram 83 Image: Standard Telegram 83	Image: Standard Telegram 83 Ethernet node Nodes accessible online Image: Standard Telegram 83 MAC address: 10:89:FE 00:00:00 Browse Image: Standard Telegram 83 Standard Telegram 83 Standard Telegram 83			_ 8 ×
DUB 1<	DUB Istandad 1 Istandad 2 ICPU 315-2 PN/OP X2 PIB Pola 2 3 Pola 2 3 Pola 2 3 ID16b0C24V/054 5 ID016b0C24V/054 6 Use IP parameters 12 IP address: 13 IP address: 12 ID16b0C24V/054 6 Use IP parameters 10 If IP address: 12 D016b0C24V/054 6 Ite index 10 Ite index 11 Parameters 12 Ite index 13 Ite index 14 Ite index 15 Ite index		- Ethernet node Nodes accessible online	
	Close Holp T ID-System		Set IP configuration	NORBUS DP NORBUS PA NORNETIO MATLE 300 MATLE 400 MATLE PC Based Control 300/400 MATLE PC Station

Figure 15 - Edit Ethernet Node confirmation

After completing the operation, we can easily check the entered Device Name. To do this press again the **Browse...** button in the **Edit Ethernet node** page to find all the nodes connected to the network. Check that the encoder is listed properly in the page.

🖳 HW Config - [SIMATIC 300(1) (Configu		- B 🗙
Station Edit Insert PLC View Options		- 8 ×
D 🍃 🖫 🦉 🥵 🍯 👘 🛍 🕯	Edit Ethernet Node 🛛 🗙	
DOUR 1 2 1 4 1 4 1 4 1 4 1 4 1 166024V 2 10160224V 2 10160224V05A	Ethemet node Nodes accessible online MAC address: 1089FE:00:00 QA Browse Browse Network - 2 Nodes Start IP address MAC address: Device type Name Start 192-018:20.1180 00.18-18-19-50-31 \$7:30.0 Device type Name	Standard Standard Standard Standard SoPRUS-PA OFINET 10 MATIC 200 MATIC 400 MATIC 200 MATIC PC Station
ID HM Stat Module Order ID HM Stat Module Order If Module If Max A7 I Ant I A7/I A	Flash MAC address: 1089FE.00.00.0A OK Cancel Help Reset to factory settings: Reset Close Help	710 System 25
Press F1 to get Help.	1	(cha

Figure 16 - Browsing the network



5.3.6 Checking the device name

After completing the operation, we recommend the Device Name to be checked. To do this press **PLC**, **Ethernet** and then **Verify Device Name...** command in the menu bar of the **HW Config** window.

	PLC View Options Window Download	Ctrl+							
\$° 8~ 10 10 10 €	Upload	Curr							
	Download Module Identifica		_			^			
	Upload Module Identification): PROFI	NET-IO-System (100)			Eind:		
	Faulty Modules		_	Ī			Profile:	Standard	
🗃 (0) UR	Module Information	Ctrl+I	D			ī	王 現	PROFIBUS DP	
1	Operating Mode	Ctrl+						PROFIBUS-PA	
2	Clear/Reset			(1) HM			B 8	PROFINET IO	
X1 X2	Set Time of Day			-				SIMATIC 300	
- X2 X2 Р1 Я	Monitor/Modify			- B - B-				SIMATIC 400	
X2P2R	Update Firmware			1				SIMATIC PC Based Control 300/400 SIMATIC PC Station	
3 4	Save Device Name to Memo	ry Card							
5				v					
-	Ethernet		EQUE	thernet Node					
	Ethernet PROFIBUS		• Verify	Device Name					
			• Verify						
	PROFIBUS Save Service Data		• Verify	Device Name		×			
	PROFIBUS Save Service Data		• Verify	Device Name					
(1) HM	PROFIBUS Save Service Data		• Verify	Device Name Device Name	Comment				
(1) HM Module	PROFIBUS		Vertfy Assign	Device Name Device Name Diagnostic address: 204.3*	Comment				
(1) HM Module	PROFIBUS Save Service Data		Vertfy Assign	Device Name Device Name Diagnostic address: 204.9* 204.2*	Comment				
(1) HM Module <i>HM</i> <i>Interface</i> <i>Fort 1</i>	PROFIBUS Save Service Data		Vertfy Assign	Device Name Device Name Diagnostic address: 204.9* 204.9* 204.9*	Comment				
(1) HM Module Interface Fault 1 Fault 2	PROFIBUS Save Service Data Doder number ////////////////////////////////////		Vertfy Assign	Device Name Device Name Diagnostic address: 2013* 2014* 2014* 2014* 2014*	Comment				
(1) HM Module HM Interface Port 1 Port 2 Multitum 30	PROFIBUS Serve Service Data Dider number //Macar 16/10 Bit Module		Vertfy Assign	Device Name Device Name Diagnostic address: 204.3* 204.3* 204.3* 2038* 2038*	Comment				
(1) HM Module Metrice Harri 1 Ravi 2	PROFIBUS Save Service Data Doder number IMMace 16/11 Bit Mackule ever Paint		Vertfy Assign	Device Name Device Name Diagnostic address: 2013* 2014* 2014* 2014* 2014*	Comment				

Figure 17 - Verifying device name

In the **Verify Device Name** dialog box, check that the encoder is listed properly with correct Device name and status.

							^			
			Et	hemet(1): PROFINE	T-IO-System (100)			Eind:		M1
								Profile:	Standard	
20) UR								田田田	PROFIBUS DP PROFIBUS-PA	
2	CPU 315-2 PN	/DF	evice Nam						PROFIBUS-PA	
X1 X2	MPI/DP PN-ID	verny b	levice Nam	18				Ľ	ATIC 300	
X2PTR	Porta 1	Available	e Devices:						ATIC 400 ATIC PC Based Control 300/400	
X2 P2 R	Porta 2	Device	name	Statu	IS IP address	MAC address			ATIC PC Based Control 300/400	
3 4	DI16xDC24V	HM	- Hamo			10-B9-FE-00-0				
5		10000								
	D016xDC24V/0.	5A.					Assign N	ame		
12	DU16xDC24V/0.	54				-	Assign N	ame	1	
1	DU16xDC24V/0.	54				<u> </u>	Assign N	ame		
	U16xDC24V70.	54				1	Assign N	ane		
1×	U16xDC24V70.	54					Assign N	lame		
-	DU16xDC24V70.	54					Assign N	lame		
	11 2 DU16xDC24V/0.	54					Assign N	ame		
L	1	54					Assign N	ame		
	D016xDC24V/0.	54				-	Assign N	ame	1	
	1					<u>></u>	Assign N	ame		
(1) HM	10	Show	v only missing	and incorrectly coordinate	nfigured devices	 (8) 	Assign N	ame	1	
(1) HM	10	Contraction of the second seco			vligured devices					
(1) HM tx Module 7 H/M	10	Show			nligured devices	<u>.</u>		Help	1	
(1) HM (1) HM (1) Module 7 HM MM	10	Contraction of the second seco		g and incorrectly co					1	
(1) HM (0) Module (7) Module (7) Module (7) Module (7) Module	10	Contraction of the second seco		g and incorrectly co	2040*					
(1) HM lot Module 7 AM 77 Art 1 71 Art 2 71 Art 2 71 Art 2 72 Art 2 71 Art 2 72 Art 2 71 Art 2	10	Contraction of the second seco		g and incorrectly co		(2)			1	
(1) HM tet Module Module Markace Markace Markace Markace Markace Markace	30 Bit Medele Access Fair	Contraction of the second seco	se	and incorrectly con					1	
(1) HM ot Module 7 Markate 7 Asat 1 7 Asat 2 7 Mathiann 7 Asat 2 7 Mathiann 7 Asat 2 7 Mathiann	30 Bit Medde	Contraction of the second seco		g and incorrectly cor	2040* 2028* 2038*				1	

Figure 18 - Verifying device name

5.3.7 Setting the IP address

To help with configuration you are required only once to assign an IP address. When configuring the PROFINET IO controller in the **HW Config** window, STEP 7 opens a dialog for selecting the IP address and the Ethernet subnetwork.

When the system boots up, the IO controller assigns the IP address to the IO device. Please make sure that the **Assign IP address via IO controller** check box in the **Properties** dialog box is selected if the IP address has to be assigned to the encoder via the IO controller. Anyway the assignment of the IP Address can be disabled by deselecting the **Assign IP address via IO controller** check box. In this case the IP address set in the IO device is used (the IP address is uploaded from the internal memory). By default, before delivery the IP address of the encoder is set to **0.0.0.**

After having set the Device name, you can set the IP Address. To set the IP address first enter the **Properties** dialog box by double clicking the encoder icon in the **HW Config** window. Check that the **Assign IP address via IO controller** check box is selected if you want the IP address being assigned by the IO controller; otherwise deselect it if you want it to be uploaded from the internal memory of the IO device. Press the **Ethernet...** button in the **Node in PROFINET IO system** group if you want to assign an IP address different from the one suggested by the system. Press the **OK** button to confirm. Download data to the PLC pressing the **Download** button in the Toolbar.

HW Config - [SIMATIC 300(1) (Configura						_ @ D
🖞 Stabion Edit Insert PLC View Options W	Andow Help	.9				
	erties - HM	¢t			×	0 ×
Gene	eral					nt n.
Sho	ort description:	НМ				dard 🔄
1 2 X1 MP/DP		Multitum encoder 30 bit(16 bit	singleturn,14 bit multiturn)	-	JS DP JS-PA ET IO
- X2 PN-10 Dre	der No./ firmware:	HMxxx16/16384PT-xx / V1.0	Properties - Ether	net interface HM		
X2 P1 R Porta 1 X2 P2 R Porta 2 Far	nily:	LIKA ROTACOD	General Paramete	ers		
3 4 D116xDC24V 5 D016xDC24V/0 C	vice name:	НМ				
GS	D file:	GSDML-V2.25-LIKA-0239-RO Change Release Number	IP address: Subnet mask:	192.168.20.187 255.255.255.0		leway Do not use router
	lode in PROFINET I	D System	oublict music.	Inclusion and the		Use router
C	Device number:	1 💌	Subnet:		-	Address
🗲 📄 (1) HM 🛛 🛛	P address:	192.168.20.189	not networked			New.
Slot Module	Assign IP address	via IO controller	Ethernet(1)			Properties
X7 Inhadana	mment:					Delete
X11 Fort2						
Multitum 30 Bit Module Parameter Access Point					_	Cancel Help
1.2 Standard Telegram 83	ок			Cancel H	lelp	
					200 manage	for detail description
				GSDM	IL-V2.25-L	IKA-0239-R0TAC0D-20131024.xml
see Et to got Help						Charles

Figure 19 - Setting the IP address



If you want to change both the IP address and the subnet mask you can also proceed as follows.

Press PLC, Ethernet and then Edit Ethernet node command in the menu bar of the HW Config window. Press the Browse... button to find all the nodes connected to the network. Select the IO device you want to assign the IP address to. The MAC address of the encoder is written on the encoder label. Select the LIKA ROTACOD device type and then press the OK button to confirm.

HW Config - [SIMATIC 300(1) (Configu	ation) Lika]	
🕅 Station Edit Insert PLC View Options	Vindow Help	_ 6 X
] D 🚅 🐎 🛛 🗞 🍊 🗞 🖻 🎪 🕯	Edit Ethernet Node	
	Ethernet node	
	Nodes accessible online	nt ni
	MAC address: 10-89-FE-00-00-0A Browse	Standard 💌
😑 [0] UR		ROFIBUS DP
1 2 CPU 315-2 PN/DP	Browse Network - 2 Nodes	ROFIBUS-PA ROFINET IO
X1 MPI/DP X2 PN-ID		Additional Field Devices
X2 P1 R Porta 1	Start IP address MAC address Device type Name 192.168.20.180 00-1B-1B-16-FD-31 \$7-300 pr-io	Encoders
X2P2R Porta 2	Stop 0.0.0.0 10-89-FE-00-00-0A LIKA ROTACOD hm	😑 🧰 Multitum
4 DI16xDC24V		E LIKA EMx13/16384PT E LIKA HMx16/16384PT
5 D016xDC24V/0.5A	I Fast search	🖃 🚺 Multitum 30 Bit Module
87		Standard Telegram 82
		Standard Telegram 83 Standard Telegram 84
		🗈 🧰 Singleturn
		Gateway HMI
<	C	1/0
有 🔿 Ш нм	Flash MAC address: 10-B9-FE-00-00-0A	Network Components Sensors
		Switching devices MATIC 300
Slot Module Order		MATIC 400
X1 Interface	OK Cancel Help	MATIC PC Based Control 300/400 MATIC PC Station
X11 Fort 2		
1 Multitum 30 Bit Module	Reset to factory settings	
1.2 Standard Telegram 83	Reset	
	-	
	Close Help	nanual for detail description 2.25-LIKA-0239-R0TAC0D-20131024.xml

Figure 20 - Browsing the network

In the **Set IP configuration** group, enter the required IP address in the **IP address** field; enter the required subnet mask in the **Subnet mask** field below. Press the **Assign IP configuration** button to confirm.

B HW Config - [SIMATIC 300(1) (Configur		- 8 ×
Image: Constraint of the		Standard Standard TOFIBUS PP TOFIBUS PP TOFIBUS PA TOFIBUS PA
1.2 1 Standard Telegram 83	Close Hep	nanual for detail description 2,254.LKA-0239-ROTACDD-20131024.xml
Desce Et he act Units		

Figure 21 - Assigning IP configuration

The following confirmation message will appear on the screen.

	Ethernet node	
	Nodes accessible online	nt n
Farmer	MAC address: 10-89-FE-00-00-0A Browse	Standard
Image: CPU 315-2 PN/DP 1 CPU 315-2 PN/DP X1 MPU/DP X2 PA/D X3 PA/D X4 DO16xDC24V/0.5A X1 Module Drider Module Drider HM/max Module Drider PA/D Multitum 30 Bit Module Parameter Acceter Part Parameter Acceter Plart Parameter Acceter Plart Standard Telegram 83 D	Set IP configuration • Use IP parameters IP address: 132.168.20.187 Subnet me Construction Subnet me Construction Construction Construction Construction Construction Assign TP Configuration Assign Name Reset to factory settings Reset	BOFBUS OP DOFBUS PA DOFBUS PA DOFNET IO DEBUS PA DOFNET IO DEBUS PA DEBUS P
	Close Help	hanual for detail description

Figure 22 - Edit Ethernet Node confirmation

Now press the **OK** button to close the message and then press again the **Browse...** button in the **Edit Ethernet node** page to find all the nodes connected to the network and check whether the encoder is listed properly in the page.

Image:	🖳 HW Config - [SIMATIC 300(1) (Configu		- B 🗙
Image: State of the state o			(B.)
Image: Contract of the second state] D 🌽 🏪 🗣 🗣 🎒 🖷 🛍 🏜	Edit Ethernet Node	
1 CPU 315-2 PM/DP X7 MRV/DP X7 MRV/DP X7 MRV/DP X8 MRV/DP X9 MRV/DP X9 MRV/DP X9 MRV/DP X9 MRV/DP 34 Diffs/DC24V/D5A X9 Fast X9 Diffs/DC24V/D5A X9 Fast X9 MAX Model Order X9 MAX X9 X9	😂 (J) UR	MAC address: Browse	
III HM Flash MAC address: 10.89 FE 00 00 0A Start Module Orders 0 # MMM MMdrace 0K Cancel XM Bart / X Astronometry Access Plaint 1 12 Standard Telegram 63 Reset Reset Reset	X1 MPUDP X2 PH4D X2 P1 A Pote 1 X2 P2 A Pote 2 3 4 4 D166/0C24V 5 D0166/0C24V/05A	Browse Network - 2 Nodes	IFIBUS-PA IFINET IO ATIC 300 ATIC 400 ATIC PC Based Control 300/400
	Stot Module Order 0 HM HMaa X7 Interface Interface X7 Rot 1 Interface X7 Rot 1 Interface X7 Rot 1 Interface X1 Rometer Access Field Interface	Flash MAC address: T0:B3:FE:00:00:0A DK Cancel Help Reset to factory settings:	
	1.2		D-System <u>E</u>

Figure 23 – Browsing the network

The new IP address has been assigned.



5.4 Setting the parameters: Parameter Access Point

Double click the **Parameter Access Point** slot 1.1 of the module to open the dialog box where the encoder parameters are listed.

# • • • • • • • • • • • • • •	á á () 🗆 🥈				~		
	15	Ethernet(1): PROF	INET-IO-System (100)		Eind:		
Image: CPU 315-2 X1 Image: CPU 315-2 X2 Image: CPU 315-2 3 Image: CPU 315-2 4 Image: DI1660C24V 5 Image: DD1660C24V			Т()HM		÷	Standard PROFIBUS DP PROFIBUS PA PROFIBUS PA INATIC 300 SIMATIC 400 SIMATIC PD Based Control 300/400 SIMATIC PD Based Control 300/400	
101				<u>⊳</u>			
N				3	8		
📄 (1) HM		ddress Q address	Diagnostic address:	Comment			
📄 (1) HM	Order number I a HMaar16/1639	ddress Q address	2043*				
I) HM Module HM Interface		ddress Q address	2043* 2042*				
(1) HM Module MM Module MM Motore Motore //nterface //star /		ddress Q address	2043* 2042* 2040*				
(1) HM Module HH Artiface April 1 Arr 2		ddress Q address	2043* 2042* 2040* 2039*				
		ddress Q address	2043* 2042* 2040* 2039* 2039*				
(1) HM Module HH Artiface April 1 Arr 2			2043* 2042* 2040* 2039*				

Figure 24 - Entering the Parameter Access Point dialog box

<u>lika</u>

The **Properties – Parameter Access Point** property sheet will appear. Enter the **Parameters** tabbed page to display the complete list of the parameters available for the Profinet encoder.

The encoder specific parameters implemented by the manufacturer are shown in the table. The parameters data is transferred to the encoder using 0xBF00 data record at each system boot up.

To set the parameter data, select the value in the drop-down list next to each parameter in the column **Value**.

For detailed information on the implemented parameters, please refer to the section "9.4 Index 0xBF00 : user parameter data" on page 85.

General Addresses Parameters			
	Value		
Parameters Code sequence Code sequence Class 4 functionality Class 4 functionality Class 4 function control Class 4 function control Class 4 function control Compatibility Mode Measuring units / Revolution Total measuring range Waximum tolerated failures of M Velocity measuring unit	CW(0) enable disable disable Disable =>Profile Version 4.1 65536 1073741824 1 Steps/s		
		Cancel	Help

Figure 25 - Parameter Access Point properties

After having changed any parameter values, you need to download data to the PLC pressing the **Download** button in the Toolbar.

	00(1) (Configuration) Lika]							- 7 🛛
Dig Station Edit Insert PLC	View Options Window Help							- 8 ×
D 😅 🛼 🖩 🗞 🍏 🛛	66 K é 6 – 2	<u> </u>						
	Download to Module				~			믜×
	Ethern	et(1): PROFIN	ET-IO-System	(100)		Find		ntai
	2400	oqu, morn	12110 0Jaan	(100)		2000		A. 1
					-	Profile:	Standard	•
🕽 (0) UR							PROFINIC DR	ACARA
1	~						PROFIBUS DP PROFIBUS PA	
2 S CPI	U 315-2 PN/DP						PROFINET ID	
X1 MP	N/DP						Additional Field Devices	
L X2 PN-			THE OWNER WHEN				Encoders	
X2 PT R Pon			🗎 (1) HM				E 🗎 LIKA ROTACOD	
X2P2R Pon	ta 2						😑 🧰 Multitum	
3			1				😟 🚡 LIKA EMx13/16384PT	
	6xDC24V		1				🖃 🚡 LIKA HMx16/16384PT	
5 DO	16xDC24V70.5A						🖃 📳 Multitum 30 Bit Module	
L.							📕 🚺 Standard Telegram 81	
							🔤 📓 Standard Telegram 82	
							🔤 🚺 Standard Telegram 83	
							🔤 📕 📲 Standard Telegram 84	
					~		😟 🧰 Singletum	
<					>		🔄 Gateway 🔄 HMI	
							1/0	
🖛 🐋 (1). НМ							Network Components	
	1	1	(-	1	is f		Sensors	
Slot Module	Order number	I address	Q address	Diagnostic address:	C		Switching devices	
0 🖬 HM	HMxxx16/16384PT-xx			2043*	-	• •	SIMATIC 300	
X1 Interface X1 Port 1			-	2042** 2040*	-		SIMATIC 400	
X1 Fort 1 X1 Fort 2			-	2039*	-		MATIC PC Based Control 300/400	
1 Multiturn 30 Bit M	ladida			2038*		🖻 🚨 9	IMATIC PC Station	
1.1 Parameter Access Po				2030				
1.2								
		-	÷		<u></u>			
						Likdow d.C	5/16384PT-xx	
						Lika Elec		₹ś
						Multiturn	encoder 30 bit/16 bit singleturn.14 bit multiturn)	
1						GSDML-	V2.25-LIKA-0239-ROTACOD-20131024.xml	
, Loads the current station into the	load memory of the current module.							Chg

Figure 26 - Downloading data to the PLC

Please note that a description / help message appears on the display when you move the cursor over the items listed on the left.

General Addresses Parameters	
	Value
🖃 🔄 Parameters	
🗄 🔄 Encoder parameters	
–≝ Code sequence	CW(0)
- 🗐 Class 4 functionality	enable
G1_XIST1 Preset control Enable/disable preset command on l Enable/disable preset command on l Enable/disable preset command on l Enable/disable preset command on l	G1_XIST1.This parameter is ignored if
- Measuring units / Revolution	65536
- Total measuring range	1073741824
— 🗐 Maximum tolerated failures of M	1
Velocity measuring unit	Steps/s

Figure 27 - Parameter Access Point help messages

<u>lika</u>

5.5 Resetting the parameters to default factory values

Default values are provided to each parameter of the device and are preset at the factory by Lika Electronic engineers. The first time you install the encoder, it will operate using the default values. They allow the operator to run the IO device for standard and safe operation. They are plainly not optimized for specific application yet they provide maximum performance for most systems. To suit the specific application requirements it may be advisable and even necessary to enter new parameters instead of the factory default settings. There could be exceptional circumstances where it would be necessary for you to restore the default values of the settable parameters. When this is the case, you have to use the **Reset** command.



NOTE

When you restore the default values, please always consider that:

- the encoder parameters will be restored to the default values;
- the encoder offset will be reset;
- the Device Name will be lost and replaced with a blank string;
- the IP address wil be set to 0.0.0.0;
- the parameters associated with the IP range will be set to 0.



WARNING

The execution of this command causes all the values which have been set previously next to each parameter to be overwritten!



NOTE

The complete list of machine data and relevant default parameters preset by Lika Electronic engineers is available on page 155.

When you need to restore the default values proceed as follows.

Press PLC, Ethernet and then Edit Ethernet node command in the menu bar of the HW Config window. In the Edit Ethernet Node dialog box press the Browse... button to find all the nodes connected to the network. Select the LIKA ROTACOD device type you need to reset the parameters. The MAC address of the encoder is written on the encoder label. Press the OK button to confirm.

HW Config - [SIMATIC 300(1) (Configu Station Edit Insert PLC View Options		. 2 🛛
		X
	Ethernet node Nodes accessible online	
😂 (0) UR	MAC address: Browse	Standard
1 2 477 477 477 477 477 477 477	Browse Network - 7 Nodes Stat IP addess MAC addess Device type Name Stop 132 168 20160 0016 16 16 FP 31 57 300 prio For Fast search 122 168 20160 106 59 2 4000 24 Link HUTADDD twitter	ATTC PC Station
Image: The second sec	Flash MAC address: T089FE 00:00:004 OK Cancel Help Reset to factory settings Reset	
	CloseHelp	T 10-System

Figure 28 - Restoring default values

<u>lika</u>

The **Edit Ethernet Node** dialog box will show the identification parameters of the chosen device. Now press the **Reset** button in the **Reset to factory settings** box below in the dialog box.

💐 HW Config - [SIMATIC 300(1) (Configur		📕 🗗 🔀
Station Edit Insert PLC View Options V		
D 😅 🏪 🖉 🥵 🎒 🛍 🏙 🏙		
	Ethernet node Nodes accessible online	ntai
🚍 0) UR	MAC address: 10-B3-FE-00-00-0A Browse	Standard 💌
1 2 1 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Set IP configuration IP use IP parameters IP address: 132.168.20.167 Subnet mask: 255.255.255.0 C Use router Address: 192.168.20.167	EORBUS OP DORBUS AA BORNET IO MATIC 300 MATIC PC Based Centrol 300/400 MATIC PC Station
	O Dotan IP address from a DHCP server Identified by C Clevit D C MAC address C: Device name Dirent ID: Assign IP Configuration	
I) HM Slot Module Order n I HM HMusa X7 Interface HMusa X7 Part 1 Interface	Assign device name Device name Imm Assign Name	
X1A Part 2 1 Multitum 30 Bit Module 17 Parameter Access Roint 12 Standard Telegram 83	Reset to factory settings	
	Close Help	T IO-System
Press F1 to get Help.		Chg

Figure 29 - Reset to factory settings

You will be requested to confirm the operation. Press the **YES** button in the message that appears on the screen.

🗅 🎏 🏪 🗣 🥵 😂 🛛 🛍 🏙 🏙	Edit Ethernet Node	
	Ethernet node Nodes accessible online	nt ni
	MAC address: 10-89-FE-00-00-0A Browse	Standard 💌
OUB I CPU 3152 PMOP 2 I CPU 3152 PMOP 2 I MP/OP 2 I PMOP 2 I PMOP 32 I PMOP 4 I DIFLOC24V 5 I DOTS-DC24V/05A 5 I DOTS-DC24V/05A 6 III HM 50 III Modale 7 Modale Order 71 Modale Part 2 71 Standard Telegram 83 I	Sel IP configuration • Use IP parameters IP address: IP address: Subnet reference control Construction of the model to its factory Distance control Construction of the model to its factory Distance control Cleve to the model to its factory Distance control Cleve to the model to its factory Distance control Cleve to Ves Device name Device name Device name Device name Device name Device name Period Reset to factory settings	IDERUS DP IDERUS AP IDERUS A IDERUS A I

Figure 30 - Reset first confirmation message

If the device is online and an application relation (AR) is currently established, a second message will appear on the screen. Again you will be requested to confirm the operation by pressing the **YES** button.

HW Config - [SIMATIC 300(1) (Configura		📑 🖻 🔀
🕅 Stabion Edit Insert PLC View Options W	terminal sector and the se	- C >
	Ethernet node Nodes accessible online	kia ntai
Image: Control of the contro	MAC address: IDESPEE 00:00 GA Browse Set IP configuration • Use IP parameters IP address: IDES 20 187* • Do not use moder Submet Frid Ethernet Node (4502:1122) • Do not use moder Obtain • Item recognized that a communication relation is enablished to the model. Do you still want to reset the module? Obtain • No Assign device name: No Device name: hm Device name: hm Device name: hm Reset to factory setting: Reset	Standard CORBUS DP CORRUS PA CORRUS PA CORRUS TIO MATTC 200 MATTC 200 MATTC 200 MATTC PC Station
	Close Help	TIO-System
Press F1 to get Help.		Cho

Figure 31 - Reset second confirmation message

Press the **OK** button to close the message.

│D ☞ ╊~ 록 ♥8, 巻, ₱a ®. ▲a á	Ethernet node Nodes accessible online	
	MAC address: 10-B9-FE-00-00-0A Browse	Standard
		Increases Increases

Figure 32 - Reset executed message

When the operation is carried out, browse the network by pressing the **Browse...** button in the **Edit Ethernet Node** dialog box to find all the nodes connected to the network. The LIKA ROTACOD device type will provide the value 0.0.0.0 under the IP address item and a blank string under the Name item.

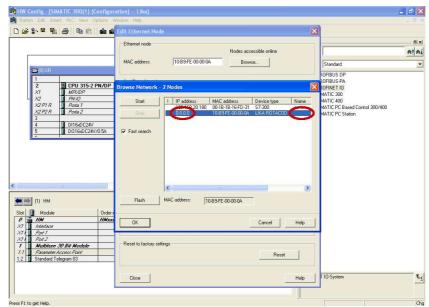


Figure 33 - Checking data after reset

6 Profinet interface

6.1 A brief introduction to Profinet

PROFINET IO is the open industrial network devised for automation applications and built on the Ethernet application layer (TCP/IP and IT standards). For PROFINET IO the layers 1 through 7a of the ISO/OSI (Open Systems Interconnection) reference model are exclusively based on internationally proven standards. The functionality of PROFINET is defined in layer 7b. PROFINET IO complies with IEEE802.3 Ethernet Standard and follows the standards IEC 61158 and IEC61784, so it is 100% Ethernet compatible.

Its technology development and standardization are entrusted to Profibus & Profinet International (PI), the international umbrella organization including members of more than 1400 companies (<u>www.profibus.com</u>).

PROFINET IO is expressly developed to connect controllers (named IO controllers, equivalent to Profibus DP Masters), peripheral devices (named IO devices, similar to Profibus DP Slaves) and programming devices / PCs (named IO supervisors) with Ethernet Real Time (RT) and Isochronous Real Time (IRT) communication all the way. Real Time channel is used for time-critical process data and allows to meet the real-time requirements of the automation engineering (cycle times < 500 μ s, jitter < 1 μ s); while IRT is suitable for sophisticated motion control and high performance applications in factory automation and permits cycle times lower than 250 μ s with less than 1 μ s jitter. The standard TCP/IP channel is used for parametrization, configuration and acyclic read/write operations.

A PROFINET IO system requires at least one IO Controller and one IO Device. The most frequent network topologies can be implemented and even mixed together including Star, Line, Tree and Ring structures by means of copper or fiber-optic cables. The number of devices (each one fitted with its own MAC address, IP address and device name) which can be connected in the PROFINET network is virtually unlimited. The transmission rate is 100Mbit/s with full duplex communication (Fast Ethernet).

PROFINET IO Devices are configured using a configuration tool which acts as the IO Supervisor. The IO Supervisor uses a GSD (General Station Description) file based on XML language, thus it is called GSDML file, see on page 33.

6.2 Profinet encoders from Lika Electronic

PROFINET encoders from Lika Electronic fully comply with the encoder profile specifications V4.1 version 3.162, the encoder profile is based on the PROFIdrive profile. For any information on the encoder profile please refer to the following document:



ENCODER PROFILE. Technical specifications for Profibus and Profinet related to PROFIdrive

edited by PI International.

Furthermore these encoders fulfil the requirements of the Application Classes 3 and 4, thus they are intended for clock-synchronous (isochronous) real-time applications with cyclic and synchronous data transmission. Anyway they can also be used in applications without clock synchronization. For detailed information on the application classes refer to the section "6.3 Application Class definition" on page 64.

PROFINET encoders supports the standard telegrams 81, 82, 83 and 84. Further information can be found in the section "7.1 Telegrams" on page 67.

The IO data is transferred to and from the Encoder Object (EO, see the section "6.4 Encoder Object model" on page 65) via the Cyclic Data Exchange Service. The EO comprises the following mandatory functionalities:

- parameters;
- measuring task (i.e. position value, velocity value, ...);
- IO data (cyclical transmission of control and actual values);
- support for Alarm Mechanism.

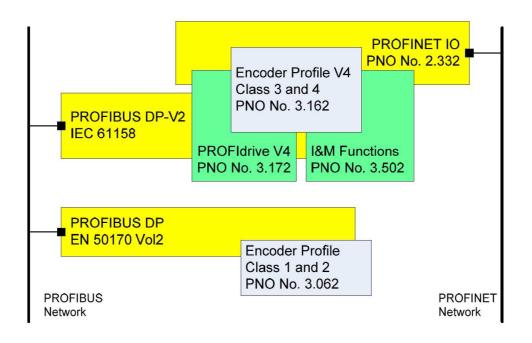
Among the parameters available in the Profinet encoders from Lika Electronic: code sequence, scaling function, preset (Class 4 functionalities), position readout, offset value, velocity value, velocity measuring unit, acyclic Error Data communication and diagnostic information.

Number of stations	Setting the IP- Address	Setting the baud rate	Transmission rate	Cable length	Cable
Virtually unlimited	Software / automatic via DCP	-	100 Mbit/s full duplex	Up to 100 m / 330 ft	M12 D- coded Profinet connectors

PROFINET at a glance



6.2.1 Overview of the encoder profiles



6.3 Application Class definition

The encoder profile defines two application classes: **Class 3** and **Class 4**. A number of mandatory functions are specified for each application class, in addition all optional functions must be recognized by the encoder and handled so that the controller is able to determine whether an optional function is supported.



NOTE

There is no relation between the Encoder application classes and the application classes defined in the PROFIdrive profile.

6.3.1 Application Class 3

Encoder with base mode parameter access and limited parametrization of the encoder functionality. Isochronous mode is not supported.

6.3.2 Application Class 4

Encoder with scaling, preset, isochronous mode and base mode parameter access. A Class 4 configured encoder fully supports all functionalities according to the encoder profile V4.1.

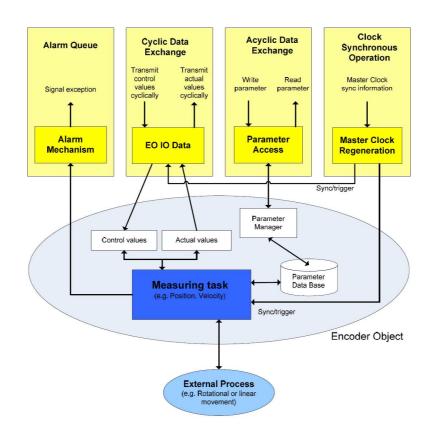
Lika Electronic encoders fulfill the requirements of CLASS 4

6.4 Encoder Object model

The Figure shows the general Encoder Object (EO) architecture. Central element of the EO is the Measuring Task where the measurements are made and the results are calculated. The properties of the EO is represented and controlled by parameters. The parameters are administered in the Parameter Data Base. To access EO parameters, Acyclic Data Exchange service is used. For periodic transportation of control values to the EO and actual values from the EO, the Cyclic Data Exchange service is used. Exception situations out of the Measuring Task and the General State Machine may be signaled by the Alarm Mechanism to the controlling device.

The EO shall comprise as minimum mandatory functionality:

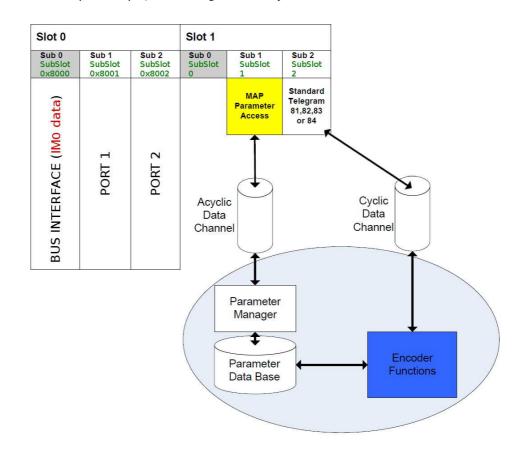
- Parameters;
- Measuring Task;
- IO Data (control value, actual value);
- Support for Alarm Mechanism;
- Optional functionality;
- Clock Synchronous operation.



6.5 Encoder object architecture

The Figure shows the general architecture and the mapping of the Encoder Object (EO) architectural elements to Communication Objects of the Peripheral Device for PROFINET IO. General with PROFINET IO the EO is mapped exactly to one Module/Slot. Slot 0 is exclusively reserved for Device representative purpose and therefore shall not used for any Encoder module. Valid Slot numbers for Encoder Objects are from 1 to 0x7FFF. Every EO contains at least the mandatory Module Access Point (MAP) which is mapped to a dedicated EO representative Submodule. This MAP Submodule contains at least the mandatory Parameter Access Point (PAP) which is mapped to a dedicated Record Data Object. Via the EO representative Submodule (MAP) and the specified Record Data Object the access to the EO parameter manager is possible. The EO parameter manager has access to the EO local Parameter Data Base. In addition to the mandatory MAP submodule, the EO may contain additional submodules which may be used to:

• represent communication end points for IO Data (cyclic data channel) and also to structure the IO Data in data blocks (telegrams, signals).



• represent physical or logical Subobjects of the EO.

7 **PROFINET IO data description**

7.1 Telegrams

A telegram is a rigidly defined bit stream carrying data. In each telegram the data length and the type of data which is sent to and from the IO controller is specified. PROFINET interface devices communicate and stay in sync by sending each other telegrams. The encoder profile supports four types of telegrams: Standard Telegram 81, Standard Telegram 82, Standard Telegram 83 and Standard Telegram 84. They are described hereafter. Standard signals are fully described in the section "Cyclic Data Exchange – Standard signals" on page 69.

7.1.1 Standard Telegram 81

The Standard Telegram 81 is the default telegram. It uses 4 bytes to output data from the IO controller to the encoder and 12 bytes to input data from the encoder to the IO controller.

Output data CONTROLLER => DEVICE

	2 bytes	2 bytes
IO Data	1	2
Set point	STW2_ENC	G1_STW

Input data DEVICE => CONTROLLER

	2 bytes	2 bytes	4 b'	ytes	4 bytes				
IO Data	1	2	3	4	5	6			
Actual value	ZSW2_ENC	G1_ZSW	G1_>	(IST1	G1_>	(IST2			

7.1.2 Standard Telegram 82

The Standard Telegram 82 uses 4 bytes to output data from the IO controller to the encoder and 14 bytes to input data from the encoder to the IO controller.

Output data CONTROLLER => DEVICE

	2 bytes	2 bytes
IO Data	1	2
Set point	STW2_ENC	G1_STW

Input data DEVICE => CONTROLLER

	2 bytes	2 bytes	4 b'	ytes	4 b	ytes	2 bytes
IO Data	1	2	3	4	5	6	7
Actual value	Actual value ZSW2_ENC		G1_>	KIST1	G1_>	(IST2	NIST_A



7.1.3 Standard Telegram 83

The Standard Telegram 83 uses 4 bytes to output data from the IO controller to the encoder and 16 bytes to input data from the encoder to the IO controller.

Output data CONTROLLER => DEVICE

	2 bytes	2 bytes
IO Data	1	2
Set point	STW2_ENC	G1_STW

Input data DEVICE => CONTROLLER

	2 bytes	2 bytes	4 b'	ytes	4 b	ytes	4 bytes			
IO Data	1	2	3	4	5	6	7	8		
Actual value	ZSW2_ENC	G1_ZSW	G1_>	(IST1	G1_>	(IST2	NIS	T_B		

7.1.4 Standard Telegram 84

The Standard Telegram 84 uses 4 bytes to output data from the IO controller to the encoder and 20 bytes to input data from the encoder to the IO controller.

Output data CONTROLLER => DEVICE

	2 bytes	2 bytes
IO Data	1	2
Set point	STW2_ENC	G1_STW

Input data DEVICE => CONTROLLER

	2 bytes	2 bytes		8 b'	ytes	5	4 b	ytes	4 bytes				
IO Data	1	2	3	4	5	6	7	8	9	10			
Actual value	ZSW2_ENC	G1_ZSW	G	1_)	KIST	3	G1_>	(IST2	NIST_B				



NOTE

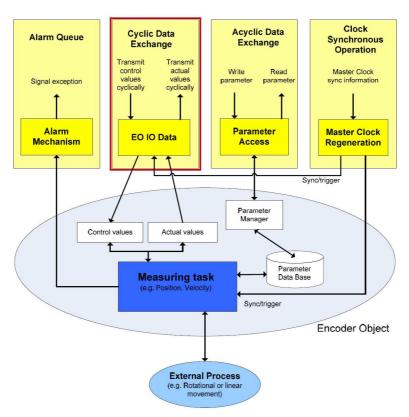
In the Standard Telegram 84, **G1_XIST2** is used to transfer the error codes and optionally the position values if the measuring length exceeds 64 bits.

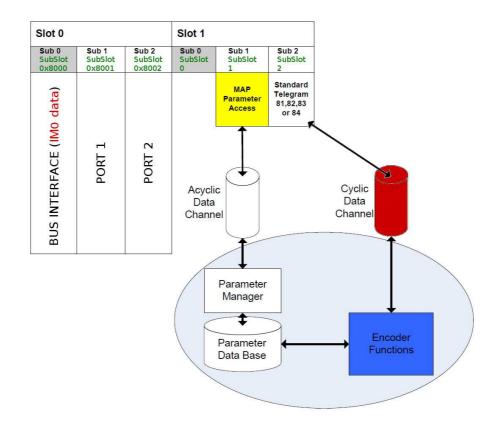


8 Cyclic Data Exchange – Standard signals

IO data is transferred via the Cyclic Data Exchange. A series of standard signals are defined to configure the IO data. In the following table the standard signals are summarily described.

Significance	Abbreviation	Length (bits)	Data type	Page
Sensor 1 position actual value 1	G1_XIST1	32	Unsigned	71
Sensor 1 position actual value 2	G1_XIST2	32	Unsigned	72
Sensor 1 position actual value 3	G1_XIST3	64	Unsigned	72
Encoder Control word 2	STW2_ENC	16	Unsigned	73
Encoder Status word 2	ZSW2_ENC	16	Unsigned	74
Sensor 1 control word	G1_STW	16	Unsigned	74
Sensor 1 status word	G1_ZSW	16	Unsigned	78
Speed actual value A	NIST_A	16	Signed	78
Speed actual value B	NIST_B	32	Signed	78







8.1 List of the available standard signals

G1_XIST1

[Unsigned, 32 bits]

It is defined as Sensor 1 position actual value 1. This signal is the actual (real) absolute position of the encoder expressed in binary notation.

Format definition:

- all values are represented in binary notation;
- the recommended default shift factor is zero (right aligned value) for both G1_XIST1 and G1_XIST2;
- the settings in the encoder parameter data affect the position value in both **G1_XIST1** and **G1_XIST2**.



Example

Here follows a format example.

25-bit absolute multiturn encoder, 13-bit singleturn resolution (8192 counts per revolution), 12-bit multiturn resolution (4096 revolutions)

- M = Multiturn value, number of revolutions
- S = Singleturn value, number of counts per revolution

M	SB																															LS	В
	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	
								Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	S	S	S	S	S	S	S	S	S	S	S	S	S	
			Abs	olu	ite	pos	siti	on	val	ue	in	G1	_X	IST	1																		
M	SB																															LS	В

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
				Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	Μ	S	S	S	S	S	S	S	S	S	S	S	S	S

Absolute position value in G1_XIST2

G1_XIST2

[Unsigned, 32 bits]

It is defined as Sensor 1 position actual value 2. By default this signal is the actual (real) absolute position of the encoder expressed in binary notation yet it has a different meaning if an error is active.

If no error is active:

this signal informs about the actual position value of the encoder, provided that the bit **Request absolute value cyclically** (bit 13 of control word **G1_STW**) is set to 1; otherwise this value is 0.

If an error is active:

this signal informs about the active error. For the complete list of the error codes refer to the section "10.3 Error codes in G1_XIST2" on page 96.

Format definition:

- all values are represented in binary notation;
- the recommended default shift factor is zero (right aligned value) for both G1_XIST1 and G1_XIST2;
- the settings in the encoder parameter data affect the position value in both G1_XIST1 and G1_XIST2;
- **G1_XIST2** displays the error telegram instead of the position value if an error occurs.

For the format example see **G1_XIST1** above.

G1_XIST3

[Unsigned, 64 bits]

It is defined as Sensor 1 position actual value 3. This 64-bit position value is intended to support the encoders having a measuring length which exceeds 32 bits. **G1_XIST3** has the following format:

- binary format;
- the actual position value is always right aligned, a shifting factor is not used;
- the settings in the encoder parameter data affect the position value in **G1_XIST3** if Application Class 4 is enabled.

IO data	1	2	3	4
Format	64-bit position value			

STW2_ENC

[Unsigned, 16 bits]

It is defined as Encoder control word 2. Control word **STW2_ENC** includes the **Control by PLC** mechanisms from PROFIdrive STW1 and the **Controller Sign-Of-Life** mechanism from PROFIdrive STW2.

Bit	Meaning
06	Reserved
7	Not used
8 9	Reserved
10	Control by PLC
11	Reserved
12 15	Controller Sign-Of-Life

Control by PLC

Bit 10

If the **Compatibility mode** is enabled (see on page 88), then bit 10 **Control by PLC** is ignored. In this case control word **G1_STW** and setpoint are always checked.

If the **Compatibility mode** is disabled (see on page 88), then bit 10 **Control by PLC** is checked. So control word **G1_STW** and setpoint are checked only if the bit **Control by PLC** is set.

Bit	Value	Significance	Comment				
10	1	Control from PLC	Control via interface, EO IO Data is processed.				
10	0	No control from PLC	E0 I0 Data not valid, except Sign-Of-Life.				

Controller Sign-Of-Life

Bits 12 ... 15

For more information on the control word **STW2_ENC** please refer to the PROFIdrive Technical Specification document.

ZSW2_ENC

[Unsigned, 16 bits]

It is defined as Encoder status word 2. The encoder status word 2 **ZSW2_ENC** includes the Control by PLC mechanism from PROFIdrive ZSW1 and the Slave Sign-Of-Life mechanism from PROFIdrive ZSW2.

Bit	Meaning
0 2	Reserved
3	Not used
4 8	Reserved
9	Control requested
10 11	Reserved
12 15	Encoder Sign-Of-Life

Control requested

Bit 9

Bit	Value	Significance	Comment	
	1 Control Requested		The automation system is requested to assume control.	
9	0	No Control requested	Control by the automation system is not possible, only possible at the device or by another interface.	

Encoder Sign-Of-Life

Bits 12 ... 15

For more information on the status word 2 **ZSW2_ENC** please refer to the PROFIdrive Technical Specification document.

G1_STW

[Unsigned, 16 bits]

It is defined as Sensor 1 control word. This control word controls the functionality of major encoder functions.

Bit	Meaning
0 7	Not used
8 10	Reserved
11	Home position mode
12	Request set/shift of home position

13	Request absolute value cyclically
14	Activate parking sensor
15	Acknowledging a sensor error



NOTE

If the **Activate parking sensor** is activated (bit 14 = 1) the encoder is still on bus with the slave Sign-Of-Life active and the encoder error and diagnostics switched off.

Home position mode Bit 11

Request set/shift of home position Bit 12

The preset function is controlled by bits 11 and 12 in this Sensor 1 control word **G1_STW** and acknowledged by the bit 12 **Set/shift of home position executed** in the sensor status word **G1_ZSW**. The preset value is 0 by default and may be set by an acyclic data exchange parameter defined in the parameters section (see **P65000 – Preset value** on page 83). The preset function has an absolute and a relative operating mode selectable by mean of the bit 11 **Home position mode** in this Sensor 1 control word **G1_STW** (0 = absolute; 1 = relative). Bit 11 and bit 12 in the Sensor 1 control word **G1_STW** control the preset function as described in the table below.

Bit 12	Bit 11	Action
0	Х	Normal operating mode.
		The encoder will make no change in the output value.
1	0	Preset mode absolute
		The encoder reads the current position value and calculates
		an internal offset value from the preset value P65000 -
		Preset value and the read position value. The position value
		is then shifted with the calculated offset value to get the
		current position value equal to the preset value. The
		encoder acknowledges the preset by setting the bit 12
		Set/shift of home position executed in the sensor status
		word G1_ZSW. Now bit 12 Request set/shift of home
		position in the sensor 1 control word G1_STW can be set
		to zero by the Master. The encoder will end the preset cycle
		by clearing the bit 12 Set/shift of home position
		executed in the sensor status word G1_ZSW. The new
		internal offset value can be read with an acyclic data
		exchange parameter (if implemented) and is securely stored



r		
		in case of voltage breakdown and uploaded again at each power on.
	1	
		Preset mode relative (offset)
		The encoder uses the preset value P65000 – Preset value
		as a relative offset value. In this mode the current position
		value is shifted by the value deriving from the preset value.
		EXAMPLE
		A preset value "1000" is intended to shift the
		current position value by 1000 steps in the
		positive counting direction. So a "real"
		position value of "5000" will have the value "6000" after the
		relative shifting sequence. The encoder will set bit 12
		Set/shift of home position executed in the sensor status
		word G1_ZSW to acknowledge the execution of the
		shifting. Bit 12 Request set/shift of home position in the
		sensor control word G1_STW can now be set to zero by the
		Master. The encoder will end the preset cycle by clearing the
		bit 12 Set/shift of home position executed in the sensor
		status word G1 ZSW. The internal offset value will be
		shifted according to the transferred preset value. The new
		offset value is securely stored in case of voltage breakdown
		and uploaded again at each power on.

The Preset command automatically saves the calculated internal offset values.



NOTE

Refer also to the index **P65000 – Preset value** on page 83; to **G1_XIST1 preset control** on page 86; and to the section "14.2 Preset diagram" on page 135. See also the section "15.2 Setting the preset value" on page 151.



EXAMPLE

An example of setting the Preset value is provided on page 126.



Request absolute value cyclically

Bit 13

Bit	Significance	Comment
13	=1 : Request absolute	Request of additional cyclic
	value cyclically	transmission of the current absolute
		position in G1_XIST2.

Activate parking sensor

Bit 14

Bit	Significance	Comment
14	=1 : Activate parking	Request to stop monitoring the
	sensor	measuring system and the current
		value measurements in the drive. This
		makes it possible to disconnect the
		encoder from the line without having
		to change the drive configuration or
		causing a fault. In this case all current
		errors of the encoder are cleared. The
		parking of the encoder while the drive
		is running is not allowed and will
		result in a sensor interface error (error
		code 0x03 in G1_XIST2)

See also "14.3 Parking sensor diagram" on page 136.

Acknowledging a sensor error

Bit 15

Bit	Significance		Comment
15	=1 : Acknowledging	а	Request to acknowledge a sensor error
	sensor error		(bit 15 Sensor error of G1_ZSW)

G1_ZSW

[Unsigned, 16 bits]

It is defined as Sensor 1 status word. This status word defines the states, acknowledgments and error messages of the encoder and its main functions.

Bit	Meaning
09	Not used
10	Reserved
11	Requirements of error acknowledge detected
12	Set/shift of home position executed
13	Transmit absolute value cyclically
14	Parking sensor active
15	Sensor error



NOTE

If bit13 **Transmit absolute value cyclically** or bit15 **Sensor error** are not set, there is no valid value or error code transferred in **G1_XIST2**.



NOTE

Bit 13 **Transmit absolute value cyclically** and bit 15 **Sensor error** cannot be set at the same time as they are used to indicate either a valid position value transmission (bit 13) or the error code transmission (bit 15) in **G1_XIST2**.

NIST_A

[Signed, 16 bits] It is defined as Current velocity value A. Velocity value is calculated every 100 ms. Refer also to the parameter Velocity measuring units on page 91.

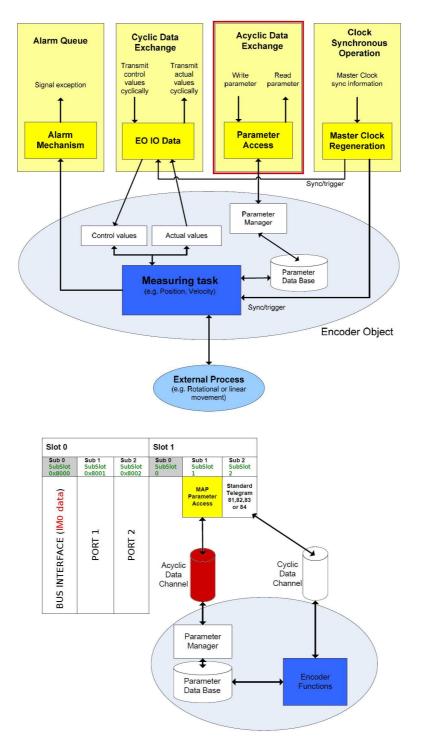
NIST_B

[Signed, 32 bits] It is defined as Current velocity value B. Velocity value is calculated every 100 ms. Refer also to the parameter Velocity measuring units on page 91.

9 Acyclic Data Exchange

lika

In addition to the Cyclic Data Exchange (see the section "Cyclic Data Exchange – Standard signals" on page 69), the Acyclic Data Exchange gives the possibility to read and write parameters over the non real time channel.



9.1 Index 0xAFF0: Identification & Maintenance (I&M) functions

Profinet encoders from Lika Electronic only implement I&M 0 Module (IM0).

IMO is accessible with record 0xAFFO and provides general information on the device such as vendor ID, order ID, serial number, etc.

Description	Number of bytes
BLOCKHEADER	6
MANUFACTURER ID (VENDOR ID)	6
ORDER ID	20
SERIAL NUMBER	16
HARDWARE REVISION	2
SOFTWARE REVISION	4
REVISION COUNTER	2
PROFILE ID (API)	2
PROFILE SPECIFIC TYPE	2
IM VERSION	2
IM SUPPORTED	2

9.2 Index 0xB02E : supported PROFIdrive specific parameters

P922 – Telegram Selection

[Unsigned16, RO] It indicates the type of telegram which is currently in use. Possible values: 81, 82, 83 and 84.

P964 – Profidrive Parameter : Device identification

[Array[0 ... 5], unsigned16, RO]

Index	Sub	Meaning	Value	Access
964	0	Manufacturer ID (Vendor ID assigned by PI)	0x239	RO
964	1	DU Drive unit type (Vendor specific)	1	RO
964	2	Software version	XXXX	RO
964	3	Software year	уууу	RO
964	4	Software day and month	dd.mm	RO
964	5	Number of Drive Object (DO)	1	RO

P965 – Encoder profile number

[Octet string 2, RO]

Index	Sub	Meaning	Value	Access
965	0	Encoder profile number	0x3D	RO
965	1	Encoder profile version, set by customer	31 or 41	RO

P971 – Transfer to non volatile memory

[Unsigned16, RW]

It is used to save the current local parameters on a non volatile memory. Write "1" to save the parameters. The encoder confirms save by writing "0" on this parameter.

Index	Sub	Meaning	Value	Access
971	0	Save on non volatile memory	variable	RW

P975 – Encoder object identification

[Array[0 ... 7], unsigned16, RO]

Index	Sub	Meaning	Value	Access
975	0	Manufacturer ID (Vendor ID	0x239	RO
575	0	assigned by PI)	07233	no
975	1	DO type (Vendor specific)	0x01	RO
975	2	Software version	XX.XX	RO
975	3	Software year	уууу	RO
975	4	Software day and month	dd.mm	RO
975	5	Profidrive DO type classification	0x05	RO
975	5	Tronutive Do type classification	encoder interface	NO
			0x8000 (encoder	
975	6	Profidrive DO subclassification 1	Application Class	RO
			4 supported)	
975	7	Drive object ID (DO ID)	0x01	RO



P979 – Sensor format

[Array[0 ... 5], unsigned16, RO]

Index	Sub	Meaning	Value	Access
979	0	Header	0x00005011	RO
979	1	Sensor type	0x80000000	RO
979	2	Sensor Resolution	variable	RO
979	3	Shift factor for G1_XIST1	0	RO
979	4	Shift factor for G1_XIST2	0	RO
979	5	Determinable resolutions	variable	RO

P980 – Number list of defined parameter

[Array[0 ... 8], unsigned16, RO]

Index	Sub	Meaning	Value	Access
980	0	P922 – Telegram Selection	922	RO
980	1	P964 – Profidrive Parameter : Device	964	RO
500		identification	504	NO
980	2	P965 – Encoder profile number	965	RO
980	80 3	P971 – Transfer to non volatile	971	RO
900	5	memory	971	NO
980	4	P975 – Encoder object identification	975	RO
980	5	P979 – Sensor format	979	RO
980	6	P61001 – IP of station	61001	RO
980	7	P65000 – Preset value	65000	RO
980	8	P65001 – Operating status	65001	RO

P61001 – IP of station

[Unsigned32, RO]

Index	Sub	Meaning	Value	Access
61001	0	IP address assigned to the encoder	variable	RO



9.3 Index 0xB02E : supported encoder specific parameters

P65000 – Preset value

[Unsigned32, RW]

Preset function is meant to assign a desired value to a known physical position of the system. The chosen physical position will get the value set next to this index and all the previous and following mechanical positions will get a value according to it. Preset value can be saved on the internal memory using the parameter **P971 – Transfer to non volatile memory**.

See also **Home position mode** and **Request set/shift of home position** in **G1_STW** on page 75; and **G1_XIST1 preset control** on page 86.

Index	Sub	Meaning	Value	Access
65000	0	Preset value	variable	RW



EXAMPLE

An example of setting the Preset value is provided on page 126.

P65001 – Operating status

[Array[0 ... 11], unsigned32, RO]

This parameter has a read only structure where information on the encoder operating status can be found. It is a complement to the PROFIdrive parameter **979** described in the PROFIdrive profile.

Index	Sub	Meaning	Value	Access
65001	0	Header	0x000C0101	RO
			See "Operating	
65001	1	Operating status	status table	RO
			values"	
65001	2	Faults	See "Faults	RO
05001	2	Taults	table"	NU
65001	3	Supported faults	0x0030	RO
65001	4	Warnings (*)	0x0	RO
65001	5	Supported warnings	0x0	RO
65001	6	Encoder profile version (**)	0x401	RO
65001	7	Operating time	OxFFFFFFFF	RO
65001	8	Offset value (related to G1_XIST1)	variable	RO
65001	9	Measuring units per revolution	variable	RO
65001	10	Total measuring range in	variable	RO



		measuring units		
65001	11	Velocity measuring unit (user setting)	variable (***)	RO

(*) Warnings are not supported in this encoder.

(**) 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.

(***) See Velocity measuring units in the section "9.4 Index 0xBF00 : user parameter data" on page 91.

Operating status table values

Bit	Meaning
0	Code sequence
1	Class 4 functionality
2	G1_XIST1 preset control
3	Scaling function control
4	Alarm channel control
5	Compatibility mode
6-7	Reserved to the encoder manufacturer
8-31	Reserved for future use

Faults table

Bit	Meaning
03	Not used
4	Commissioning diagnostic
5	Memory error
6 31	Not used

Supported faults table

Bit	Meaning
0 3	Not used
4	Commissioning diagnostics supported
5	Memory error supported
6 31	Not used

Offset value is calculated in the preset function and is intended to shift the position value. The offset value is saved on the internal memory. This parameter is a read-only parameter.



9.4 Index 0xBF00 : user parameter data

The 31-byte user parameter data listed in the table below is sent to the encoder in the start-up phase using the data record 0xBF00.

Parameter	Data Type	Default	Comment	User Data Octet Number
Code sequence	Bit	0 (CW)		Byte 0 bit 0
Class 4 functionality	Bit	1 (enabled)		Byte 0 bit 1
G1_XIST1 preset control	Bit	0 (enabled)		Byte 0 bit 2
Scaling function control	Bit	0 (disabled)		Byte 0 bit 3
Alarm channel control	Bit	0 (disabled)	Only supported in Compatibility mode	Byte 0 bit 4
Compatibility mode	Bit	1 (disabled) (profile V4.1)		Byte 0 bit 5
Reserved		0	Set to 0	Byte 0 bits 6-7
Measuring units / Revolution	Unsigned64	variable		Bytes 1-8
Total measuring range	Unsigned64	variable		Bytes 9-16
Maximum Master Sign-Of- Life failures	Unsigned8	1	Only supported in Compatibility mode	Byte 17
Velocity measuring units	Unsigned8	0 (Steps/rev)		Byte 18
Reserved		0x00	Set to 0	Bytes 19-30



NOTE

Default values are highlighted in **bold** in the following tables.

Code sequence

Code sequence sets whether the absolute position value output by the encoder increases when the encoder shaft rotates clockwise (0 = CW) or counter-clockwise (1 = CCW). CW and CCW rotations are viewed from shaft end. This parameter is processed only if **Class 4 functionality** is enabled.

Attribute	Meaning	Value
CW	Absolute position value increasing with clockwise rotation (viewed from shaft end)	0
CCW	Absolute position value increasing with counter-clockwise rotation (viewed from shaft end)	1



WARNING

Changing this value causes also the position calculated by the controller to be necessarily affected. Therefore it is mandatory to execute a new preset after setting this parameter.

Class 4 functionality

For any information on the implemented Application Classes refer to the section "6.3 Application Class definition" on page 64.

If it is enabled, Code sequence, G1_XIST1 preset control and Scaling function control affect the position value in G1_XIST1, G1_XIST2 and G1_XIST3. However the preset will not affect the position value in G1_XIST1 if the parameter G1_XIST1 preset control is disabled; it will always affect G1_XIST2 and G1_XIST3 instead.

Attribute	Meaning	Value
Disable	Code sequence, G1_XIST1 preset control and Scaling function control disabled	
Enable	Code sequence, G1_XIST1 preset control and Scaling function control enabled	

G1_XIST1 preset control

This parameter is available only if **Class 4 functionality** is enabled.

This parameter controls the effect of a preset on the $G1_XIST1$ actual value. When it is enabled, Preset will affect the position value in $G1_XIST1$.

Attribute	Meaning	Value
Enable	G1_XIST1 is affected by a Preset command	0
Disable	Preset does not affect G1_XIST1	1



WARNING

G1_XIST1 preset control is disabled by setting the value 1.



NOTE

There is no functionality of this parameter if the **Class 4 functionality** parameter is disabled.



EXAMPLE

An example of setting the Preset value is provided on page 126.

Scaling function control

This parameter enables / disables the Scaling function. When this parameter is disabled, the device uses the hardware singleturn and multiturn resolutions; when it is enabled, the device uses the resolutions set next to the parameters **Measuring units / Revolution** and **Total measuring range**. Refer also to the section "Scaling function parameters" on page 88.

Attribute	Meaning	Value
Disable	Scaling function disabled	0
Enable	Scaling function enabled	1



NOTE

There is no functionality of this parameter if the **Class 4 functionality** parameter is disabled.

Alarm channel control

This parameter enables / disables the encoder specific Alarm channel transferred as Channel Related Diagnosis. This functionality is used to limit the amount of data sent in isochronous mode.

If the value is zero (0 = default value), only the communication related alarms are sent via the alarm channel. If the value is one (1), also the encoder specific faults and warnings are sent via the alarm channel.

For further information refer also to the section "10.2 Error messages via the Alarm Channel" on page 95.

Attribute	Meaning	Value
Disable	No profile specific diagnosis	0
Enable	Profile specific diagnosis	1



NOTE

This parameter is only supported in compatibility mode (see **Compatibility mode** on page 88).



Compatibility mode

This parameter defines whether the encoder has to run in a mode compatible with Version 3.1 of the Encoder Profile. See the table below for an overview of the functions affected when the compatibility mode is enabled.

Attribute	Meaning	Value
Enable	Compatibility with Encoder Profile V3.1	0
Disable	No backward compatibility	1

Function	Compatibility mode Enabled (=0)	Compatibility mode Disabled (=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 – Encoder profile number	31 (V3.1)	41 (V4.1)

Scaling function parameters

Using the scaling function parameters the encoder absolute position value is converted by software in order to change the resolution of the encoder. The scaling parameters will only be activated if the parameters **Class 4 functionality** and **Scaling function control** are enabled.

The permissible range for the scaling parameters is limited by the hardware encoder resolution.



EXAMPLE

In a 25-bit encoder having a singleturn resolution of 13 bits (8192 cpr) and a multiturn resolution of 12 bits (4096 revolutions), the permissible value for the Measuring units / Revolution is between 2^0 and 2^{13} (2^{13} = 8192) while the



permissible value for the Total measuring range is between 2 and 2^{25} (2^{25} = 33554432).

Measuring units / Revolution

It is used to program a user specific resolution per each revolution (singleturn resolution). Allowed values are equal to or lower than the hardware counts per revolution (physical singleturn resolution). We suggest setting values that are a power of 2 (1, 2, 4, ... 2048, 4096, ...). See the parameter **Total measuring range** below.

Default = hardware counts per revolution (min. = 1, max. = hardware counts per revolution)



NOTE

There is no functionality of this parameter if the **Scaling function control** parameter is disabled.

Г	

EXAMPLE

The HS58 PT Profinet singleturn encoder has a singleturn resolution of 18 bits (262144 cpr); the permissible value for the **Measuring units / Revolution** will be between 2° and 2^{18} ($2^{18} = 262144$).



NOTE

When you change the value next to this parameter, then you are required to enter a new preset.

Total measuring range

This parameter sets the number of distinguishable steps over the total measuring range. Allowed values are equal to or lower than the total hardware resolution value (physical multiturn resolution).

We recommend the **Number of revolutions** to be set to a power of 2. The set **Number of revolutions** results from the following calculation:

Total measuring range

Number of revolutions =

Measuring units / Revolution

Setting the **Number of revolutions** to a value which is a power of 2 is meant to avoid problems when using the device in endless operations requiring the physical zero to be overstepped. If you set the **Number of revolutions** which is not a power of 2, a so-called "Red Zone" is generated before the physical zero. For more detailed information refer to the section 9.5 "Red Zone" on page 92). Default = total hardware resolution (min. = 2, max. = total hardware resolution)



NOTE

There is no functionality of this parameter if the **Scaling function control** parameter is disabled.



EXAMPLE

The HM58 PT Profinet encoder has a singleturn resolution of 16 bits (65536 cpr) and a multiturn resolution of 14 bits (16384 revolutions); the permissible value for the **Measuring units / Revolution** will be between 2° and 2^{16} (2^{16} = 65536) while the permissible value for the **Total measuring range** will be between 2 and 2^{30} (2^{30} = 1073741824).



NOTE

When you change the value next to this parameter, then you are required to enter a new preset.

Maximum Master Sign-Of-Life failures

With this parameter the number of allowed failures of the master's sign of life is defined. The default value is one (1). Default = 1 (min. = 1, max. = 255)



NOTE

This parameter is only supported in compatibility mode (see **Compatibility mode** on page 88).



Velocity measuring units

This parameter defines the coding of the velocity measuring units used to configure the signals **NIST_A** and **NIST_B**. Standard telegram 81 has no velocity information included and the encoder does not use the velocity measuring unit information in this case. Standard telegrams 82, 83 and 84 include velocity output and need a declaration of the velocity measuring unit.

Parameter	Meaning	Value
Valaaity maasuring units	Definition of the units for the	See table below
	Definition of the units for the encoder velocity output value	

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

Default = 0 (min. = 0, max. = 3)



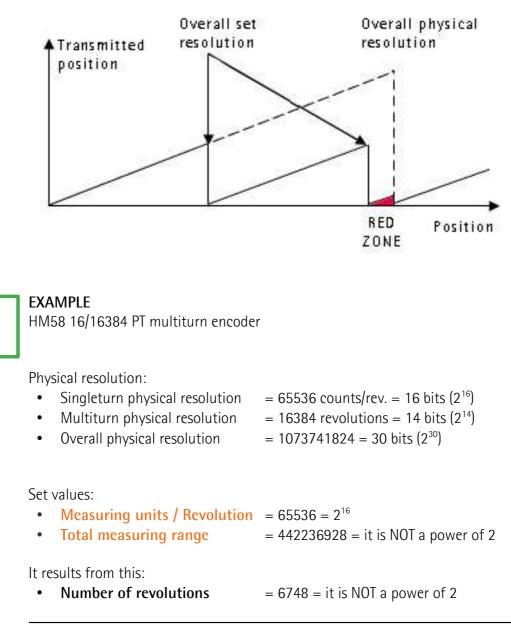
NOTE

Please note that the velocity value is always calculated every 100 ms.

9.5 "Red Zone"

The so-called "Red Zone" problem occurs when the **Number of revolutions** (i.e. the **Total measuring range / Measuring units / Revolution**) is not a power of 2.

When this problem arises, the device must operate within the "red zone" for a certain number of positions. The size of the "red zone" is variable. To calculate it we must subtract the overall set resolution from the overall physical resolution of the device as many times as until the difference is less than the overall set resolution. When the encoder crosses the limit of the last value in the overall physical resolution, a counting error occurs, i.e. a jump in the position count. The problem is represented graphically in the following Figure.





This can be proved easily:

Overall physical resolution		1073741824	2 4 2 7
Overall set resolution		442236928	- = 2,427

It follows that for 189267968 positions (1073741824 - 442236928 * 2 = 189267968), i.e. for 11552 revolutions, the encoder will work within the limits of the so-called "red zone". After position 189267968 (i.e. at the end of the "red zone") a position error (namely, a "jump" in the position count) would happen as the following position would be "0". See the Figure in the previous page.



NOTE

Make attention using the values sent by the encoder while working within the limits of the "Red Zone". When the encoder changes from normal status to "Red Zone" status (and vice versa) a jump of position occurs.

10 Diagnostics and Alarms

Diagnostics data is always transferred acyclically using Record Data communication over the non real time channel. A PN-IO controller can request diagnostic data from the PN-IO device using RDO (Record Data Object) services.

Alarm data is transmitted from the IO device to the IO controller via the RT channel.

The encoder errors are divided into **Faults** and **Warnings**, they are defined as follows.

FAULT

A Fault is set if a malfunction in the encoder could lead to incorrect position values.

WARNING

Warnings indicate that the tolerance for certain internal parameters of the encoder has been exceeded. Unlike faults, warnings do not imply incorrect position values.



NOTE

Please note that warnings are not supported in this encoder.

There are several diagnosis mechanisms that are used to monitor encoder diagnostics.

Please refer to the table below for an overview of the available diagnosis mechanisms.

Function	Reference
Acyclic diagnosis parameter P65001 – Operating status	See on page 95
Channel related diagnosis via the Alarm Channel	See on page 95
Error codes in G1_XIST2	See on page 96
LED indication	See on page 96



10.1 Acyclic diagnosis parameter P65001 – Operating status

With the Acyclic parameter **P65001 – Operating status** the current status of the Encoder Faults and Warnings as well as the support of the individual Fault and Warning bits can be read from the encoder. For detailed information on the parameter **P65001 – Operating status** please refer to page 83.

10.2 Error messages via the Alarm Channel

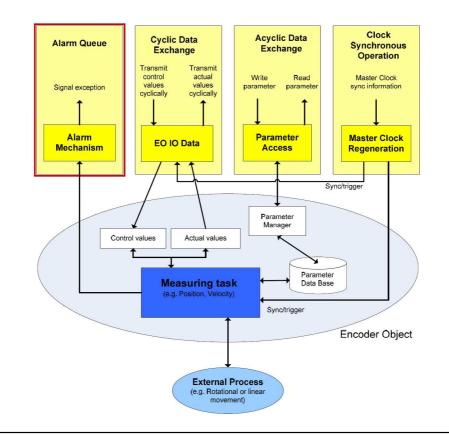
The encoder diagnosis is reported to the controller via the Alarm channel as Channel Related Diagnosis. Both warnings and faults are reported in the same manner but with different error types.



NOTE

In compatibility mode (see the parameter **Compatibility mode** on page 88), channel related diagnostics can be switched off by the **Alarm channel control** parameter, please refer to its description on page 87.

For a detailed definition of the use of the channel related diagnosis please refer to the Alarm mechanism definition for the respective communication system in the mapping part of the profile.





10.2.1 Use of the ChannelErrorType

For Profinet the encoder faults and warnings are mapped to the ChannelErrorTypes defined in the PROFIdrive profile, see the tables below. This means that there are no specific codes defined for standalone encoders and a PROFINET controller will interpret the errors from an encoder in the same ways as an error coming from a drive. Refer also to the parameter **P65001 – Operating status** on page 83.

Error type	Definition	Explanation
0x9000		The encoder failed to read saved offset or preset values from the internal non volatile memory.
0x9011	Commissioning diagnostic	User parameter data assignment error.

10.3 Error codes in G1_XIST2

Error codes are sent in **G1_XIST2** if an error occurs. For information about **G1_XIST2** refer to page 72.

G1_XIST2	Meaning	Explanation
0x0F02	Master's sign of life fault	The number of permissible failures of the master's
0,0102	Master's sign of fire fault	sign of life was exceeded.
0x0F04	Synchronization fault	The number of permissible failures for the bus
0x0F04 Synchronization fault		cycle was exceeded.
0x1001	Momore	Error while writing on or reading the internal non
0x1001 Memory error		volatile memory.
		User parameter data assignment error.
0x1002	Parametrization error	Example: Measuring units / Revolution and
		Total measuring range not compatible.

10.4 LED indication

Errors are further indicated through LEDs. Six LEDs located in the cap of the encoder (see Figure 1) are meant to show visually the operating or fault status of the encoder and the Profinet interface.

For detailed information refer to the section "4.5 Diagnostic LEDs (Figure 1)" on page 31.



11 Real time class communication

Within PROFINET IO, process data and alarms are always transmitted in real time. Real-Time for PROFINET (RT) is based on the definitions of IEEE and IEC for high-performance data exchange of I/O data. RT communication constitutes the basis for data exchange in PROFINET IO.

Real-time data are handled with higher priority compared to TCP(UDP)/IP data. This method of data exchange allows bus cycle times in the range of a few hundred milliseconds to be achieved.

Isochronous data exchange with PROFINET is defined in the Isochronous-Real-Time (IRT) concept. IRT communication is always clock synchronized and only possible within an IRT domain. Isochronous realtime communication differs from realtime communication mainly in its isochronous behavior: the start of a bus cycle can deviate by a maximum of 1 μ s (jitter is less then 1 μ s). IRT is required in motion control applications (positioning operations), for example. This communication is required, for example, for high-accuracy closed-loop control tasks.

11.1 Real-time classes in PROFINET IO

To enable enhanced scaling of communication options and, thus, also of determinism in PROFINET IO, real-time classes have been defined for data exchange. From the user perspective, these classes involve unsynchronized and synchronized communication.

PROFINET IO differentiates the following classes for RT communication.

They differ not in terms of performance but in determinism.

11.2 Real-Time class 2 (RT2) – Not synchronized

In real-time class 2 frames are transmitted via unsynchronized communication (anysochronous communication).

To activate the real-time class 2 both the IO controller and the IO device must be set exactly the same as "Not synchronized". To do this proceed as follows.

11.2.1 Setting an anisochronous communication

To configure the IO controller (Figure 34) double click the **PN-IO** slot X2 to open the PN-IO properties dialog box. The **Properties – PN-IO** property sheet will appear. Enter the **Synchronization** tabbed page and select the **Not synchronized** value in the drop-down menu of the **Synchronization role** item. Confirm pressing the **OK** button.

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Figure 34 - Setting the Not synchronized role of the IO controller

To configure the IO device (Figure 35) double click the **Interface** slot X1 of the module to open the interface properties dialog box. The **Properties – Interface** property sheet will appear. Enter the **Synchronization** tabbed page and select the **Not synchronized** value in the drop-down menu of the **Synchronization** role item. Confirm pressing the **OK** button.

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Figure 35 - Setting the Not synchronized role of the IO device

11.3 Real-Time class 3 (IRT_TOP) (RT3)

Isochronous data exchange with PROFINET is defined in the Isochronous-Real-Time (IRT) concept. IRT communication is always clock synchronized and only possible within an IRT domain. Isochronous realtime communication differs from realtime communication mainly in its isochronous behavior: the start of a bus cycle can deviate by a maximum of 1 μ s (jitter is less then 1 μ s).

This communication is required, for example, for high-accuracy closed-loop control tasks.

Only industrial IRT switches can be used.

Typical cycle time 1 ms or less. All network components must support PROFINET IRT frame priority processing. Position values are captured with an accuracy of $+/-1 \mu s$ or better, with respect to the highly accurate bus clock.

11.3.1 Setting an isochronous communication

To activate the real-time class 3 both the IO controller and the IO device must be configured. To do this proceed as follows.

To configure the IO controller (Figure 36) double click the **PN-IO** slot X2 to open the PN-IO properties dialog box. The **Properties – PN-IO** property sheet will appear. Enter the **Synchronization** tabbed page and select the **Sync master** value in the drop-down menu of the **Synchronization role** item; select the **High performance** value in the drop-down menu of the **IRT option** item. Confirm pressing the **OK** button.

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Figure 36 - Setting the sync master role of the IO controller

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To configure the IO device (Figure 35) double click the **Interface** slot X1 of the module to open the interface properties dialog box. The **Properties – Interface** property sheet will appear. Enter the **Synchronization** tabbed page and select the **Sync slave** value in the drop-down menu of the **Synchronization role** item; select the **High performance** value in the drop-down menu of the **IRT option** item. Confirm pressing the **OK** button.

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Figure 37 - Setting the sync slave role of the IO device

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Now double click the **CPU** slot 2 in the CPU configuration table to open the CPU properties dialog box. The **Properties – CPU 315** ... property sheet will appear. Enter the **Synchronous Cycle Interrupts** tabbed page and press the **Details** button.

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1 2 5 CPU 3 X7 MPV/D/ X2 PN-I0	Cycle/Clock Memory Retentive Memory Interrupts Time-of-Day Interrupts Cyclic Interrupts Cyclic Interrupts Diagnostics/Clock Protection Communication Web Image: Communication I	
X2 P1 R X2 P2 R 3 4 5 1 0016x0 5	Process image patition(s) (e.g.: 1,4)(SFC126 / SFC127 Priority Delay time Image patition(s) Image patients DB61: 25 100 ▼ 0.000 µs	
	0962: 0 0.000 µc	
Sm - 1	0863 0	
(0) UR Slot (1 Module 1 2 (1) CPU 315-2 PN/DP	0864: 0 0.000 µc	
X1 NRI/DP X2 RNID X21 Roits 1 X21 Roits 2 3	OK Cancel Help	
4 DI16xDC24V 5 D016xDC24V/0.5A 6	SEST 321-18H02-04A0 202 GEST 322-18H01-0AA0 45 PROFINE T IO-System	ŧ
7 8		

Figure 38 - CPU property sheet

The **OB61** dialog box will appear on the screen. Set the value "1" next to the **Process image partition(s)** item. Confirm pressing the **OK** button.



NOTE

For more information on PIPs (Process Image Partitions) refer to the section "11.5 PIP (Process Image Partition)" on page 112.

Image: Solution of the solution	W HW Config - [SIMATIC 300(W Station Edit Insert PLC View				- 8 X
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Image: Constraint of the second sec	1	Cycle/Clock Memory Retentive Memory Diagnostics/Clock Protectiv General Startup Proce Priority IO system no. coli i Defait: 25 Defaite Defait: 0662 Defaite	Application Priority: Application cycle [µ1} Delaution cycle [µ1] Process image partition(s): Tiv/To most Time Ti (read in process values) [µ2] Timin: Ti fread in process values) [µ2]	Factor Data cycle [µc] 1000.000 = 1 → × 1000.000 Automatic settings 1 0.000 → Timebase [µs] 0.000	_
X21 X100 2 Cancel Help 3 0K Cancel Help 3 0156/0224//054 6657 322-18H02/04A0 202 5 0.0156/0224//054 6657 322-18H01/04A0 45 6 - - - 7 - - - - 8 - - - - -	OI UR Sizt Module 1 CPU 315-2 PN/DP A/1 M69/DP A/2 PN/07 A D16x0C24V/05A 5 D16x0C24V/05A 7	0664: 0	I/O IO system no.: Data cycle [µs]; DK	100 y Factor Transmit cycle (j 1000.000 = 1 y x 1000.000 Cancel Help PROFINET IO System	

Figure 39 - PIP of OB61

Now set the encoder in isochronous mode. To do this double click the **Interface** slot X1 of the module to open the interface properties dialog box. The **Properties – Interface** property sheet will appear. Enter the **IO cycle** tabbed page and select the **OB61** value in the drop-down menu of the **Assign IO device in isochronous mode** item. For further information see also the section "11.4 OB61" on page 111.

HW Config - [SIMATIC 300(1) (Configuration) Lika]	📕 🗗 🔀
🖏 Station. Edit Insert PLC View Options Window Help	
×	미치
Properties - Interface (X1)	nt ni
General Addresses Synchronization ID Cycle	
⊨mur	Research
	DP PA
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2 PN-10 Undeterments	0
X2P18 Potra 1 V1929 - Devta 2	Based Control 300/400
3 Watchdog Time	Station
A D116xDC24V Number of accepted update cycles with missing ID data: 3	
3 Watchdog time fault	
Isochronous Mode	
Assign ID device in isochronous mode:	
Application male [us]: 1000.000 Deta cycle [us]: 1000.000	
Ti/To mode In the network	
Time Ti (read in process values) [us]	
Stat Mine_Thises [jus] T25,000 Timebase Ti/To [jus] T25,000 Slat Module Time To (output process values) [jus] T25,000 Timebase Ti/To [jus] T25,000	
X7/ Rwt 7 Isochronous Mode Modules / Submodules .	
X1/ Pot2 1 Multitum 30 Bit Module	
1.1 Brameter Access Paint	
1.2 Standard Telegram 83 OK Cancel Help	
PROFINET 10-Syste	m t <u>í</u>
	Cha

Figure 40 - OB61: assigning IO device in isochronous mode

Press the **Isochronous Mode Modules / Submodules** ... button below in the **Properties – Interface** property sheet and enter the **Isochronous Modules / Submodules** dialog box. Check that an isochronous submodule has been installed (Standard Telegram 83 in the example). Confirm pressing the **OK** button.

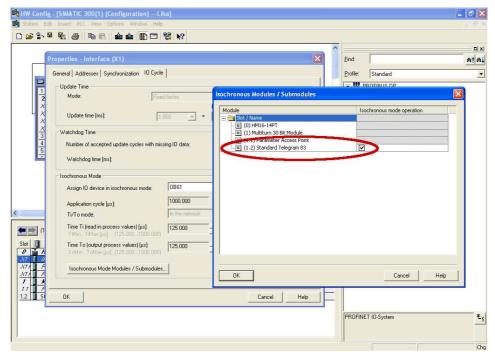


Figure 41 - Standard Telegram as isochronous submodule

Double click the **Standard Telegram** slot 1.2 of the module to open the telegrams properties dialog box. The **Properties – Standard Telegram** property sheet will appear. Enter the **Addresses** tabbed page and set the process image of the isochronous submodule as **PIP 1**. Select the **PIP1** value in the drop-down menu of the **Process image** items in both **Inputs** and **Outputs** group boxes. Confirm pressing the **OK** button.



NOTE

For more information on PIPs (Process Image Partitions) refer to the section "11.5 PIP (Process Image Partition)" on page 112.

	(1) (Configuration) Lika]	
Station Edit Insert PLC	sw Options Window Help 💼 🏙 🏙 👔 🖬 😫 校	
	Properties - Standard Telegram 83	
	General Addresses	
1		DP
2 X1 MPI/L	15-2	PA
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X2 P1 R Port 1 X2 P2 R Port 2	Contraction of the second seco	Based Control 300/400 Station
3	Churt 0	, Station
4 DI16x 5 D016	L24V	
iui		
🔿 (1) нм		
Module		
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First 1 First 2		
Multiturn 30 Bit Mo		
Parameter Access Poir Standard Telegram 83	OK Car	ncel Help
E orannain Leishiaill oo		
		PROFINET IO-System

Figure 42 - Setting PIP for Standard Telegram IOs

Now you need to set a connection between the port of the controller and the port of the encoder. Please check the specific configuration of your Profinet network. In the example the port 2 of the IO controller is connected to the port 1 of the IO device; see Figure 55.

So, first configure the IO controller and set its port 2 to be connected to the port 1 of the IO device. Double click the **X2 P2 R PORT 2** slot in the CPU configuration table and open the Port 2 properties dialog box. The **Properties – PN-IO – Port 2** property sheet will appear. Enter the **Topology** tabbed page and set the **Port 1 (X1 P1)** value in the drop-down menu in the **Partner port** item of the **Partners** group box. Confirm pressing the **OK** button.

Refer also to section "11.7 Topology Editor" on page 118.

🖳 HW Config - [SIMATIC 300(1)				_ 5 ×
Station Edit Insert PLC View	Options Window Help			- 6 X
🗅 🚅 🐎 🗳 🗞 🎒 🖻 🖻	🖌 🎰 🏟 👔 🗖 😫 📢	?		
				모시
				nt ni
	Properties - PN-10 - Port	2 (R0/S2/X2 P2 R)		
🚥 (0) UR	General Addresses Topoli	pay Options	H	•
		- (1-6-mm)	DP	
2 CPU 315-	Port Interconnection		PA	
X1 MPI/DP	Local port	SIMATIC 300(1)\PN-I0 (CPU 315-2 PN/DP)\Port 2 (R0/S2/X2 P2 R)	0	
X2 PN-10 X2 P1 R Port 1	- Medium:	Local port: Copper Partner port:	0	
X2P2R Poll2	Cable name:	Copper	Based C	ontrol 300/400
3		1-302-2	Station	
4 DI16xDC24 5 D016xDC2				
	Partner port	Any partner	*	
5	Alternating partner ports:	Apu partner		
	When loving parties porto.	SIMATIC 300(1)(1) HM\Port 1 (X1 P1) SIMATIC 300(1)(1) HM\Port 2 (X1 P2)		
			1	
<		2	2	
		Add Delete Details		
(0) UR				
Slot 🚺 Module 🛛 🕻	Dro Cable Data			
1 2 B CPU 315-2 PN/DP 6	Cable length:	C 100 m		
2 CPU 315-2 PN/DP 6	C Signal delay time (µs):	0.60		
X2 FNID				
X21 Port1				
X2/ Port 2	OK.	Cancel	Help	
	ES7 321-1BH02-0AA0	202		
	ES7 322-18H01-0AA0	45	PROFINET IO-System	x
6 7			PROFINE LID-System	£
8				
1519-02 - 13		and the second		

Figure 43- Configuring the IO controller topology



Then configure the IO device and set its port 1 to be connected to the port 2 of the IO controller. Double click the X1 P1 PORT 1 slot in the Device configuration table and open the Port 1 properties dialog box. The Properties – Interface – Port 1 property sheet will appear. Enter the Topology tabbed page and set the Port 2 (X2 P2 R) value in the drop-down menu in the Partner port item of the Partners group box. Confirm pressing the OK button.

Refer also to section "11.7 Topology Editor" on page 118.

HW Config - [SIMATIC 300(1) (Configuration) Li Station Edit Insert PLC View Options Window Help □ ☞ 음~ ☞ 두 등 등 ● ● ● ● ● ● ● ● ● ●	22.00 I	X
		비치
Properties - Inter	ace - Port 1 (X1 P1)	nt ni
	Topology Options	• •
	1.5. 1	DP
2 CPU 315-2		PA 0
X7 <u>MPI/DP</u> Local port: X2 PIV-ID	SIMATIC 300(1)\(1) HM\Port 1 (X1 P1)	0
X2 P1.R Port 1 Medium:	Local port: Copper Partner port: Copper	0 Based Control 300/400
X2 P2 R Port 2 Cable name:	Copper	Station
3 4 DI16xDC24V		
5 D016xDC24v Partners		
Partner port:	SIMATIC 300(1)/PN-I0 (CPU 315-2 PN/DP)/Port 2 (R0/S2/X2 P2 R) Any partner	<u> </u>
Alternating partne	Ports: SIMATIC 300(1)/PN-I0 (CPU 315-2 PN/DP)/Port 2 (80/52/42 P2 R) SIMATIC 300(1)/PN-I0 (CPU 315-2 PN/DP)/Port 1 (80/52/42 P1 R)	
	SIMATIC 300(T)(PN-10 (CP0 315-2 PN/DP))Port T(R0/S2/X2 PTR)	
<		
🗲 🐋 (1). НМ	Add Delete Details	
- Cable Data		
Slot Module Cable Data	< 100 m	
X7 Interface		
X11 Fait 1 C Signal delay tr	ue finst in po	
1 Multiturn 30 Bit Module		
1.7 Parameter Access Paint OK	Cancel	Help
	PBOF	NET IO-System 🕹
		<u></u>
a nan nann	1	1000

Figure 44 - Configuring the IO device topology

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Finally check the Profinet IO isochronous mode.

Right click the **2** CPU slot in the CPU configuration table and press the **PROFINET IO Isochronous mode** command.

	B 1	🛍 🋍 🗊 🗔 👯 📢						
					^	-	1	
		Etherne	(1): PROFINET-IO-S	ystem (100)		Eind:		mt
						Profile:	Standard	
😑 (0) UR							PROFIBUS DP	
1 2 CPU :	15-2 P			-		쁆	PROFIBUS-PA PROFINET IO	
X1 MPI/D		Copy Paste	Ctrl+C Ctrl+V	(1) HM			SIMATIC 300	
- X2 X2 P1 R Port 1		Replace Object	Surr	- 2			SIMATIC 400	
X2 P2 R 🚺 Port 2		Add Master System		- W			SIMATIC PC Based Control 300/400 SIMATIC PC Station	
3 4 Di16xD	C20/	Disconnect Master System						
	DC24V/	Master System Isochronous Mo Insert PROFINET IO System	de					
	_	Disconnect PROFINET IO System	m					
		PROFINET IO Domain Managem	ent					
		PROFINET IO Topology PROFINET IO Isochronous mod	2					
		Specify Module	2					
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111		Go To		-	>			
🔿 (0) UR		Filter Assigned Modules						
I Module	Orde	Monitor/Modify		- nent	1			
		Edit Symbols			~			
CPU 315-2 PN/DP	6ES	Object Properties	Alt+Return					
PN-ID		Open Object With Change Access	Ctrl+Alt+O					
Port 1	-			-				
Post 2	-	Assign Asset ID		_				
DI16xDC24V	6ES7	Product Support Information	Ctrl+F2 Ctrl+F7					
D016xDC24V/0.5A	6ES7	FAQs Find Manual	Ctrl+F6	-		PROFIN	IET 10-System	
	-	Start Device Tool		_				

Figure 45 - Checking the Profinet IO isochronous mode



The **Isochronous Mode** dialog box will appear on the screen. The installed Standard Telegram is the only submodule which provides IO data.

In this page you can check which IO devices / modules / submodules have been set in isochronous mode with the IO controller.

ation Edit Insert PLC	Isochronous CPU:										
	CFU.			CPU 315-	2 PN/DP		-				
	Isochronou	s mode application:		OB61			-				
	Application of	letails									1
	Application	cycle [µs];		1000.000		Process in	age partition	(s): 1			
😄 (0) UR	Delay time	íus):		15.000							1
1				1000.000			Details	1			
2 CPU X1 MPI/	Data cycle			100	2017		D'otalis				
- X2 PN-K	10 system r	number:		Tim	•						
X2 P1 R Porta X2 P2 R Porta	Ti/To mo	de Ti	TiMir	TiM	x To	ToM	in Tok	tou Tio	Fime		Control 300/400
3	Automatic		125.0		x 10				000		
4 DI16	Fatomato	ally 120.000	12.0.1	100		200	000 100	0.000 120			
5 D016											
	10 devices in	n isochronous mode									Ť
	Address	Designation		PIPs	Ti/Tom	Ti	To	TiMin	ToMin	TioTime	
	1(100)	НМ		1,	in the ne	125.000	250.000	125.000	250.000	125.000	
100											
🔿 (0) UR											
	- Modules / su	ubmodules									7
Module	Slot	Designation		PIPs	Synchro.	TDPMin	TDPMax	TiMin/T	CI T	oMin/TCQ	
CPU 315-2 PN/DP	0	HM			no			0.000		.000	
MFI/DF	1	Multiturn 30 Bit N			no		122	0.000		.000	
FNID	1.1	Parameter Acce Standard Telegr		1	no			0.000		.000 25.000	
Fort 1	1.2	Stanuaru relegi	ani 05	20	yes			120.000	3 1	20.000	
Fort 2											
	<									>	
DI16xDC24V											1
DI16xDC24V D016xDC24V/0.5A											

Figure 46 - Isochronous Mode dialog box

11.4 OB61



WARNING

Use of OBs requires both in-depth skills and specific expertise in SIMATIC STEP 7 programming environment. For detailed information please consult the STEP 7 Programmer's handbook and documentation.

Organization blocks (OBs) form the interface between the CPU operating system and the user program. The order in which the user program is executed is defined in the organization blocks.

The synchronization with the user program is maintained through the clocked interrupt OB61. OB61 is a synchronous cycle interrupt; in other words it is an isochronous event that is called with the start of every PROFINET cycle. It is synchronous with the Profinet send clock.

😹 LAD/STL/FBD -	[OB61 "SYNC_1" Lika\SIMATIC 300(1)	CPU 315-2 PN/DP\.	.\0861]			×
🖬 File Edit Insert	PLC Debug View Options Window Help				- 6	r ×
D 🚅 🔓 🔒 🤞	B 🔏 🖻 🛍 🗠 🗠 🕅 🏜 🖂 🐾 🔅	* !« »! 🗖 🖪	** ++ +-) 団 L ユ ト •	?		
) C 40					
X	Contents Of:	'Environment\Inte	rface'			
Bill New netw Bill New netw Bill New netw Bill Second	0B61 : "DP Synchronous Interrupt" Comment: Network 1 : SFC126 Comment: CALL "SYNC_P1" PART 1:=SF1681 PAT 124.:="PatVal SFC126" FLADDR :="FLADDR SFC126" FLADDR SFC127	SFC126 MV1502 MV1504	Synchronous updatin	g of a process-image	partition of the inpu	22
<	CALL "SYNC_BO" PART "SFSIGE PART ULL="RecVal SFC127" FLADDR :-"FLADDR SFC127"	SFC127 HNISOS HNISOS	Synchronous updatin	g of a process-image	partition of the outp	at
Progra	<		© offline	Abs < 5.2	Insert Chg	>

Figure 47 - 0B61



11.5 PIP (Process Image Partition)



WARNING

Use of PIPs requires both in-depth skills and specific expertise in SIMATIC STEP 7 programming environment. For detailed information please consult the STEP 7 Programmer's handbook and documentation.

11.5.1 Consistency

PIPs (Process Image Partitions) are used to update the distributed IO device synchronously with the constant bus cycle time clock.

Compared with direct access to the input/output modules, the main advantage of accessing the process image is that the CPU has a consistent image of the process signals for the duration of one program cycle. If a signal state on an input module changes while the program is being executed, the signal state in the process image is retained until the process image is updated again in the next cycle. The process of repeatedly scanning an input signal within a user program ensures that consistent input information is always available. You define process image partition with STEP 7 when you assign addresses (which input/output addresses of the modules are listed in which process-image partition). The process image partition is updated by the user with SFCs.

💐 HW Config - [SIMATIC 300(1) (Configuration) Lika]	
Station Edit Insert PLC View Options Window Help	_ a ×
D 😂 🐎 🖣 🏭 🎒 🛍 🃾 🚯 🗖 🐮	?
Properties - Standard	elegram 83
General Addresses	
1 Inputs 2 MBV/DP X7 MBV/DP X2P1R Pon 1 X2P2R Pon 2 3 Outputs 4 D16x0C2AV 5 D016x0C2AV 6 D016x0C2AV	Process image: PIP 1 Process image: Process image: Process image: PIP 1 Process Image: PIP 1 PIP
	Cancel Help PROFINET IO-System t

Figure 48 - Process Image Partition

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The assigned process image partitions must be updated in the synchronous cycle interrupt OB61 at the call of the functions SFC126 "SYNC_PI" and SFC127 "SYNC_PO". The call of the function SFC126 "SYNC_PI" updates the process image partition input table; the call of the function SFC127 "SYNC_PO" updates the process image partition output table. So cyclic interrupt OB61 works with consistent image of the process signals. Refer also to page 106.

11.5.1 SFC126 "SYNC_PI"

This special function is used to update a process image partition input table in a synchronous cycle. Synchronous cycle interrupt OB61 calls the function SFC126 "SYNC_PI" to consistently and synchronously update the input data located in a process image partition.

11.5.2 SFC127 "SYNC_PO"

This special function update a process image partition output table in a synchronous cycle. Synchronous cycle interrupt OB61 calls the function SFC127 "SYNC_PO" to synchronously update the output data located in a process image partition and consistently transmit them to the encoder.

11.6 Domain Management



WARNING

The configuration of the Sync domain requires both in-depth skills and specific expertise in SIMATIC STEP 7 programming environment. For detailed information please consult the STEP 7 Programmer's handbook and documentation.

In the case of PROFINET IO with IRT, a sync master transmits a synchronization message to which all sync slaves synchronize themselves. The synchronization mechanisms will be controlled by ERTEC (Enhanced Real-Time Ethernet Controller) of the integrated PROFINET interface. This ensures a synchronization accuracy of less than one microsecond. The synchronization of all IRT-capable PROFINET devices on a common time base is the prerequisite for the scheduled communication control and the bandwidth reservation.

You assign the device roles syn master and sync slave by configuring the PROFINET devices in STEP 7, as described below. The role of a sync master can be assigned both to an IO controller as well as a switched configured on an IO device, provided these support the "sync master" function.

The sync master and the sync slaves together form the sync domain. A sync domain has exactly one active sync master - for the runtime.

It is mandatory that all PROFINET devices that are to be synchronized via PROFINET IO with IRT must belong to a sync domain. The sync domain consists of precisely one sync master and at least one sync slave. IO controllers and switches can hold the role of a sync master or sync slave. Other IO devices support only the role as sync slave. An IRT Class 3 Device must be member of a sync domain too. The properties of the sync domain must be set in the dialog boxes described in this section, especially the cycle time of the send clock. Only those values may be entered which are common to both the Master and all devices on the bus.

To assign the IO device to a sync domain select and right-click the **Profinet-IO system** in the **HW Config** window. Press the **PROFINET IO Domain Management...** command in the shortcut menu.

HW Config - [SIMATIC 300(1) (Configuration) Like	1		
🍇 Station Edit Insert PLC View Options Window Help 🗅 😅 음~ 🗟 🕵 🚳 🗈 🗈 🖄 🏜 🏥	8 10		- 6
	14 RE 1		<u> </u>
	Ethernet(1): PROFINET-IO-System (10	0)	Eind: mt
⇒0)UR	Copy Paste Paste Shared	Ctrl+C Ctrl+V	Profile: Standard
1 2 2 2 2 2 2 2 2 2 2 2 2 2	Insert Object Edit PROFINET IO System IP addre PROFINET IO Domain Management PROFINET IO Topology		
3	Specify Module		
4 DI16xDC24V 5 D016xDC24V/0.5A	Delete	Del	
	Move Size Minimize Maximize		
	Go To Object Properties Open Object With	Alt+Return Ctrl+Ak+O	N N
	Assign Asset ID		<u> </u>
Ethernet(1): PROFINET-IO-System (100) evice Number II P addres Device Name Internet 192.168.20.1HM HMxx		Cbrl+F2 Cbrl+F7 Cbrl+F6	
192.168.20. HM HMXX	Start Device Tool		
			PROFINET IO-System
lays properties of the sync domains of the current subnet and allo	we edition		

Figure 49 - Assigning the IO device to a sync domain

The **Domain Management** dialog box will appear on the screen. Using the **Domain management** dialog box you can check the settings of the PROFINET IO system.

The name of the sync domain is automatically assigned by STEP 7 with "syncdomain-default" when the first sync domain is configured. You find it under the **Sync domain** item in the **Sync domain** group box. Alternatively you can create further sync domains.

The **Send clock time (ms)** is the period between two successive intervals for IRT or RT communication. The send clock is the shortest possible transmit interval for exchanging data. You have the option to establish the send clock for your sync domain in order to achieve an optimum coordination of the transmission bandwidth to the data volume. Depending on the PROFINET devices of the respective PROFINET IO systems, STEP 7 calculates the possible values that can be set. Select one of the default send clock time values in the drop-down list.

	omain management - Ethernet(1)				- 8 X
175 M	Sync Domain MRP Domain			11	
	- Sync Domain				미치
	Sync domain: sync domain-default	▼ New	Delete Ec	in	ntai
			J J		•
至 (0) UR	Send clock time 1.000	Details			
1 2 CF					
XT M	Nodes				
X2 FI X2 P1 R Po X2 P2 R Po	Station / IO system	400		introl 2	300/400
X2 P2 R Po 3	SIMATIC 300(1) / PROFINET-IO-System	[100]		THOUSE STREET	300/400
4 DI					
5 DC					
10 m					
	Add Remove				
	Station / Device Name	Synchronization Role RT Class	IRT Option Redur	dancu	
	SIMATIC 300(1) / PN-I0	Sync master RT, IRT	high flexibility, high perfor Full	durity	
<	SIMATIC 300(1) / (1) HM	Sync slave IRT	high performance Full		
Ethernet(1): PROFIN					
Device Number					
1 192					
	Device Properber				
	Modules			1	
	Display				
_					£
	OK		Cancel	Help	
Press F1 to get Help.					íCha

Figure 50 - Domain management dialog box

EMx58 - Hx58x Profinet

You have the option of establishing the reserved transmission bandwidth for IRT data as a proportion of the maximum reservable transmission bandwidth for cyclic user data communication. The proportion is specified in percent (%). In doing so, the maximum transmission bandwidth set by the system for cyclic data may not be exceeded by the reserved transmission bandwidth for IRT plus the transmission bandwidth that is required for the cyclic data in the free transmission bandwidth (RT communication).

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Press the **Details...** button in the **Domain Management** dialog box. The **Details** – **Sync domain** dialog box will appear on the screen. In the **Upper limit for IRT** drop-down list available in the **Cyclic data** group box, select one of the default values (in %). STEP 7 offers the following selections: 0, 10, ... 100.

HW Config - [SIMATIC	Domain management - Ethernet(1)		×	_ 5 X
D <mark>☞</mark> ₽₽¶	Sync Domain MRP Domain			D×
10 UR		Details - Sync Domain		14 🔀
	Send clock time 1.000	Maximum bandwidth for cyclic data: Bandwidth used for cyclic data:	500,000	µs µs
→ 22 77 → 22 77 18 78 → 22 72 18 78 → 22 78 → 23 78	Station / IO system SIMATIC 300(1) / PROFINET-IO-System (100)	Free bandwidth for TCP/IP:	977.270	με
4 DI 5 DC		20% 100.000 μs		
	Add Remove	- Cvolic data		
۲	Station / Device Name Synchronizatio SIMATIC 300(1) / PN-IO Sync master SIMATIC 300(1) / (1) HM Sync slave	Upper limit for IRT: 100.000 Calculated allocation for IRT: 15.630	μs = μs PROFINET-10	-System (100)
Ethernet[1]: PROFIN		Calculated allocation for RT: 7.040	μs PROFINET-10	-System (100)
	Device Properties	OK	Cancel	Help
	Modules			_
	Display			ŧź
	<u></u> OK	Ca	incel Help	

Figure 51 - Sync domain details dialog box

The PROFINET IO system of the sync domain is established now on a send clock. Save the settings and close both the **Details – Sync Domain** and the **Domain management** dialog boxes pressing the **OK** button.

Finally save, compile and then download the configuration to the controller.

EMx58 - Hx58x Profinet

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11.7 Topology Editor

Using the **Topology Editor** you can topologically configure your PROFINET IO system. The topology editor has a series of functions for setting, interconnecting and diagnosing the properties of all PROFINET devices including their ports. So it supports you in the following tasks:

- obtaining topology information about all ports of the PROFINET devices in the project;
- configuring the set topology on PROFINET by interconnecting the interfaces and ports by simply dragging and dropping and establishing properties.

Enter the **Topology Editor** dialog box to edit the topology of your Profinet-IO System. To do so select and right-click the **Profinet-IO system** in the **HW Config** window and then press the **PROFINET IO Topology...** command in the shortcut menu.

-	Ethernet(1): PROFINET-IO-S Copy	ystem (100) Ctrl+C		Find	
- mun				-	1
	Paste	Ctrl+V		Profile:	Standard
	Paste Shared				PROFIBUS DP
1 2 III CPU 315-2 PN/DP	Insert Object				PROFIBUS-PA PROFINET IO
X1 MPI/DP X2 PN-ID	Edit PROFINET IO System IP addre PROFINET IO Domain Management			•	SIMATIC 300
X2 P1 R Port 1	PROFINET IO Topology				SIMATIC 400 SIMATIC PC Based Control 300/400
X2 P2 R Port 2	Specify Module				SIMATIC PC Based Control 300/400 SIMATIC PC Station
4 DI16xDC24V	Delete	Del			
5 D016xDC24V/0.5A	Move				
1	Size				
	Minimize Maximize				
	Go To				
	Object Properties	Alt+Return	~		
	Open Object With	Ctrl+Alt+O	>		
	Assign Asset ID				
Ethernet(1): PROFINET-IO-System (100)	Product Support Information	Ctrl+F2			
lumber 🛛 📳 IP addres Device Na	me FAQs Find Manual		tial S C		
192.168.20. HM	Start Device Tool		tivate		

Figure 52 - Entering the Topology Editor

The **Topology Editor** dialog box will appear on the screen.

As the PROFINET IO system has already been set up and the PROFINET devices connected (to connect the port of the IO controller and the port of the IO device see on page 107), they do not need to be first of all interconnected to a topology within the project. So in the **Table view** tabbed page you will see the configured PROFINET devices and ports currently connected in the system.

The **Interconnection table** in the left area of the page lists all the configured PROFINET devices with their ports. The **Selection range** group box in the top right section lists all the PROFINET devices that are available for the topological interconnection.

			/online comparison]							1
		Interconne							Selection range	
Ξ	Show st	ation name	1	Filter: Show a	ll ports		•	Filter:	how all ports	-
Ē	Port		Partner port	Cable len	Signal del	Comment		e- HM		
	⊡-HM							SIMATIC 300(1)		
		Port 1 (X1 P1) Port 2 (X1 P2)	SIMATIC 300(1) \ PN-IO(CPU 31	5 100m	0.60µs					
	SIMATK						-			
-		IO(CPU 315-2 PN/DP)								
		Port 1 (X2 P1 R)					-			
		Port 2 (X2 P2 R)	HM \ Port 1 (X1 P1)	100m	0.60µs					
<u> </u>										
								-	assive Components	
- 11								- SCALANCE X100		
								- SCALANCE W		
								PC Modules	7	
								- Standard IE		
e N								- SIMATIC HMI		
								-		
	<						>			
		Update	() () ()	- 1		-1		1		
			Object Properties	Export	Options			Add		
	Online	opusie	orbiport roponice	0.002/0.003	10000000000			1155595		

Figure 53 - Topology Editor: Table view



The **Offline/online comparison** tabbed page lists the configured PROFINET devices with their interfaces and ports and the associated neighbor ports in the left box **Configured topology (offline)**. The right box **Detected topology (online)** shows the online view of the PROFINET IO system with its interconnection for the runtime. Press the **START** button above in the box to import the PROFINET devices of your project.

	Configur	red topology (offline)		D	etected topology (online)	
	Filte	r: Show all devices	-	Start 2 devic	es found	
Obje	t name	Partner port	Cable data	Object name	Partner port	Cable data
E-H	И			🖃 - hm		
	Port 1 (X1 P1)	SIMATIC 300(1) \ PN-IO(CPU	315100m (0.60 µs)	Part 1	pn-io \ Port 2	5m (0.01 µs)
	Port 2 (X1 P2)			Port 2		
∎ PI	HO(CPU 315-2 PN/DP)		1	⊡- pn+io		
1	Port 1 (X2 P1 R)			Port 1	??? \ Port 1	-(-)
	Port 2 (X2 P2 R)	HM \ Port 1 (X1 P1)	100m (0.60 µs)	Port 2	hm \ Port 1	5m (0.01 µs)
				K		
				Assign Ap	ply Export Or	otions

Figure 54 - Topology Editor: Offline/Online comparison



The **Graphic view** tabbed page displays the PROFINET devices in the project and their interconnections.

In the **Miniature View** in the top right section, you can use the slider to select the section of the PROFINET IO system and its enlargement factor. To change the section of the PROFINET IO system, use the mouse to drag the frame across the desired area that you wish to see in detail.

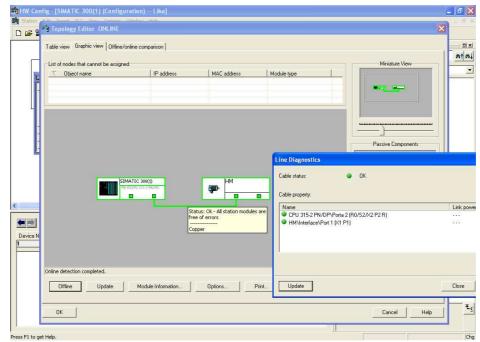


Figure 55 - Topology Editor: Graphic view

Save the settings and close the **Topology Editor** dialog page by pressing the **OK** button.



11.8 Message monitoring

Below is an example of traffic between the IO controller and the IO device in IRT mode.

Elle Edit Yiew Go G	apture Analyze Statistics	Telephony Iools Internals	Help							
梁 鹿 慶 慶 慶 二		् 🗢 🔿 🖗 🕹		Q Q	Q 🗹 🖥		-	% 🖪		
ilter:		×	Expression	Clear App	ly Save					
. Time	Source	Destination Stemens_16:T0:31	Protocol	Info	10:0X0100,	Lenz	40	IVCIETIAN/A	(vaild, Primary, UK, Kun)	
773 9,694220000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0×0101,				(Valid, Primary, Ok, Run)	
9774 9.695217000	LikaSrl 00:00:01	Siemens_16:fd:31	PNIO		ID:0×0100,				(Valid, Primary, Ok, Run)	
9775 9.695223000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	
776 9,696223000	LikaSrl 00:00:01	Siemens 16:fd:31	PNIO		ID:0×0100,				(Valid, Primary, Ok, Run)	
777 9.696229000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	
778 9,697224000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	
9779 9.697231000	LikaSrl 00:00:01	Siemens 16:fd:31	PNIO		ID:0×0100.				(Valid, Primary, Ok, Run)	
9780 9,698222000	Siemens_16:fd:31	LikaSrl 00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	
9781 9.698228000	LikaSr1_00:00:01	Siemens_16:fd:31	PNTO						(Valid, Primary, Ok, Run)	
9782 9,699225000	Siemens 16:fd:31	LikaSr1 00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	_
9783 9,699231000	LikaSr1_00:00:01	Siemens_16:fd:31	PNIO		ID:0×0100,				(Valid, Primary, Ok, Run)	
784 9,700224000	Siemens 16:fd:31	LikaSrl 00:00:01	PNIO		ID:0×0101.				(Valid, Primary, Ok, Run)	
785 9.700230000	LikaSr1_00:00:01	Siemens_16:fd:31	PNIO		ID:0×0100.				(Valid, Primary, Ok, Run)	
786 9.701226000	Siemens 16:fd:31	LikaSrl 00:00:01	PNIO		ID:0x0101.				(Valid, Primary, Ok, Run)	
9787 9.701232000	LikaSr1_00:00:01	Siemens_16:fd:31	PNIO		ID:0x0100.				(Valid, Primary, Ok, Run)	
9788 9.702224000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0x0101,				(Valid, Primary, Ok, Run)	
9789 9.702230000	LikaSr] 00:00:01	Siemens 16:fd:31	PNIO		ID:0x0100.				(Valid, Primary, Ok, Run)	
9790 9.703223000	Siemens_16:fd:31	LikaSr1_00:00:01	PNIO		ID:0x0100,				(Valid, Primary, Ok, Run)	
9791 9.703230000	LikaSr1_00:00:01	Siemens_16:fd:31	PNIO		ID:0x0100.				(Valid, Primary, Ok, Run)	
9792 9.704184000	Siemens_16:fd:31	LikaSrl_00:00:01	PNIO		ID:0x0100, ID:0x0101.				(Valid, Primary, Ok, Run)	
9793 9.704184000 9793 9.704191000	LikaSrl_00:00:01	Siemens 16:fd:31	PNIO						(Valid, Primary, Ok, Run)	
3/95 9.704191000	L1ka5F1_00:00:01	51emens_16:rd:51	PNIO	RICS.	10:0x0100,	Len:	40,	Cycle:14944	(Valid, Primary, OK, Ruh)	>
		s), 60 bytes captured								
		:b9:fe:00:00:01), Dst:					1)			
		ID:0x0100, Len: 40, C		Valid, P	rimary, 0k, I	Run)				
		mary, Provider: Ok and	Run)							
	c Service Data Unit:									
	ing GAP and RTCPaddin	g): 39 bytes								
Undecoded Data: 4	0 bytes									
000 00 1b 1b 16 fd										
020 02 00 00 00 00 00										
030 00 00 00 00 00			9.5.							

Figure 56 - Message monitoring

12 Encoder replacement using LLDP

LLDP (Link Layer Discovery Protocol) is a Layer 2 protocol that is used to detect the closest neighbors in the network. It enables a device to send information about itself and to save information received from neighboring devices, i.e. it provides the option of communicating data between neighboring devices (e.g. device name, port, MAC address). This information allows a network management system to determine the network topology. The protocol is formally referred to by the IEEE as *Station and Media Access Control Connectivity Discovery* specified in standards document IEEE 802.1AB.

Among the main uses, LLDP allows to replace a device of the Profinet network. The partner ports before and behind the replaced device save the relevant information so that no additional configuration is necessary. The flag **Support device replacement without exchangeable medium** must be activated in the Controller.

To activate / deactivate the function double click the **PN-IO** slot X2 to open the PN-IO properties dialog box. The **Properties – PN-IO** property sheet will appear. Enter the **General** tabbed page to find the **Support device replacement** without exchangeable medium check box. Please note that the **Support device replacement without exchangeable medium** function is activated by default in the IO controller.

		^	c)
r	Ethernet(1): PROFINET-IO-System (100)	Eind	nt n
() UR	Properties - PN-IO (R0/S2.2)		tandard 🔄
1 CPU 315-2 PM/L 2 AVR/DP X2 AVR/DP 4 D116.0C24V/DP 5 D016.0C24V/DP 7 0 10 UR	Media Redundancy Time-of-Day Synchronization General Addresses PROFINET I-Device Short description: PN-IO Device name: FSUE IL: - overent method to cobtain device trans- V: Support device replacement without exchangeable medium Interface Type: Ethernet Device: 0 Address: 192 (158 20 180) Networked: Yes Properties Comment:	Options Synchronization	BBUS-RA FINET IIO TIC 300 TIC 400 TIC PC Based Control 300/400 TIC PC Station
Module Order nu		×	
1 MFI/DP 2 FN/ID 2/ Port 1 2/ Port 2	OK. Can	cel Help	1
1 1 1 1 1012			
DI16xDC24V 6ES7 321 D016xDC24V/0.5A 6ES7 322	18H02-0440 202 18H01-0440 45		

Figure 57 - Link Layer Discovery Protocol (LLDP)

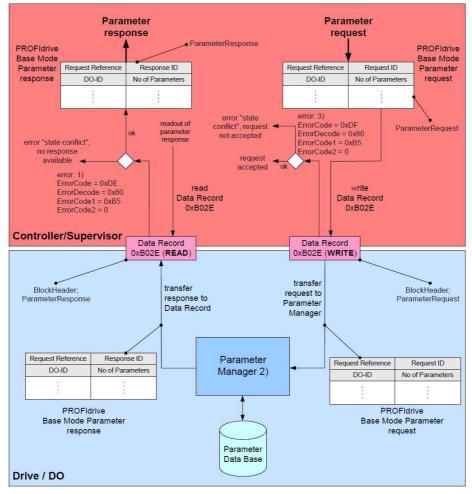


NOTE

When you replace a device, make sure that the PROFINET cable is then inserted into the correct port as it is configured in STEP 7. Otherwise, the system will not run.

13 Read & write in acyclic communication

lika



1) Error because the parameter manager is busy but not finished with the processing yet, or the parameter manager is idle

2) Processing of only one parameter requests per connection. Multiple connections cause multiple state machines for the processing each for every connection

3) Also error 0xB0 may be used if there is no PAP available and error 0xB7 if there is an error in the request header

Figure 58 - Base mode parameter request and response



- 13.1 Example: reading and writing a parameter (Preset Value)
- 13.1.1 System Function Block 52 (SFB52)

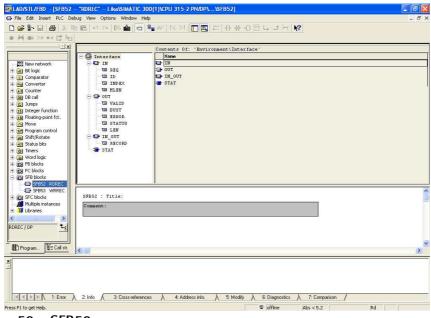


Figure 59 - SFB52

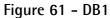
13.1.2 System Function Block 53 (SFB53)

		C 300(1)/CPU 315-2 PN/DP1/SFB53]	
File Edit Insert PLC De			- 8 3
		□ 🎥 &r !≪ ≫! 🛄 🖾 #: +! +! -O 🗇 ၊→ 그 H: 😯	
● }4 ⊕ ≫ ↔ 📑 b _□			
	🖃 🖨 Interface	Contents Of: 'Environment\Interface'	
	- Interface		-
🖲 🔂 FC blocks	TE REQ	De our	
SFB blocks SFB52 RDREC	ID INDEX	IN_OUT	
SFB53 WRREC	LEN LEN		
E 🔂 SFC blocks	DONE		
SFC126 SYNC_F	BUSY		
Multiple instances	ERROR		
🕀 👭 Libraries	STATUS		
	TE RECORD		
	STAT		
< >	SFB53 : Title:		
WRREC / DP	Connent:		
Program			8
	<		>
×			
ILError	2: Info 🔏 3: Cross-refere	ences λ 4:Address info. λ 5:Modify λ 6:Diagnostics λ 7:Comparison /	
Press F1 to get Help.	Z 2. IND A 3. Closs-felere		Rd
		Se jortline Abs < 5.2	Ka
re 60 - SFB	53		

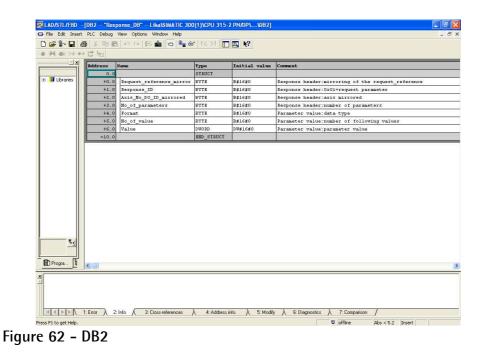


13.1.3 Data Block 1 (DB1)

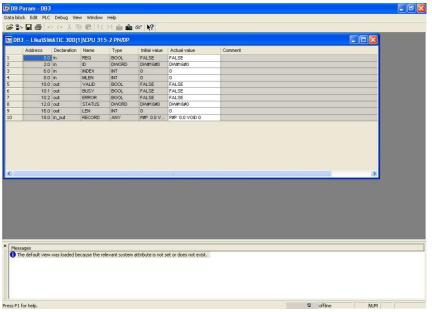
	C Debug	rest_DB" Lika\SIMATIC 30 View Options Window Help	0,1,1,1,1,0,0,0,1,0,1		
	-				- 0
		ю α 0# 🏜 🔽 🏪	og. i≪ ≫i ∏	1 🖳 🥂	
• }€ ⊕ ≫≎ •→ [3 10				
	ddress	Name	Туре	Initial value	Connent
	0.0		STRUCT		
🕂 🎁 Libraries	+0.0	Request_reference	BYTE	B#16#0	Request header: unique identification of the request/response.
	+1.0	Request_ID	BYTE	B#16#2	Request header:0x01=request parameter,0x02=change parameter
	+2.0	Axis_No_D0_ID	BYTE	B#16#0	Request header:D0 addressing for multi-axis or modular device
	+3.0	No_of_parameters	BYTE	B#16#1	Request header:number of parameterer (range 0x010x27)
	+4.0	Attribute_parameter_01	BYTE	B#16#10	Parameter address:type of object (0x10=value)
	+5.0	No_of_elements_01	BYTE	B#16#0	Parameter address:num. of elements(0=special function)
	+6.0	parameter_number_01	WORD	W#16#3D3	Parameter address
	+8.0	subindex	WORD	W#16#0	Parameter address:subindex
	+10.0	Format	BYTE	B#16#43	Parameter value:data type (0x43=doublw word)
	+11.0	No_of_value	BYTE	B#16#1	Parameter value:number of following values
	+12.0	Value	DINT	L#32	Parameter value
	=16.0	·	END STRUCT		
€ <u>(</u>					

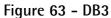


13.1.4 Data Block 2 (DB2)



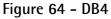
13.1.5 Data Block 3 (DB3)





13.1.6 Data Block 4 (DB4)

	Address	Declaration	Name.	Type	Initial value	Actual value	Comment			
1	0.0		REQ	BOOL	FALSE	FALSE	Commente			
2	2.0		ID	DWORD	DV/#16#0	DV/#16#0				
3	6.0		INDEX	INT	0	0				
4	8.0		LEN	INT	0	0				
5	10.0	out	DONE	BOOL	FALSE	FALSE				
6	10.1	out	BUSY	BOOL	FALSE	FALSE	T			
7	10.2	out	ERROR	BOOL	FALSE	FALSE				
8	12.0		STATUS	DWORD	D\/\#16#0	DV/W#16#0				
9	16.0	in_out	RECORD	ANY	P#P 0.0 V	P#P 0.0 VOID 0				
<								j	۶	
<						- til			٤	
<						. 40			٤	
<						111			\$	
<						- 10			×	
<					_	.e	_		×	_
<					_	m			8	
<						- HT		_	8	
						- HP			×	
Mess	9 <u>965</u>								8	
Mess	iges e default view	was loaded bi	scause the re	levant system	attribute is not	errit set or does not exist.				
Mess	sges	was loaded by	scause the re	levant system	attribute is not :				\$	





13.1.7 Organization Block 1 (OB1)

		a\SIMATIC 300(1)\CPU 315-2 PN/DP\\OB1]	E 🖻 🛛
File Edit Inser	t PLC Debug View Options Wind	w Help	_ 8 ×
🗋 😂 🚔 🔛	😂 👗 🖻 🛍 🗠 🖂 (H) 🎪		
	↔ 🕼 4 <u>0</u>		
		Contents Of: 'Environment\Interface'	
	- @ Interface	Name	
New netw	E EP TEMP	TENP	
FB blocks			
🗄 💼 SFB block			
SFC block Multiple in			1
E Ibraries	OB1 : "Main Program (Cy		<u>(</u>
	Network 1 call FC1 for a	which request of reading/writing parameter	
	Network 1): Title:		
	Call FC1		
I			
I	CALL "Check async	request" FC1	
I	CALL CHECK async	request for	
I			
I			
I			
I			
<			
T _s			
Progra	<		~
× 1			
	1: Error A 2: Info A 3: Cross-	eferences λ 4: Address info. λ 5: Modify λ 6: Diagnostics λ 7: Comparison /	1
Press F1 to get Help.		© offline Abs < 5.2	Insert

Figure 65 - OB1

13.1.8 Function 1 (FC1)

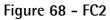
	[FC1 "Check async. request" Lika\SIMATIC 30	00(1)\CPU 315-2 PN	/DP\\FC1]		
File Edit Insert	PLC Debug View Options Window Help			-	a x
🗅 😂 🔓 🖬 🧧) X Ba 🖻 🗠 🖓 🕅 🏜 🔽 🐾 😚 ! «.	>! 🛄 🖪 🛱 +}	+++-0 団 L→ -1+ L N?		
● } € ⊕∋ ≫≎ +→	L‡ b□				
	Contents Of: 'Envir	conment\Interface'			
New netw	FC1 : Function called by OB1				^
FB blocks	Connent:				1
FC blocks FS block					
	Metwork 1: Select record index				
Multiple in	Connent:				
🖲 🤴 Libraries					
	CALL "Select Record Index"	¥C2			
	CALL Select Record Index.	102			
	-				
	Network 2 : Write request				
	Use SFB53 "WRREC" (write record) for writ	e a data record			
	U "Reques R/W record index"	H8.4			
	UN "Write in progress"	H8.1			
	UN "Read in progress"	H8.3			
	UN "Read request"	H8.2			
	S "Write request"	H8.0			
	L W#16#B02E				
	T "INDEX 0xB02E"	HW100			
	CALL "WRREC" , "InstanceDB_SFB53"	SFB53 / DB4	Write a Process Dat	a Record	
	REQ :="Write request"	H8.0		and the second second second	
	ID :="Diag. Address of PAP" INDEX :="INDEX OxBO2E"	HD108 HD100	Diagnostic address	of Parameter Access Point in Slot 1 St	τb
	LEN :=16	10100			
	DONE :="Write completed"	H14.0			
	BUSY :="Write in progress"	H8.1			
	ERROR :="Error in write record"	H14.2			
	STATUS: #HD10				
< >	RECORD:=P#DB1.DBX0.0 BYTE 16				
T _s	U "Write in progress"	H8.1			
	R "Write request"	H8.0			
					~
Progra	< 100				>
ress F1 to get Help.			9 offine At	s < 5.2 Nw 1 Ln 3 Insert	-
	-04			The second se	
e 66 - F	-(1)				
C 00 I	0.				

	PLC Debug View Options Window Help			5
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∲¶ ∰ ≫0 +-				
×	Contents Of: 'Envir	onment\Interface'		
				_
K New netv				
FB blocks				
SFB block	Network 3 : Read request			
E SFC block	Use SFB52 RDREC" (read record) for read a	data record		
Multiple in				
🔰 Libraries	U "Reques R/W record index"	M8.4		
	UN "Write in progress"	M8.1		
	UN "Read in progress"	M8.3		
	UN "Write request"	H8.0		
	S "Read request" L W#16#B02E	M8.2		
	L W#16#B02E T "INDEX 0xB02E"	MW100		
		COMPANY.		
	CALL "PDREC" , "InstanceDB_SFB52"	SFB52 / DB3	Read a Process Data Record	
	REQ := "Read request"	M8.2		
	ID :="Diag. Address of PAP" INDEX :="INDEX 0xB02E"	MD108 MW100	Diagnostic address of Parameter Access Point in Slot 1	Sub
	MLEN :=10	HOLOO		
	VALID :=M16.0			
	BUSY :="Read in progress"	M8.3		
	ERROR :=M16.2			
	STATUS:=MD18			
	LEN :=NW22 RECORD:=P#DB2.DBX0.0 BYTE 10			
	RACORD PROBZ. DBX0.0 BTTE 10			
	U "Read in progress"	M8.3		
	R "Read request"	M8.2		
× 111				
€ <u>≺</u>				
Progra				>

Figure 67 - FC1

13.1.9 Function 2 (FC2)

• ∞ ⊛ ≫• ⊻⊻						
		Contents Of: 'Environme	nt\Interface'			
B Hew netw	FC2 : Sele	ct Record Index				
FC blocks	Comment:					
5FB block	Network 1:	Tiple:				
Multiple ir		record index for read/write operat	ion			
Dibranes			5.07			
	U SPB	"Req P65000:Preset Value" Pl	M102.0			
	SPA	PEND				
	//P65000:P					
	P1: L T	L#65000 "Request DB".parameter number 01	DPI DPHC	Parameter	addross	
	L	W#16#43	001.0000			
	T	"Request_DB".Format W#16#0	DB1.DBB10	Parameter	value: data type (0x43=doublw word))
	Ť	"Request_DB".subindex	DB1.DBWS	Parameter	address: subindex	
	L	"Response DB".Value	DB2,DBD6	Parameter	value:parameter value	
	T	"P65000: Preset Value"	MD150			
	SPA	PEND				
	PEND: NOP	0				





13.1.10 Acyclic request of Preset

See P65000 – Preset value on page 83.

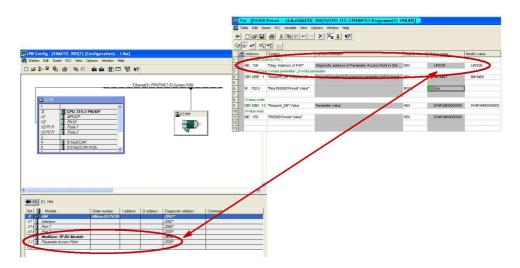
1	Address	Symbol	Symbol comment	Display format	Status value	Modify value
	//encoder(20	38=0x7F6)				
2	MD 108	"Diag. Address of PAP"	Diagnostic address of Parameter Access Point in Stot	DEC	L#2038	L#2038
2 3 4 5 6 7		be:1=read parameter ,2=write p	arameter			
4	DB1.DBB 1	"Request_DB".Request_ID	Request header:0x01=request parameter,0x02=chang.	HEX	B#16#01	B#16#01
5						
6	M 102.0	"Req P65000:Preset Value"		BOOL	true	
8	//Value write					
8	and an and a second sec	2 "Request_DB".Value	Parameter value	HEX	DVV#16#00000000	DVV#16#0000000
10	//Value read	1				
11	MD 150	"P65000:Preset Value"		HEX	DVV#16#00000000	[
12 13						
13						

Figure 69 - Acyclic request of Preset value



NOTE

Please always ascertain that MD 108 Diag. Address of PAP is the same as the diagnostic address of Parameter Access Point in Slot 1.1.





13.2 Monitoring a variable

Below is an example of variable monitor in case of Telegram 83 and IRT communication.



NOTE

Controller Sign-Of-Life is active.

-V	66"	42	60° M2 Meye					
	Ad	Idress	Symbol	Symbol comment	Display format	Status value	Modify value	
	ff==	-	==== STANDARD TELEG	RAM 83				
	//==		OUTPUT DA	FA (CONTROLLER => DEVICE) =========				
	AVA	/ 0	"STW2_ENC"	Encoder control word	BIN	2#0000_0100_0000_0000	2#0000_0000_0000_0000	
	A	0.2	"STW2_ENC.10"	Control by PLC	BOOL	📙 true	true	
			"G1_STW"	Sensor 1 control word	HEX	V/#16#2000		
	A		"G1_STW.11"	Home position mode (0=absolute,1=relative)	BOOL	false		
	A		"G1_STW.12"	Set this bit for preset position (if enabled)	BOOL	false		
	A		"G1_STW.13"	Transmit absolute value cyclically	BOOL	true 🚺	true	
	A		"G1_STW.14"	Activate parking sensor	BOOL	false		
2	A		"G1_STW.15"	Acknowledging a sensor error	BOOL	false		
2				(DEVICE => CONTROLLER) =========				
3	EW	0	"ZSW2_ENC"	Encoder status word	BIN	2#0000_0000_0000_0000		
4	EVV	/ 2	"G1_ZSW"	Sensor status word	HEX	V/#16#2000		
5	E		"G1_ZSW.11"	Error ack detected	BOOL	false		
6	E	2.4	"G1_ZSW.12"	preset executed	BOOL	false		
7	E		"G1_ZSW.13"	Enc. is transmitting position value ciclically	BOOL	true		
з	E		"G1_ZSW.14"	Parking sensor active	BOOL	false		
Э	E	2.7	"G1_ZSW.15"	Sensor error	BOOL	false		
) .								
1	a de tradação		"G1_XIST1"	Enc. position value	HEX	DV/#16#0DA0A064		
2	and the second second		"G1_XIST2"	Enc. position value/error telegram	HEX	DW#16#0DA0A064		
3	ED	12	"NIST_B"	Velocity 32 bit	DEC	L#0		
2 3 4 5								
5								

Figure 70 - Monitoring a variable

14 Encoder state machine

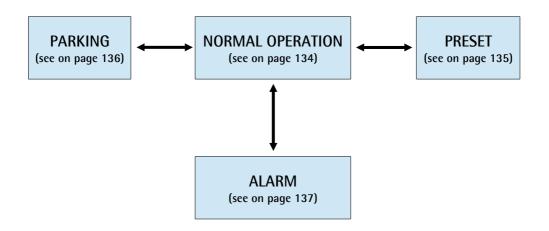
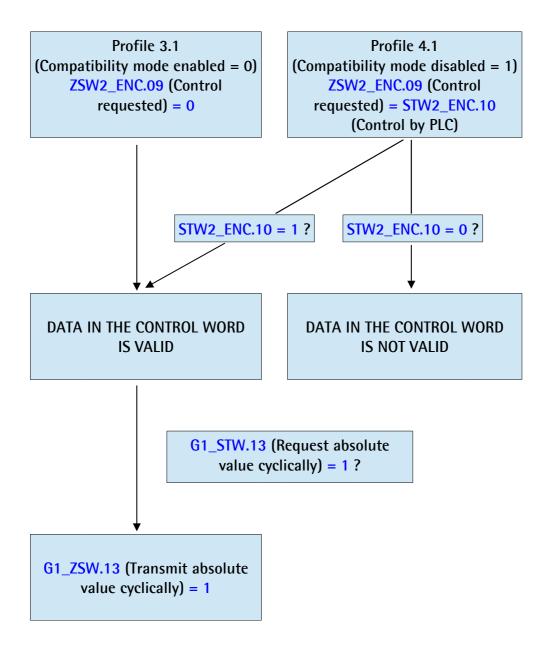


Figure 71 – Encoder state machine

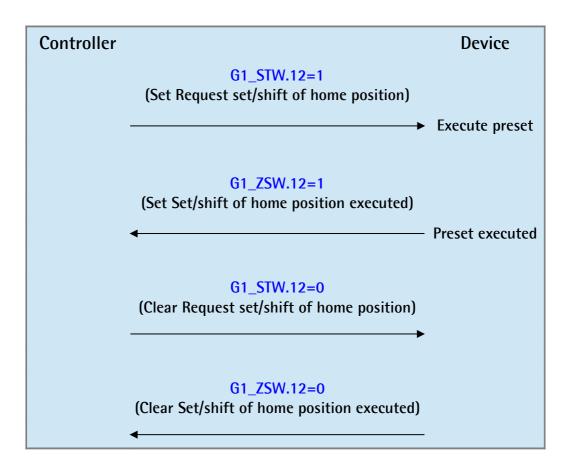


14.1 Normal operation diagram

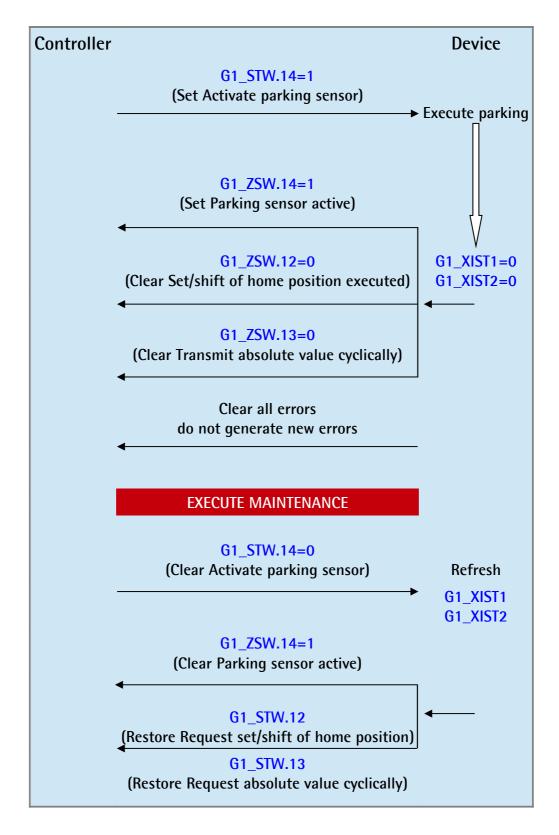




14.2 Preset diagram



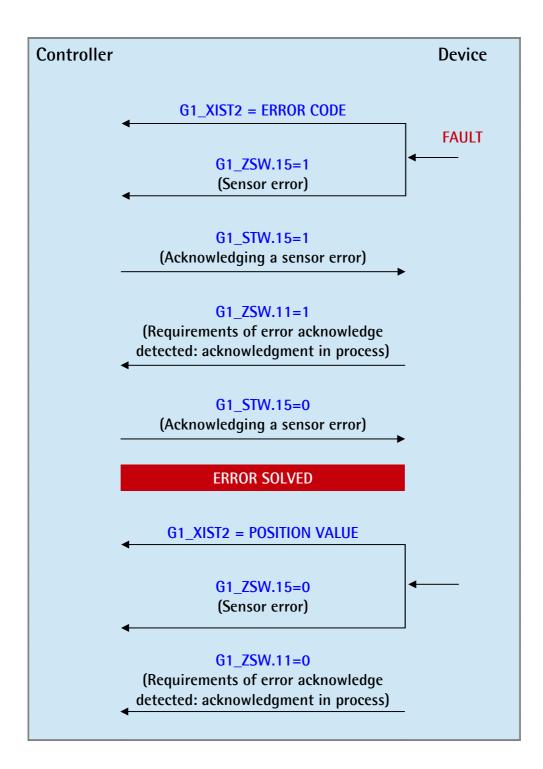
14.3 Parking sensor diagram



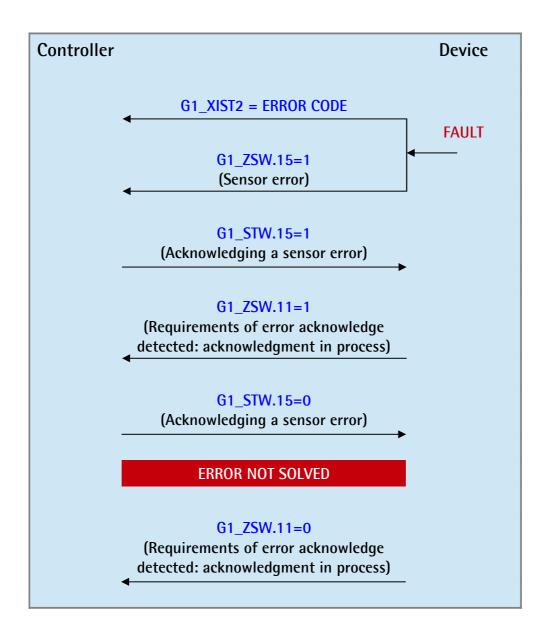


14.4 Error diagram

14.4.1 Acknowledgment of acknowledgeable sensor error



14.4.2 Acknowledgment of not acknowledgeable sensor error



15 Integrated web server

Profinet encoders from Lika Electronic integrate a web server. This web-based user interface is designed to deliver helpful information on the device that can be accessed through the Internet. In particular it makes monitoring and advanced maintenance of the encoder from every PC running a web browser possible. Since its only requirement is a HTTP connection between the web browser and the web server running on the device, it is perfectly fitted also for remote access scenarios.

Before opening the Profinet encoder web server please ascertain that the following requirements are fully satisfied:

- the encoder is connected to the network;
- the encoder has valid device name and IP address;
- the PC is connected to the network;
- a web browser (Internet Explorer, Mozilla Firefox, Google Chrome, Opera, ...) is installed in the PC or in the device used for connection.



NOTE

This web server has been tested and verified using the following web browsers:

- Internet Explorer IE7 version 7.0.5730.13
- Mozilla Firefox version 28.0
- Google Chrome version 33.0.1847.116 m
- Opera version 20.0.1387.91



NOTE

Please note that the snapshot look may vary depending on the used web browser. The following snapshots have been taken from Internet Explorer.



To open the Profinet encoder web server proceed as follows:

1. type the IP address of the encoder you want to connect to (in the example: 192.168.20.195) in the address bar of your web browser and confirm by pressing **ENTER**;

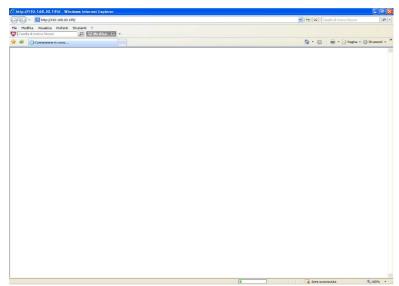


Figure 72 - Opening the web server

2. as soon as the connection is established, the web server Home page will appear on the screen;



Figure 73 - Web server Home page

In the Home page some commands are available in the menu bar.

Press the **website** command to enter Lika's web site (www.lika.biz).

Press the **certificates** command to enter the Product certifications page on Lika's web site (http://www.lika.it/eng/certificazioni.php).

Furthermore some commands are available in the left navigation bar. The menu bar is divided into two sections: the commands in the above section allow to enter freely accessible pages; while the commands in the below section (under the label **Password protected menus**) allow to enter password protected pages.

These commands allow to enter specific pages where information and diagnostics on the connected encoder can be achieved.

They are shown in the following snapshots.



Figure 74 - Encoder Information page

Parameters listed in the **Encoder Information page** are sent by the controller to the encoder during initialization (for further information refer to the section "9.4 Index 0xBF00 : user parameter data" on page 85).

For further information on the encoder specific profile parameters refer to the sections "9.2 Index 0xB02E : supported PROFIdrive specific parameters" on page 80 and "9.3 Index 0xB02E : supported encoder specific parameters" on page 83.



Figure 75 - Encoder position page

In the Encoder position page the current encoder position is shown.

🕢 🔹 🙋 http://192.168.20.195/ChangePresi	etValue.htm	🗸 🛃 🗶 Casella di ricerca Secure	
Modifica Visualizza Preferiti Strumenti ?			
Casela di ricerca Secure	McAfee 🕥 -		
🕸 🏀 PerUpgrade		🟠 🔹 🖾 👘 👘 Pagina 🔹 🌘	🔉 Strument
		iau.	
	Change the preset va	lue	
	Insert the preset value in hexadecimal form without 0x p	orefix, then press ENTER	
	Example write 123 for the value 0x123=2	91 decimal	
	reset value : 0x		
	vs you just to enter and save the preset value, not	to execute the preset.	
you need to execute the p	preset you must operate via the controller.		

Figure 76 - Change the preset value page

For detailed information on setting the preset value please refer to the section "15.2 Setting the preset value" on page 151.

The **technical documentation** command allows to enter the web page (http://www.lika.it/eng/prodotti.php?id_cat=267&tid_fam=270&tid_sfam=492) in the corporate web site where specific technical information and documentation concerning the Profinet encoder can be found.

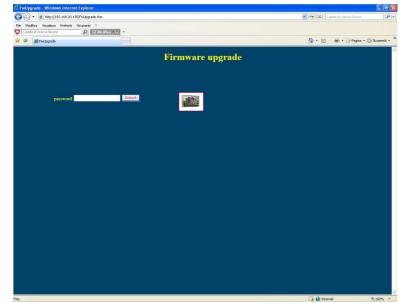


Figure 77 - Firmware upgrade page

This is a password protected page. For detailed information on the firmware upgrade please refer to the section "15.1 Firmware upgrade" on page 144.

15.1 Firmware upgrade



WARNING

Firmware upgrading process has to be accomplished by skilled and competent personnel. It is mandatory to perform the upgrade according to the instructions provided in this section.

Before installation always ascertain that the firmware program is compatible with the hardware and software of the device. Furthermore never turn off power during flash upgrade. In case of flash upgrade error, the program is lost irreversibly (there is not a bootloader) and the device must be sent back to Lika Electronic for restoring.

This operation allows to upgrade the unit firmware by downloading upgrading data to the flash memory.

Firmware is a software program which controls the functions and operation of a device; the firmware program, sometimes referred to as "user program", is stored in the flash memory integrated inside the unit. These encoders are designed so that the firmware can be easily updated by the user himself. This allows Lika Electronic to make new improved firmware programs available during the lifetime of the product.

Typical reasons for the release of new firmware programs are the necessity to make corrections, improve and even add new functionalities to the device.

The firmware upgrading program consists of a single file having .BIN extension. It is released by Lika Electronic Technical Assistance & After Sale Service.

If the latest firmware version is already installed in the unit, you do not need to proceed with any new firmware installation. Current firmware version can be verified in the Encoder Specific Profile Parameters page after connection to the web server.



NOTE

If you are not confident that you can perform the update successfully please contact Lika Electronic Technical Assistance & After Sale Service.

Before proceeding with the firmware upgrade please ascertain that the following requirements are fully satisfied:

- the encoder is connected to the network;
- the encoder has valid device name and IP address;
- the PC is connected both to the network and the IO controller;

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- a web browser (Internet Explorer, Mozilla Firefox, Google Chrome, Opera, ...) is installed in the PC or device used for connection;
- you have the SW_PN.EXE executable file;
- you have the .BIN file for firmware upgrade.

To upgrade the firmware program please proceed as follows:

1. open the Profinet encoder web server by typing the IP address of the encoder you want to connect to (in the example: 192.168.20.195) in the address bar of your web browser and confirm by pressing **ENTER**;

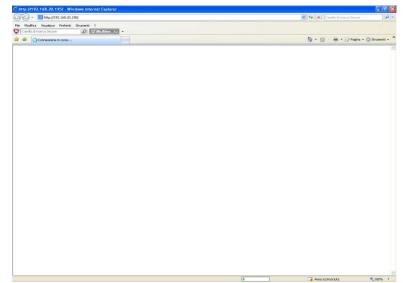


Figure 78 - Opening the web server



2. in the Home page press the **Firmware upgrade** command to enter the **Firmware upgrade** page;



Figure 79 - Web server Home page

3. before entering the page you are requested to confirm the operation; press **OK** to continue;



Figure 80 - Confirming the access to the Firmware upgrade page



4. in the **Password** text box type the password <u>lika</u> and then press the **Submit** button;

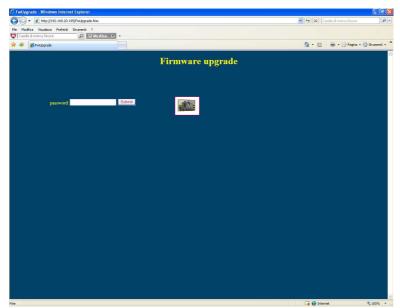


Figure 81 - Firmware upgrade page

5. a message will appear on the screen while the background color of the page will be changed to red; now the web server is stopped and the encoder is ready to accept the firmware program;

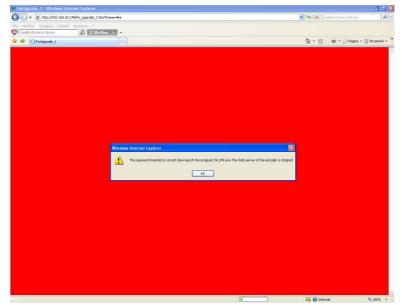


Figure 82 - Web server stopped



6. as soon as you press the **OK** button the following message will appear on the page: now you must launch the SW_PN.EXE executable file to continue with the procedure;

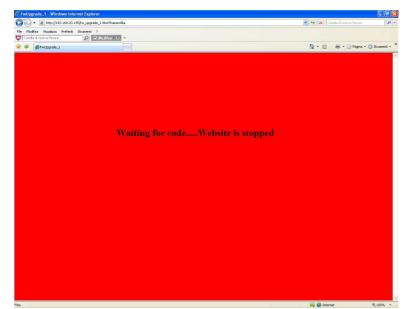


Figure 83 - Web server stopped

- 7. launch the SW_PN.EXE executable file provided with the technical documentation;
- 8. in the page that appears press the **SELECT FILE** button; once you press the button the **Open** dialogue box appears on the screen: open the folder where the firmware upgrading .BIN file released by Lika Electronic is located, select the file and confirm;

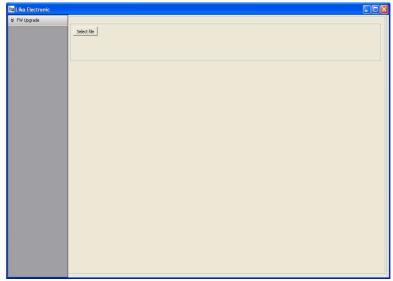


Figure 84 - Firmware upgrade executable file



- 9. in the **Remote host** text box type the IP address of the encoder you need to update; leave the **Remote port** box unchanged;
- 10. to start the upgrade press the **Upgrade FW** button;

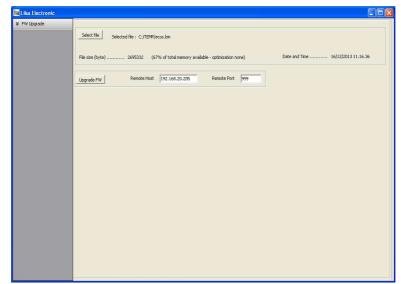


Figure 85 - Starting the firmware upgrade operation



WARNING

Before installation always ascertain that the firmware program is compatible with the hardware and software of the device.

Never turn off power during flash upgrade.

In case of flash upgrade error, the program is lost irreversibly (there is not a bootloader) and the device must be sent back to Lika Electronic for restoring.



11. download progress bars and additional information are shown in the page during operation;

FW Upgrade	
	Selected He : C:(TEMP/ecos.bin
	File size (byte)
	0%
	0%
	0% 100% Programming flish dore
	Remote Host = 192.168.20.205 Remote Port = 999 Host name = LIXA212-C Host address = 10.10.10.63
	dv, establishednow receive image to flash via top read image life header fle gas received = 26%3232 ok Alox memory done start receiving mage fle
	end receiving mape file Clededom = 0.0045056OK e dead file frog et al
	verfy flash programdone

Figure 86 - Firmware upgrade operation process

- 12. during download operation S1 Status 1 LED starts blinking green at 1 Hz while S2 Status 2 LED is OFF (see on page 31);
- 13. as soon as the operation is carried out successfully, the FLASH PROGRAMMED SUCCESSFULLY message appears on the screen;
- 14. turn encoder power off and then on to complete the operation.



NOTE

While downloading the firmware upgrading program, unexpected conditions may arise which could lead to a failure of the installation process. When such a matter occurs, download process cannot be carried out successfully and thus the operation is aborted; S2 Status 2 LED starts blinking red at 1 Hz while S1 Status 1 LED is OFF (see on page 31). In case of flash upgrade error, the program is lost irreversibly (there is not a bootloader) and the device must be sent back to Lika Electronic for restoring.

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15.2 Setting the preset value

N T

NOTE

This page is designed to help you setting a Preset value easily. Please note it allows you just to enter and save the value, not to execute the preset. If you need to execute the preset you must set the bit 12 (**Request set/shift of home position**) of the **G1_STW** control word (see on page 74). Refer also to the index **P65000 – Preset value** on page 83; to **G1_XIST1 preset control** on page 86; and to the section "14.2 Preset diagram" on page 135. In a customary way you should always use the asynchronous transmission to set the preset value. Using this page the preset value is stored automatically on the non volatile memory (you do not need to use the parameter **P971 – Transfer to non volatile memory**).

To enter a preset value please proceed as follows:

1. open the Profinet encoder web server by typing the IP address of the encoder you want to connect to (in the example: 192.168.20.195) in the address bar of your web browser and confirm by pressing **ENTER**;

- Shttp://192.168.20.195/	😭 🤧 🗶 Casella di ricerca Secure
e Modifice Visualizze Preferiti Strumenti ?	
Casela dirkerca Secure P W McAfeer 🕥 •	
🕸 🔾 Connessione in corso	🏠 • 🔯 - 🖶 • 🕞 Pagina • 🌀 Szumenti

Figure 87 - Opening the web server



2. in the Home page press the **Change the preset value** command to enter the **Change the preset value** page;



Figure 88 - Web server Home page

3. before entering the page you are requested to confirm the operation; press **OK** to continue;



Figure 89 - Confirming the access to the Preset page



in the page that appears you have to enter the desired preset value expressed in hexadecimal format; please enter the value without the 0x prefix. Press ENTER to confirm. In the example, the value 0x1000 hex (= 4096 dec) is entered. The preset value is stored automatically on the non volatile memory (you do not need to use the parameter P971 – Transfer to non volatile memory);



Figure 90 - Changing the Preset value



5. after completing the operation the following page will appear: the preset value has been stored properly on the non volatile memory.

nttp://192.168/20.195/ChangePreset_1.asp?/name=1000 - Windows Internet Explorer	V 49 X Caesia di ricerca Secure
	Casesa di noteca secure
Nodifica Visualiza Preferiti Strumenti ? Casela di ricerca Secure 😰 W. Mc.Meer 🕥 🔹	
* #http://192.168.20.195/ChangePrest_1.asp?fname=	🏠 + 🔝 - 🖶 - 🕞 Pagina + 🎯 Strumenti -
 Europhise: top:20:120/clander.esec_radoundate 	Ci Ci de Citare d'acteur
e preset value 0x1000 has been properly stored in permanent memory	

Figure 91 - Preset value stored properly

6. if you try to enter a preset value that is already stored on the memory the following message will be returned.

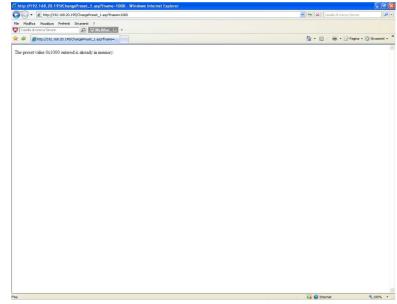


Figure 92 - Preset value already stored

16 Default parameters list

Parameters list	Default value	
Code sequence	0	
Class 4 functionality	1	
G1_XIST1 preset control	0	
Scaling function control	0	
Alarm channel control	0	
Compatibility mode	1	
Measuring units /	Hardware singleturn	
Revolution	resolution	
Total manageming range	Hardware multiturn	
Total measuring range	resolution	
Maximum Master Sign-	1	
Of-Life failures		
Velocity measuring units	0	



GSDML file version	Encoder HW version	Encoder SW version	Document release	Description
From release 20131024 to	1	1.0.1	1.0	1 st issue
From release 20131024 to	1	1.0.1	1.1	Profinet certificates
From release 20131024 to	1	1.0.2	1.2	Firmware upgrade, section 15 "Integrated web server" updated
From release 20131024 to	1	1.0.3	1.3	Firmware upgrade, section 15 "Integrated web server" updated
From release 20131024 to	1	1.0.4	1.4	Firmware upgrade, section 15 "Integrated web server" updated
From release 20131024 to	1	1.0.5	1.4	Reading of the Preset value sent in asynchronous communication mode corrected (09_14)



This device is to be supplied by a Class 2 Circuit or Low-Voltage Limited Energy or Energy Source not exceeding 30 Vdc. Refer to the product datasheet for supply voltage rate.



Dispose separately



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