

PSSu 312043 Profinet with SIMATIC S7



Product

Type: PSSu
Name: PSSu H F PN FS-Nibble-Mapping (Halbbyte-Mapping)
Manufacturer: Pilz GmbH & Co. KG, Safe Automation

Document

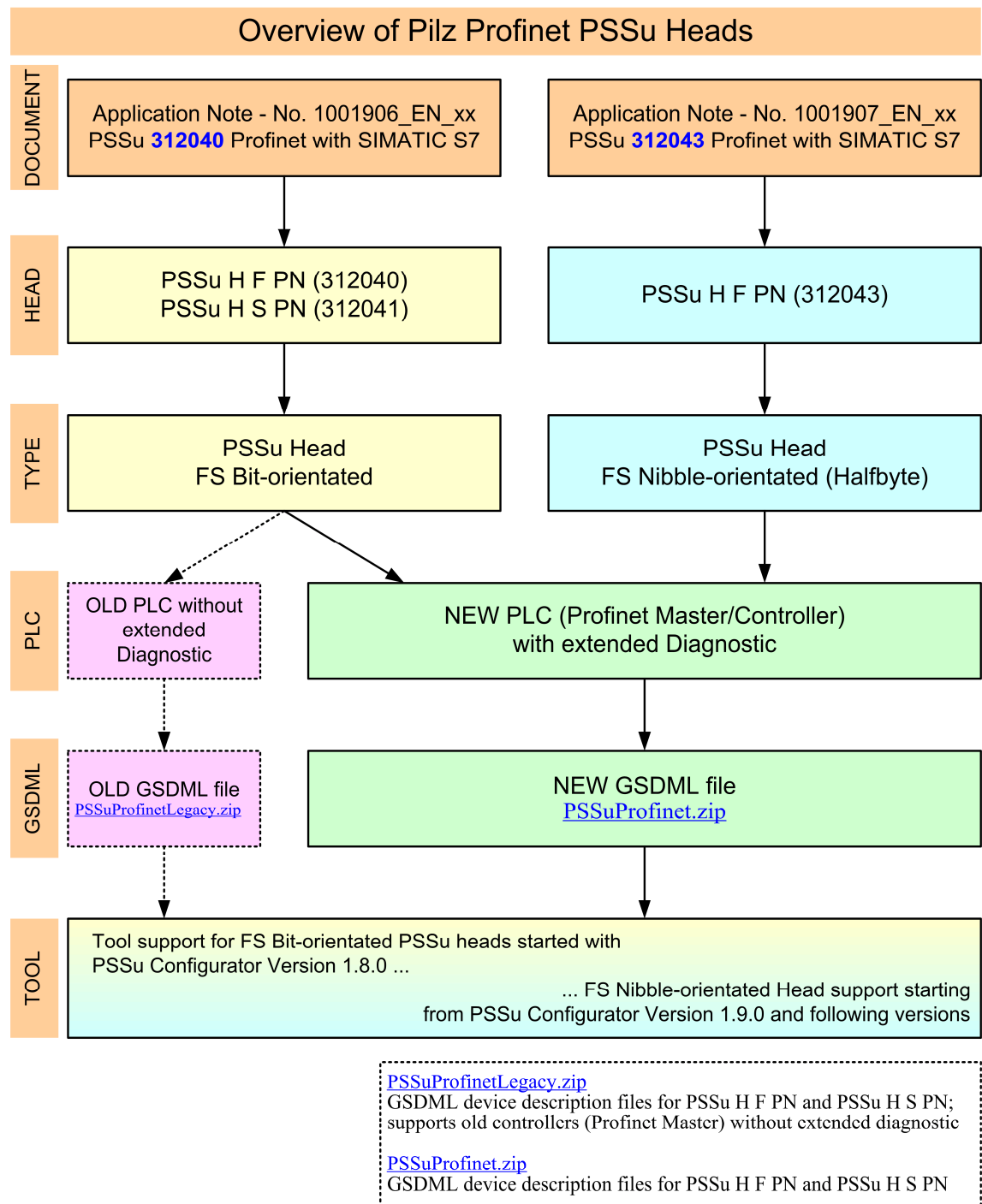
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Important Note

There are two versions of Application Note about "PSSu Profinet".
Consider the overview on the following page.

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02	14.12.2009	2 different documents: "PSSu 312040 .." and "PSSu 312043 .."	Doc-History
03	23.07.2010	Make ready for Internet-Release	only logistic data



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July 2010

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1. Useful documentation

Reading the documentation listed below is necessary for understanding this application note. The availability of the indicated tools and safe handling are also presupposed with the user.

1.1. Documentation from Pilz GmbH & Co. KG

No.	Description	Item No.
1	Pilz international homepage, download section	www.pilz.com
2	Software "PSSuniversal Assistant", Online Help Pilz's international homepage > Products section > Safety control technology > PSSuniversal > Selection guides (download link)	www.pilz.com
3	Operating manual of module "PSSu H F PN" (english)	22 072-xx
4	Operating manual of module "PSSu H S PN" (english)	22 103-EN-xx
5	Technical Catalogue of PSSuniversal (english)	21 144-xx (5-1-2-2-xxx)
6	System Description of PSSuniversal (english)	21 257-xx
7	Installation Manual of PSSuniversal (english)	21 263-xx

1.2. Documentation from other sources of information

No.	Description	Item No.
1	SIMATIC portal "Automation Systems" (international) http://www.automation.siemens.com/simatic/portal/index_76.htm	
2	PROFINET portal (english) http://www.profinet.com	
3	Siemens portal "Training material" (english) http://www.automation.siemens.com/fea/html_76/down_module.htm#E	Section "Downloads", Module "E"
4	Siemens homepage, Safety Integrated – Overview http://www.automation.siemens.com/cd/safety/html_76/produkte/si_ueberblick.htm	

2. Used Software

This Application Note has been tested with the following Software:

No.	Description	Item No.
1	Pilz: PSSu Assistant	V1.9.0. Build 24
2	Siemens: Simatic Manager Step 7	V5.4 + SP5
3	Siemens: S7 Distributed Safety Programming	V5.4 + SP5
4	Siemens: S7 F Configuration Pack	V5.5 + SP6
5.	ServersCheck BVBA: Servers Check MIB Browser	V0.1

► Note:

Dialogs and Message boxes can be differ to other Software Releases
(e.g. Siemens Step 7 V5.4 SP3 HF1).

3. Preface

This document provide a Step by Step example of interfacing a Siemens S7 PLC with PROFINET/PROFIsafe Master to the PSSuniversal PROFINET/PROFIsafe Module.
The document is not intended as a technical documentation for general use of the Simatic Manager Step 7. It may not be distributed to customers without a special note to its scope.

4. New PSSu features

4.1. FS-IO-Size

**312 043 PSSu PROFINETSafe Process Image
with Nibble Mapping**

State of FS-Outputs

Status

FS-Process Image of Inputs	32 FS-Inputs 7 Byte = 14 Nibbles	1 Byte	1 Byte	CRC 3 Byte
----------------------------	-------------------------------------	--------	--------	---------------

Control

FS-Process Image of Outputs	32 FS-Outputs 7 Byte = 14 Nibbles	1 Byte	1 Byte	CRC 3 Byte
-----------------------------	--------------------------------------	--------	--------	---------------

Reset
FS-Output
Error

Fig. 1: Simatic HW Manager – PSSu Process Image

4.2. Reintegration of FS-Outputs

If there is an FS-Output error detected, the PSSu-System would stay in “Safe Operation Mode”. In this case all FS-Output would be switched off only.

You can read the FS-Output state (passivated/ not passivated) via the FS- Output State Bit.
You can reset the detected FS-Output error via the FS-Output Reset Bit.

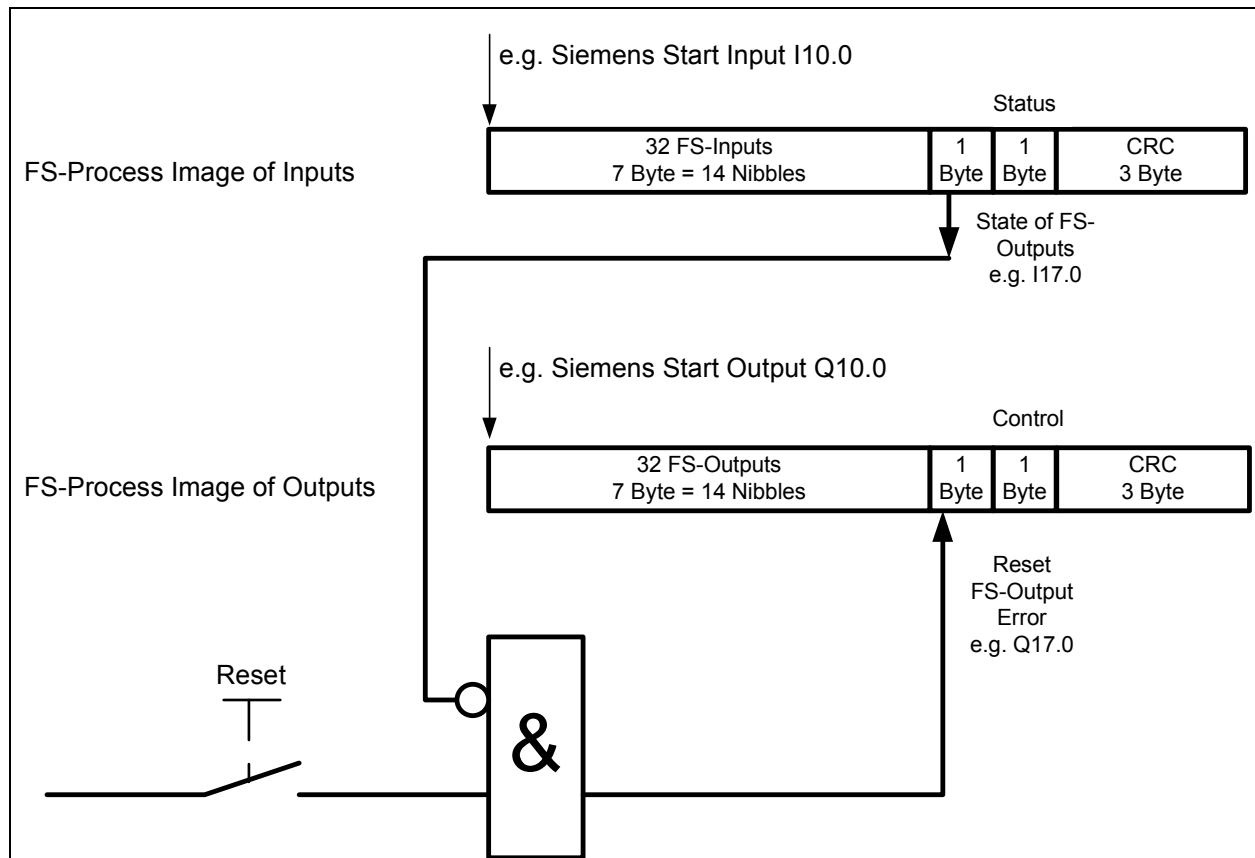


Fig. 2: State and Reset of the FS-Output of a PSSu-System

4.3. FS I/O-Mapping (Nibble Start Addresses)

There is a new FS-Mapping rule:

The I-O-Mapping of the next PSSu E FS-Module (PSSu E F....) will start always at the next possible Process Image Input or Output nibble.

Each PSSu FS-Electronic Module uses 4 Bit in the I/O- Mapping. If the user data size is smaller then 4 Bit the other Bits can't be used by the PLC-Coder. PSSu FS- Output Electronic Modules takes 4 Bit of FS-Outputs and PSSu FS-Input Electronic Modules takes 4 Bit of FS-Inputs. The PSSu E FDIOZ2 is Input and Output Electronic Module so it takes 4 Bit of FS-Outputs and 4 Bit of FS-Inputs.

4.3.1. Example 1: FS-Out-Mapping of 14 PSSu E F 2DO2:

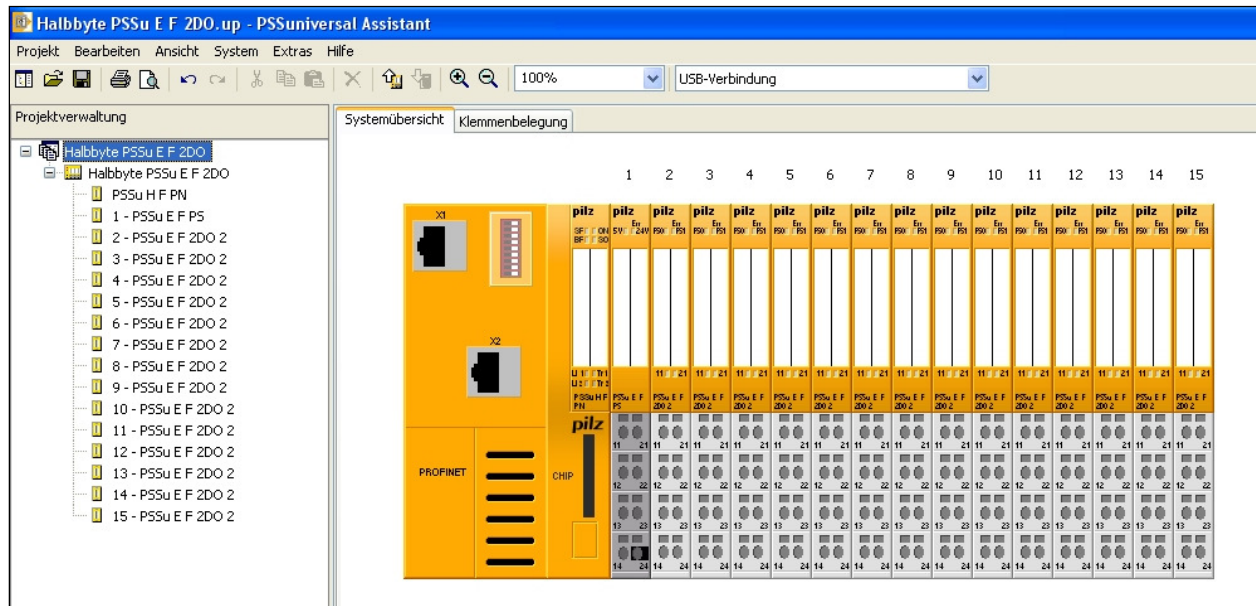


Fig. 3: PSSu Configurator - FS-Out-Mapping of 14 PSSu E F 2DO2

Output Bit	0.0	Output clamp 11
Output Bit	0.1	Output clamp 21
Output Bit	0.2	
Output Bit	0.3	
Output Bit	0.4	Output clamp 11
Output Bit	0.5	Output clamp 21
Output Bit	0.6	
Output Bit	0.7	
Output Bit	1.0	Output clamp 11
Output Bit	1.1	Output clamp 21
Output Bit	1.2	
Output Bit	1.3	
Output Bit	1.4	Output clamp 11
Output Bit	1.5	Output clamp 21
Output Bit	1.6	
Output Bit	1.7	
Output Bit	2.0	Output clamp 11
Output Bit	2.1	Output clamp 21
Output Bit	2.2	
Output Bit	2.3	
Output Bit	2.4	Output clamp 11
Output Bit	2.5	Output clamp 21
Output Bit	2.6	
Output Bit	2.7	
Output Bit	3.0	Output clamp 11
Output Bit	3.1	Output clamp 21
Output Bit	3.2	
Output Bit	3.3	
Output Bit	3.4	Output clamp 11
Output Bit	3.5	Output clamp 21
Output Bit	3.6	
Output Bit	3.7	
Output Bit	4.0	Output clamp 11
Output Bit	4.1	Output clamp 21
Output Bit	4.2	
Output Bit	4.3	
Output Bit	4.4	Output clamp 11
Output Bit	4.5	Output clamp 21
Output Bit	4.6	
Output Bit	4.7	
Output Bit	5.0	Output clamp 11
Output Bit	5.1	Output clamp 21
Output Bit	5.2	
Output Bit	5.3	
Output Bit	5.4	Output clamp 11
Output Bit	5.5	Output clamp 21
Output Bit	5.6	
Output Bit	5.7	
Output Bit	6.0	Output clamp 11
Output Bit	6.1	Output clamp 21
Output Bit	6.2	
Output Bit	6.3	
Output Bit	6.4	Output clamp 11
Output Bit	6.5	Output clamp 21
Output Bit	6.6	
Output Bit	6.7	

4.3.2. Example 2: FS-I/O-Mapping of 14 PSSu E F DIOZ2:

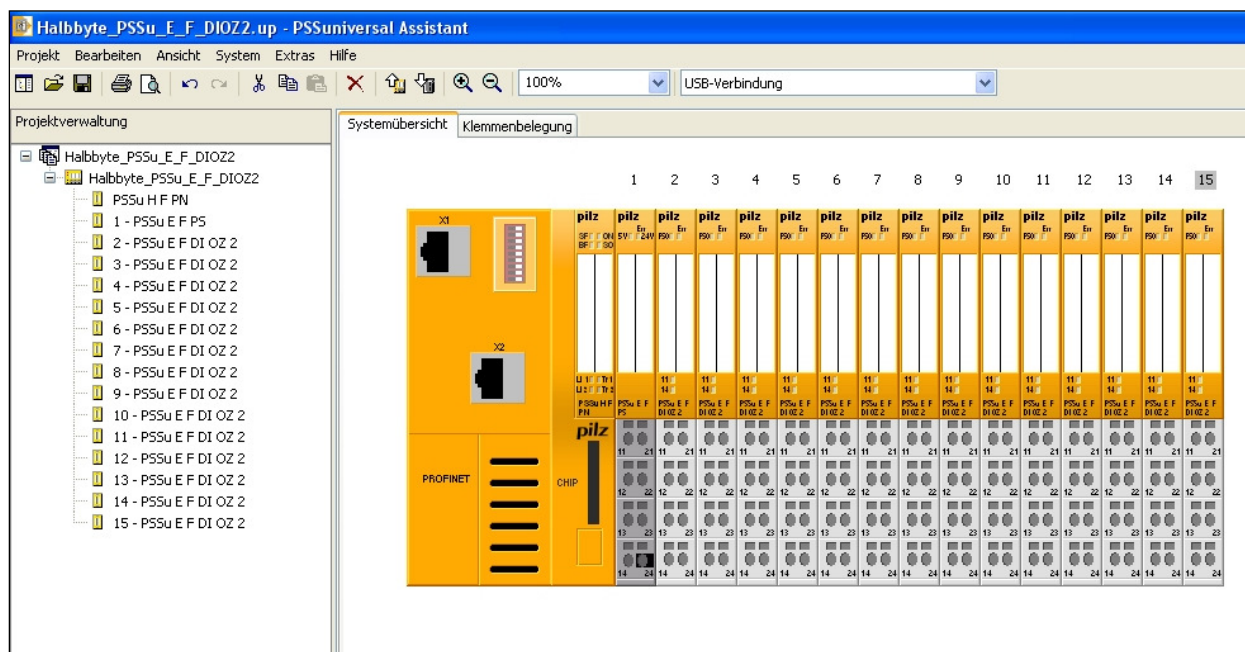


Fig. 4: PSSu Configurator - FS-I/O-Mapping of 14 PSSu E F DIOZ2

Input Bit	0.0	Input Clamp 14		Output Bit	0.0	Output Clamp 11
Input Bit	0.1	State "No open circuit"		Output Bit	0.1	
Input Bit	0.2			Output Bit	0.2	
Input Bit	0.3			Output Bit	0.3	
Input Bit	0.4	Input Clamp 14		Output Bit	0.4	Output Clamp 11
Input Bit	0.5	State "No open circuit"		Output Bit	0.5	
Input Bit	0.6			Output Bit	0.6	
Input Bit	0.7			Output Bit	0.7	
Input Bit	1.0	Input Clamp 14		Output Bit	1.0	Output Clamp 11
Input Bit	1.1	State "No open circuit"		Output Bit	1.1	
Input Bit	1.2			Output Bit	1.2	
Input Bit	1.3			Output Bit	1.3	
Input Bit	1.4	Input Clamp 14		Output Bit	1.4	Output Clamp 11
Input Bit	1.5	State "No open circuit"		Output Bit	1.5	
Input Bit	1.6			Output Bit	1.6	
Input Bit	1.7			Output Bit	1.7	
Input Bit	2.0	Input Clamp 14		Output Bit	2.0	Output Clamp 11
Input Bit	2.1	State "No open circuit"		Output Bit	2.1	
Input Bit	2.2			Output Bit	2.2	
Input Bit	2.3			Output Bit	2.3	
Input Bit	2.4	Input Clamp 14		Output Bit	2.4	Output Clamp 11
Input Bit	2.5	State "No open circuit"		Output Bit	2.5	
Input Bit	2.6			Output Bit	2.6	
Input Bit	2.7			Output Bit	2.7	
Input Bit	3.0	Input Clamp 14		Output Bit	3.0	Output Clamp 11
Input Bit	3.1	State "No open circuit"		Output Bit	3.1	
Input Bit	3.2			Output Bit	3.2	
Input Bit	3.3			Output Bit	3.3	
Input Bit	3.4	Input Clamp 14		Output Bit	3.4	Output Clamp 11
Input Bit	3.5	State "No open circuit"		Output Bit	3.5	
Input Bit	3.6			Output Bit	3.6	
Input Bit	3.7			Output Bit	3.7	
Input Bit	4.0	Input Clamp 14		Output Bit	4.0	Output Clamp 11
Input Bit	4.1	State "No open circuit"		Output Bit	4.1	
Input Bit	4.2			Output Bit	4.2	
Input Bit	4.3			Output Bit	4.3	
Input Bit	4.4	Input Clamp 14		Output Bit	4.4	Output Clamp 11
Input Bit	4.5	State "No open circuit"		Output Bit	4.5	
Input Bit	4.6			Output Bit	4.6	
Input Bit	4.7			Output Bit	4.7	
Input Bit	5.0	Input Clamp 14		Output Bit	5.0	Output Clamp 11
Input Bit	5.1	State "No open circuit"		Output Bit	5.1	
Input Bit	5.2			Output Bit	5.2	
Input Bit	5.3			Output Bit	5.3	
Input Bit	5.4	Input Clamp 14		Output Bit	5.4	Output Clamp 11
Input Bit	5.5	State "No open circuit"		Output Bit	5.5	
Input Bit	5.6			Output Bit	5.6	
Input Bit	5.7			Output Bit	5.7	
Input Bit	6.0	Input Clamp 14		Output Bit	6.0	Output Clamp 11
Input Bit	6.1	State "No open circuit"		Output Bit	6.1	
Input Bit	6.2			Output Bit	6.2	
Input Bit	6.3			Output Bit	6.3	
Input Bit	6.4	Input Clamp 14		Output Bit	6.4	Output Clamp 11
Input Bit	6.5	State "No open circuit"		Output Bit	6.5	
Input Bit	6.6			Output Bit	6.6	
Input Bit	6.7			Output Bit	6.7	

4.3.3. Example 3: FS-I/O-Mapping of 14 PSSu E F 4 DO0.5 and 14 PSSu E F 4DI:

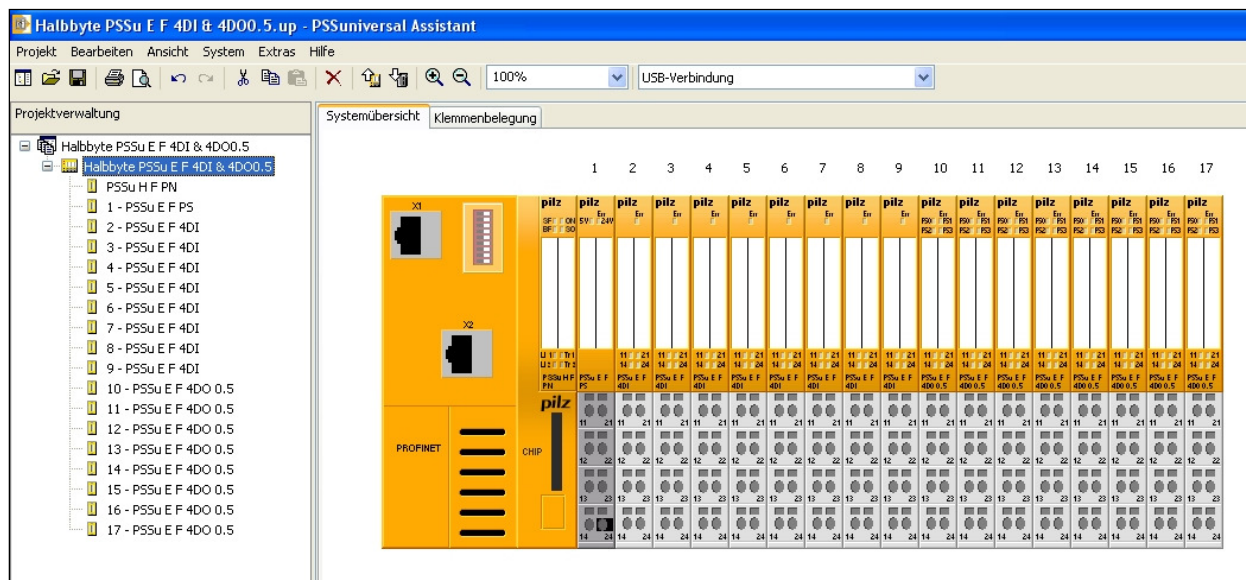


Fig. 5: PSSu Configurator - FS-I/O-Mapping of 14 PSSu E F 4 DO0.5 and 14 PSSu E F 4DI

Input Bit	0.0	Input clamp	11	Output Bit	0.0	Output clamp	11
Input Bit	0.1	Input clamp	21	Output Bit	0.1	Output clamp	21
Input Bit	0.2	Input clamp	14	Output Bit	0.2	Output clamp	14
Input Bit	0.3	Input clamp	24	Output Bit	0.3	Output clamp	24
Input Bit	0.4	Input clamp	11	Output Bit	0.4	Output clamp	11
Input Bit	0.5	Input clamp	21	Output Bit	0.5	Output clamp	21
Input Bit	0.6	Input clamp	14	Output Bit	0.6	Output clamp	14
Input Bit	0.7	Input clamp	24	Output Bit	0.7	Output clamp	24
Input Bit	1.0	Input clamp	11	Output Bit	1.0	Output clamp	11
Input Bit	1.1	Input clamp	21	Output Bit	1.1	Output clamp	21
Input Bit	1.2	Input clamp	14	Output Bit	1.2	Output clamp	14
Input Bit	1.3	Input clamp	24	Output Bit	1.3	Output clamp	24
Input Bit	1.4	Input clamp	11	Output Bit	1.4	Output clamp	11
Input Bit	1.5	Input clamp	21	Output Bit	1.5	Output clamp	21
Input Bit	1.6	Input clamp	14	Output Bit	1.6	Output clamp	14
Input Bit	1.7	Input clamp	24	Output Bit	1.7	Output clamp	24
Input Bit	2.0	Input clamp	11	Output Bit	2.0	Output clamp	11
Input Bit	2.1	Input clamp	21	Output Bit	2.1	Output clamp	21
Input Bit	2.2	Input clamp	14	Output Bit	2.2	Output clamp	14
Input Bit	2.3	Input clamp	24	Output Bit	2.3	Output clamp	24
Input Bit	2.4	Input clamp	11	Output Bit	2.4	Output clamp	11
Input Bit	2.5	Input clamp	21	Output Bit	2.5	Output clamp	21
Input Bit	2.6	Input clamp	14	Output Bit	2.6	Output clamp	14
Input Bit	2.7	Input clamp	24	Output Bit	2.7	Output clamp	24
Input Bit	3.0	Input clamp	11	Output Bit	3.0	Output clamp	11
Input Bit	3.1	Input clamp	21	Output Bit	3.1	Output clamp	21
Input Bit	3.2	Input clamp	14	Output Bit	3.2	Output clamp	14
Input Bit	3.3	Input clamp	24	Output Bit	3.3	Output clamp	24
Input Bit	3.4	Input clamp	11	Output Bit	3.4	Output clamp	11
Input Bit	3.5	Input clamp	21	Output Bit	3.5	Output clamp	21
Input Bit	3.6	Input clamp	14	Output Bit	3.6	Output clamp	14
Input Bit	3.7	Input clamp	24	Output Bit	3.7	Output clamp	24
Input Bit	4.0	Input clamp	11	Output Bit	4.0	Output clamp	11
Input Bit	4.1	Input clamp	21	Output Bit	4.1	Output clamp	21
Input Bit	4.2	Input clamp	14	Output Bit	4.2	Output clamp	14
Input Bit	4.3	Input clamp	24	Output Bit	4.3	Output clamp	24
Input Bit	4.4	Input clamp	11	Output Bit	4.4	Output clamp	11
Input Bit	4.5	Input clamp	21	Output Bit	4.5	Output clamp	21
Input Bit	4.6	Input clamp	14	Output Bit	4.6	Output clamp	14
Input Bit	4.7	Input clamp	24	Output Bit	4.7	Output clamp	24
Input Bit	5.0	Input clamp	11	Output Bit	5.0	Output clamp	11
Input Bit	5.1	Input clamp	21	Output Bit	5.1	Output clamp	21
Input Bit	5.2	Input clamp	14	Output Bit	5.2	Output clamp	14
Input Bit	5.3	Input clamp	24	Output Bit	5.3	Output clamp	24
Input Bit	5.4	Input clamp	11	Output Bit	5.4	Output clamp	11
Input Bit	5.5	Input clamp	21	Output Bit	5.5	Output clamp	21
Input Bit	5.6	Input clamp	14	Output Bit	5.6	Output clamp	14
Input Bit	5.7	Input clamp	24	Output Bit	5.7	Output clamp	24
Input Bit	6.0	Input clamp	11	Output Bit	6.0	Output clamp	11
Input Bit	6.1	Input clamp	21	Output Bit	6.1	Output clamp	21
Input Bit	6.2	Input clamp	14	Output Bit	6.2	Output clamp	14
Input Bit	6.3	Input clamp	24	Output Bit	6.3	Output clamp	24
Input Bit	6.4	Input clamp	11	Output Bit	6.4	Output clamp	11
Input Bit	6.5	Input clamp	21	Output Bit	6.5	Output clamp	21
Input Bit	6.6	Input clamp	14	Output Bit	6.6	Output clamp	14
Input Bit	6.7	Input clamp	24	Output Bit	6.7	Output clamp	24

4.4. Further new PSSu H F PN Features

4.4.1. PROFINET I/O Topology and Diagnostics, PSSu

After downloading the PROFINET Topology an plugging error will be detected by the PROFINET diagnostics.

Siemens PG-Online Diagnostics (german):

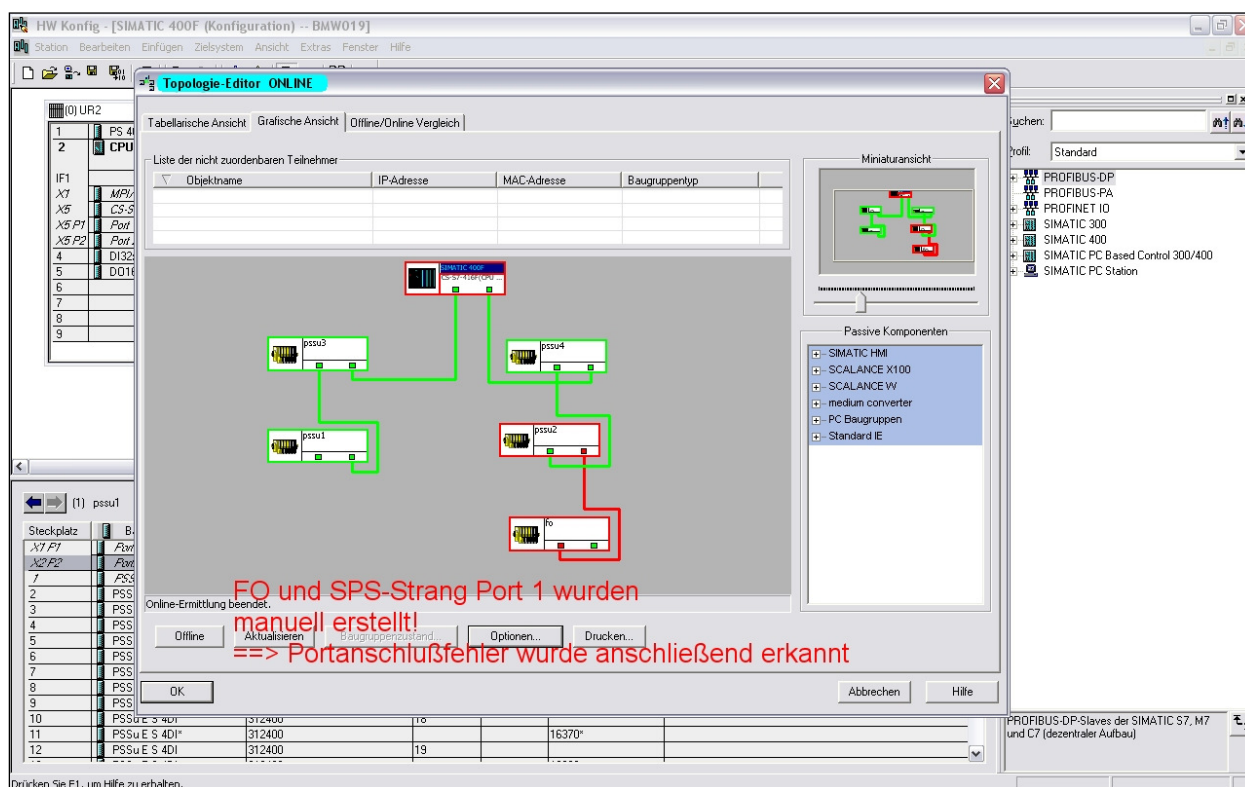


Fig. 6: Simatic HW Manager – Topology, PROFINET diagnostic (Part 1)

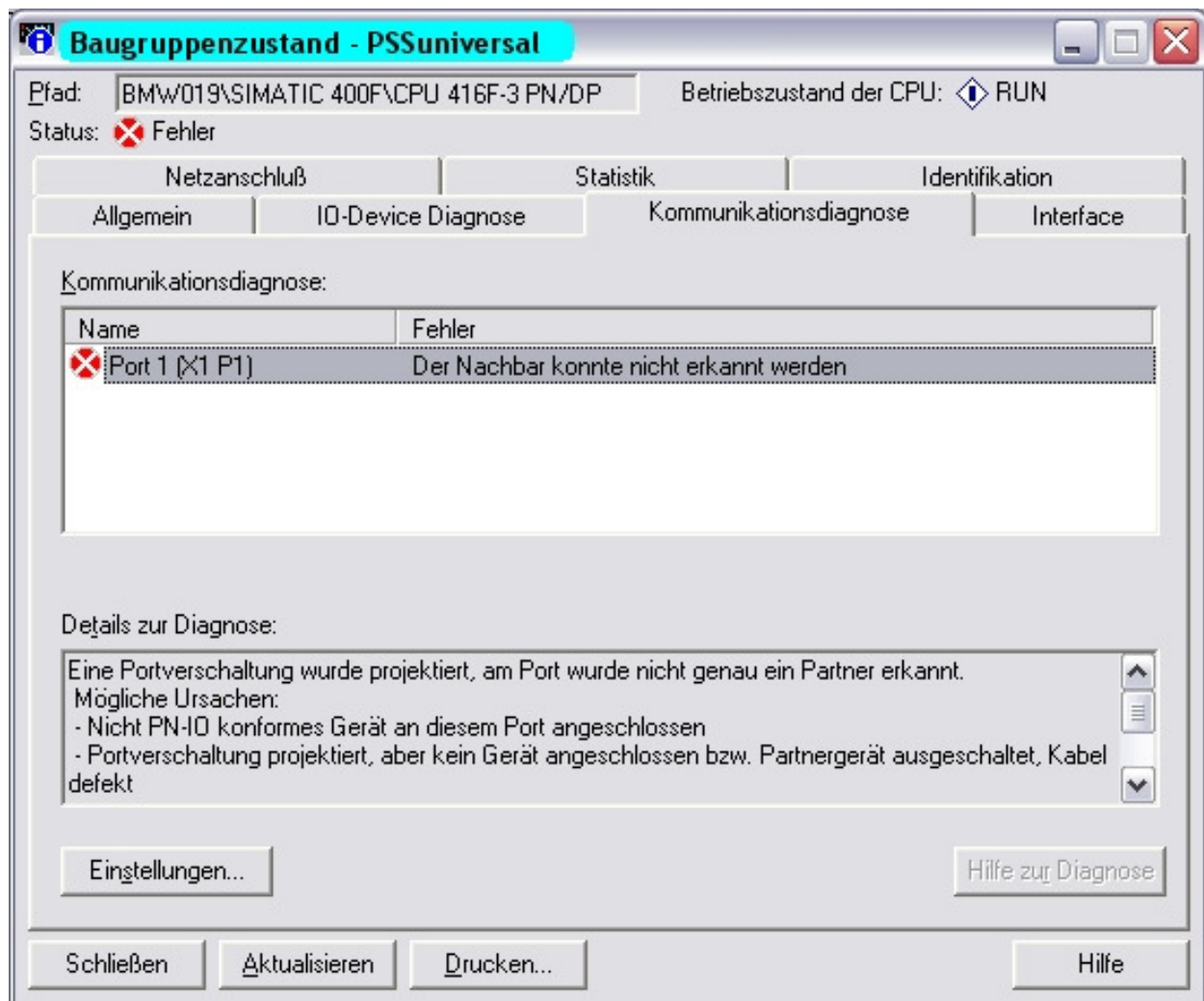


Fig. 7: Simatic HW Manager – Topology, PROFINET diagnostic (Part 2)

4.4.2. PSSu configuration CRC check between Siemens S7-Project and physical PSSu-Hardware

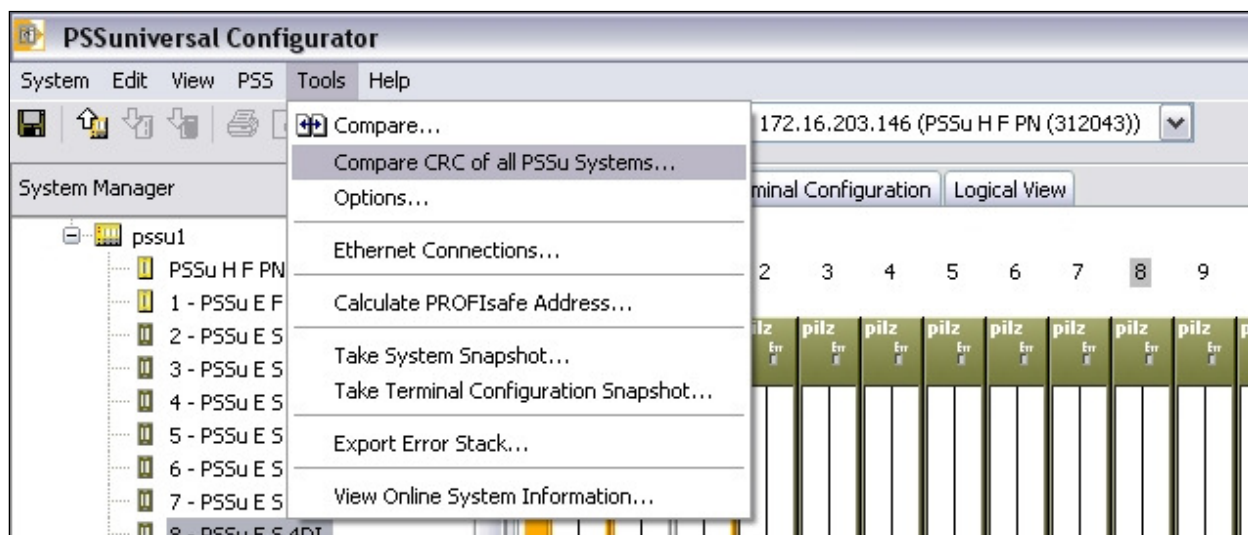


Fig. 8: PSSu Configurator –CRC comparison (Part 1)

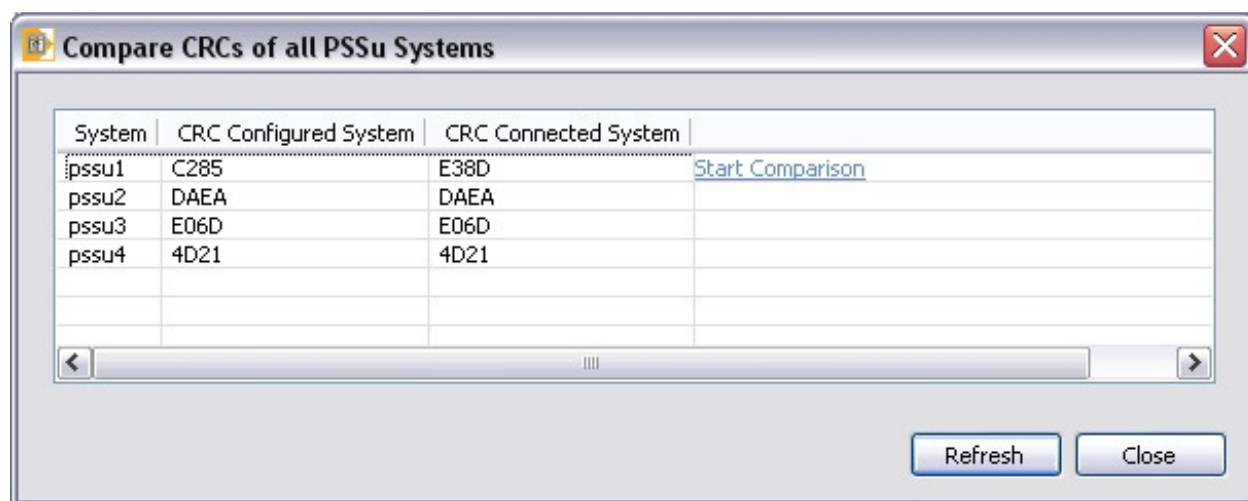


Fig. 9: PSSu Configurator –CRC comparison (Part 2)

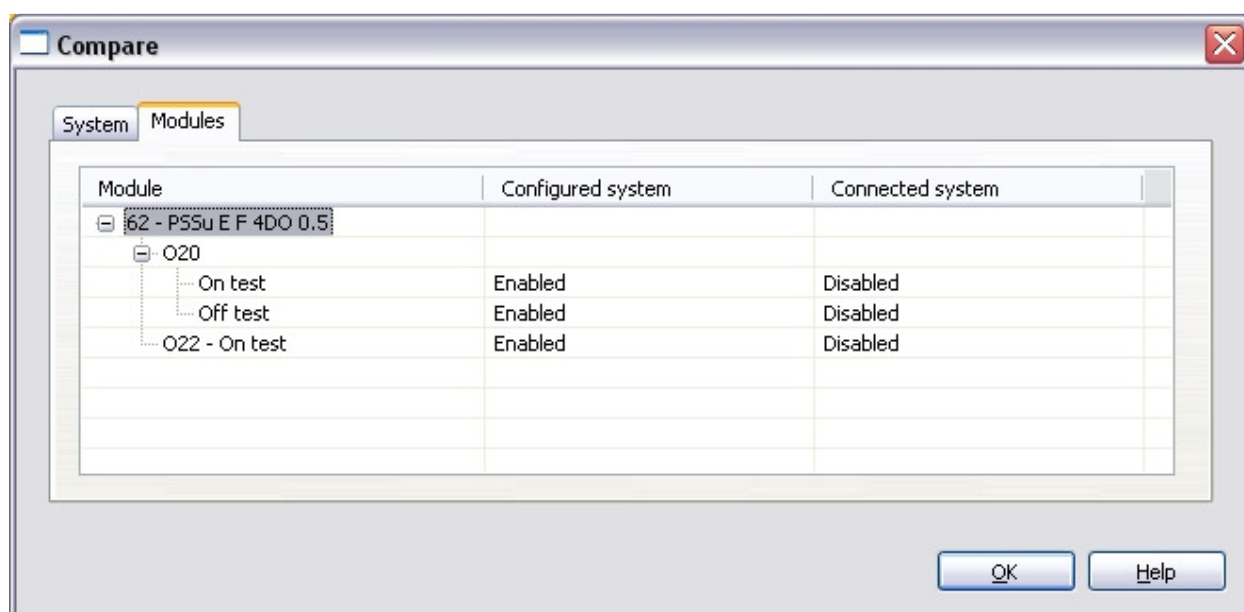


Fig. 10: PSSu Configurator –CRC comparison (Part 3)

The screenshot shows the 'PSSUniversal Startup' application window. The 'Tools' menu is open, displaying the following options: 'Options...', 'Ethernet Connections...' (which is highlighted), 'Take System Snapshot...', 'Take Terminal Configuration Snapshot...', and 'Export Error Stack...'. The background of the application window is dark gray.

Ethernet Connections

Ethernet Connections

Name	Head Module	PROFIsafe Address	IP Address	Port Number

New

Edit

Delete

Test

Import...

OK Help

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Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

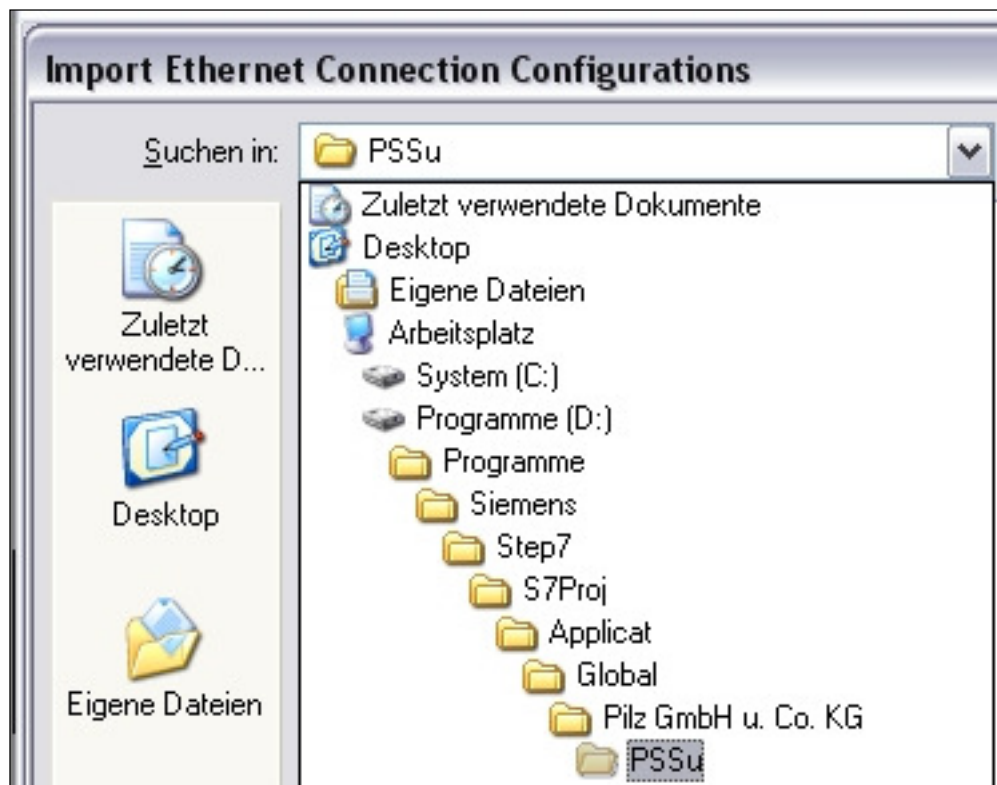


Fig. 13: PSSu Configurator – Ethernet Connections (Part 3)

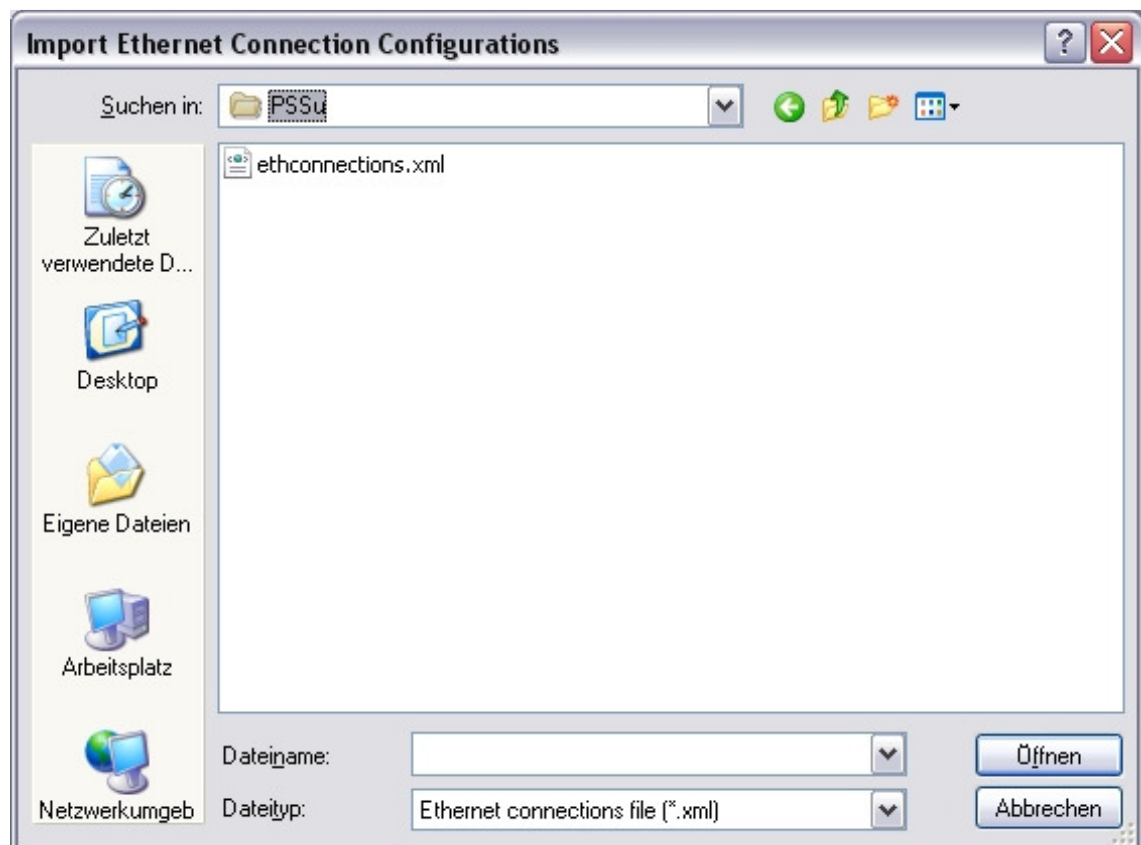


Fig. 14: PSSu Configurator – Ethernet Connections (Part 4)

4.4.4. SNMP Support

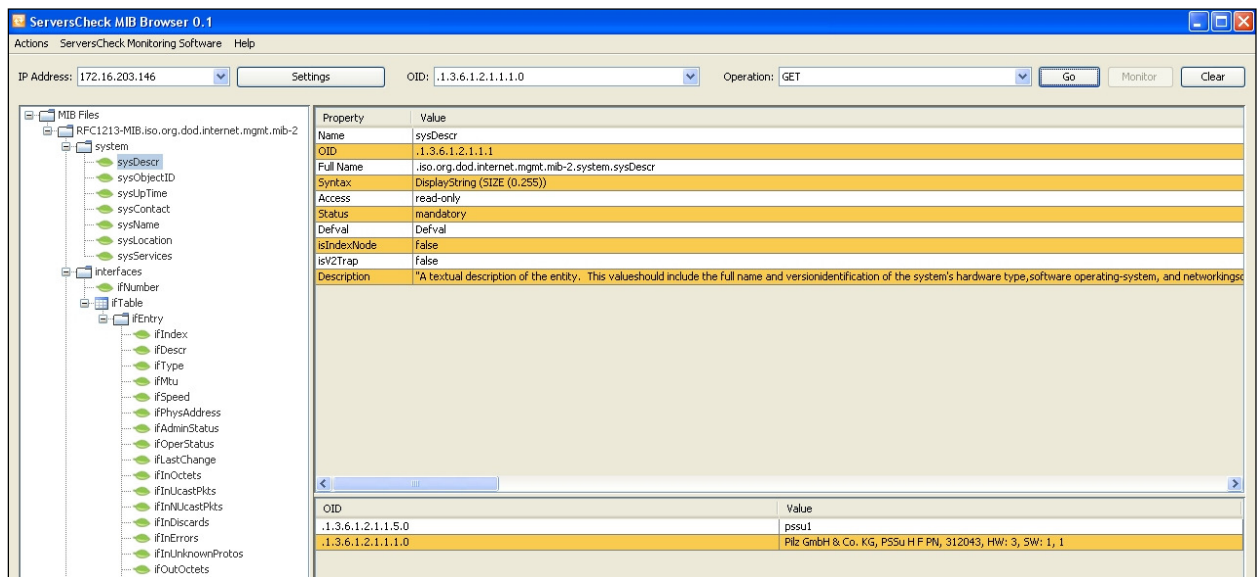


Fig. 15: CheckingType, Firmware Versions etc.

4.4.5. Maintenance: Save all configured PSSu PN-Error Stacks in one file

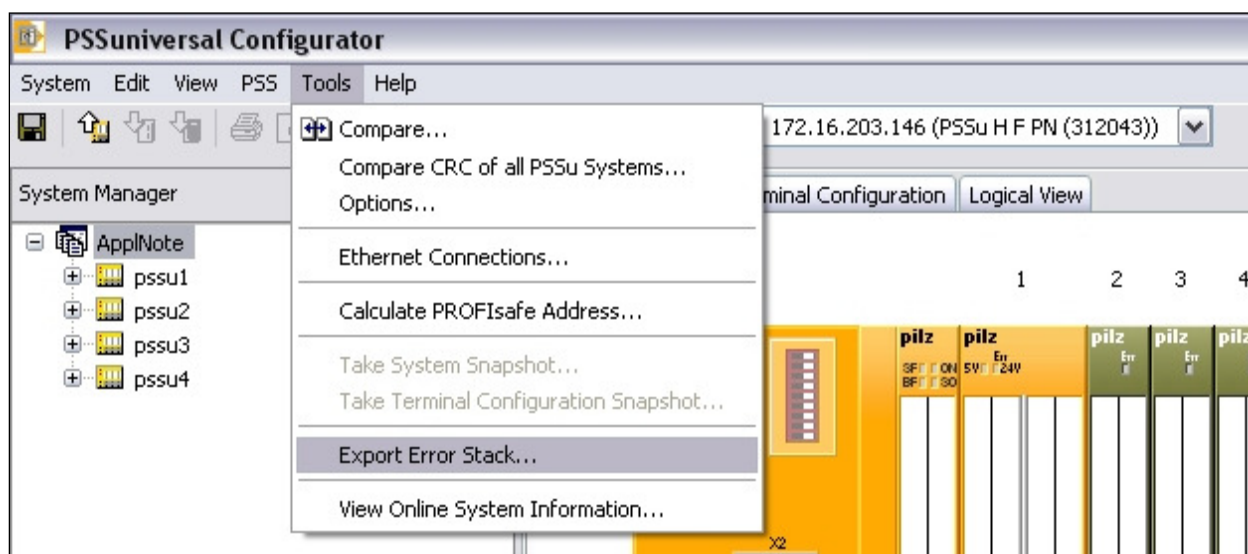


Fig. 16: PSSu Configurator, Export Error Stack

Name: pssu1						
IP Address: 172.16.203.146						
Comment:						
Time Stamp	Class	Number	Priority	Location	Description	
04_00h_09m_20s	S-50	17	Error	CPU C	A PROFIsafe watchdog timeout has occurred	
04_00h_09m_20s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSSu system and the Master"	
04_00h_09m_11s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master	
04_00h_05m_39s	S-50	17	Error	CPU C	A PROFIsafe watchdog timeout has occurred	
04_00h_05m_39s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSSu system and the Master"	
04_00h_05m_30s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master	
04_00h_00m_03s	F-80	22	Status	CPU A	All FS outputs have switched to a RUN state	
04_00h_00m_03s	F-80	23	Status	CPU A	All FS inputs have switched to a RUN state	
04_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted	
04_00h_00m_03s	F-80	22	Status	CPU A	All FS outputs have switched to a RUN state	
04_00h_00m_03s	F-80	23	Status	CPU A	All FS inputs have switched to a RUN state	
04_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted	

Fig. 17: PSSu Configurator, Text-file: All known PSSu PN-Error Stack will be saved in one file

5. Application Task

Implement a E-STOP-CALL with PSSu E F 4DI-Inputs used by a PSSu H F PN-System. The initial S7-Hardware configuration is not implemented in this “Application Note”. One can get further details if one read the Siemens Simatic Step 7 manual.
(e.g. http://www.automation.siemens.com/fea/html_76/down_module.htm).

6. Hardware Configuration

6.1. Siemens Safety PLC

This Application Note has been tested with the following Hardware:

- ▶ CPU 416F-3 PN/DP 416-3FR05-0AB0 V5.2.0
- ▶ ST Input Slot: DI31xDC24V 421-1BL01-0AA0 (used for E-Stop reset)

6.2. Pilz Failsafe- & Standard-I/Os

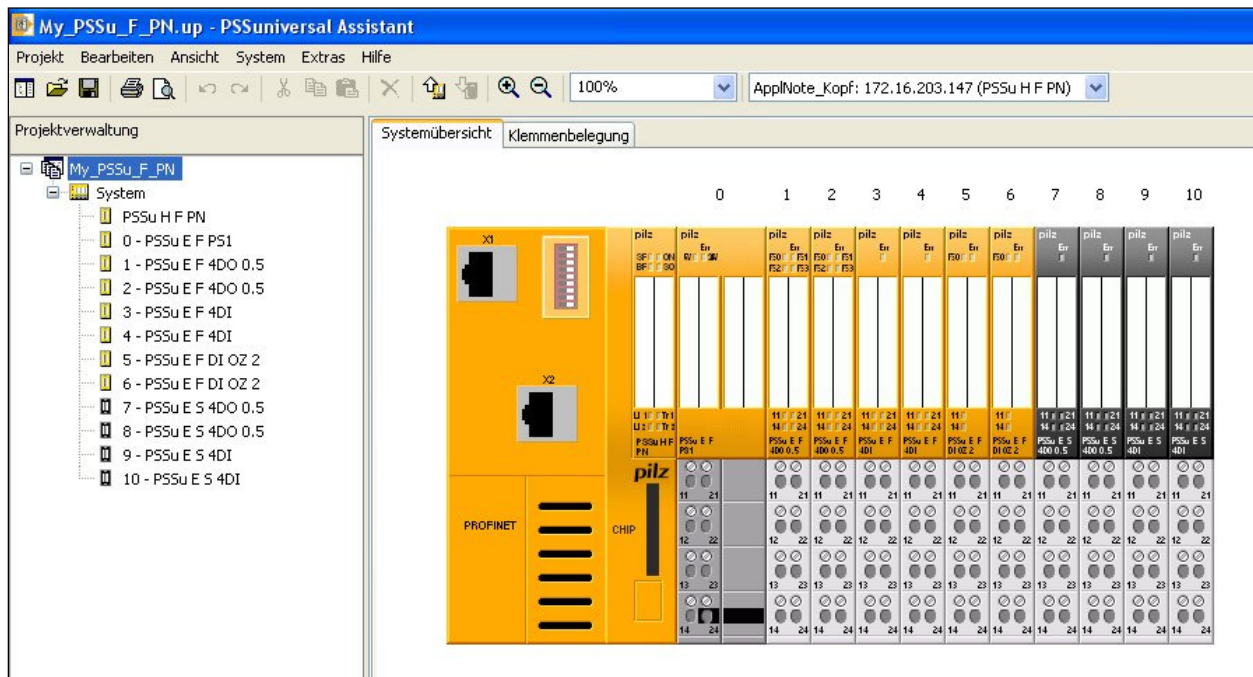


Fig. 18: PSSu Configurator – Configuration of PSSu H F PN-System

This Application Note has been tested with the following Hardware:

PSSu H F PN (PSSu PROFISafe Head module)

- ▶ Slot 00 PSSu E F PS1 (Power Supply)
- ▶ Slot 01 PSSu E F 4DO (PSS Failsafe Outputs)
- ▶ Slot 02 PSSu E F 4DO (PSS Failsafe Outputs)
- ▶ Slot 03 PSSu E F 4DI (PSS Failsafe Inputs)
- ▶ Slot 04 PSSu E F 4DI (PSS Failsafe Inputs)
- ▶ Slot 05 PSSu E F DI OZ 2 (PSS Failsafe Input and one Dual Output)
- ▶ Slot 06 PSSu E F DI OZ 2 (PSS Failsafe Input and one Dual Output)
- ▶ Slot 07 PSSu E S 4DO 0.5 (ST outputs)
- ▶ Slot 08 PSSu E S 4DO 0.5 (ST outputs)
- ▶ Slot 09 PSSu E S 4 DI (ST Inputs)
- ▶ Slot 10 PSSu E S 4 DI (ST Inputs)

6.3. Maximum PSSu Failsafe- & Standard-I/O-Process Images

- ▶ Standard: 64 Byte Inputs, 64 Byte Outputs
- ▶ Failsafe: 32 Bit Input, 32 Bit Outputs
Best case of FS-Nibble-Mapping 8 X PSSu E F 4DI & 8 X PSSu E F 4DO0.5

6.4. Diagnostic Information

- ▶ Process Image: 1 Bit State of FS-Outputs (see chapter 4.1. FS-IO-Size)
- ▶ PROFINET Diagnostic data: Like Profibus DP-Diagnostic (e.g. FB149; see Siemens Manual)

7. Configuration of Siemens S7 PLC

Download actual device description file (“GSDML”)

Download actual modularly XML-File (“GSDML”) with associated bitmaps as an packed file (ZIP-format) from Internet presence of Pilz GmbH & Co KG.

► Download selection; <http://www.pilz.com/support/downloads/index.en.jsp>

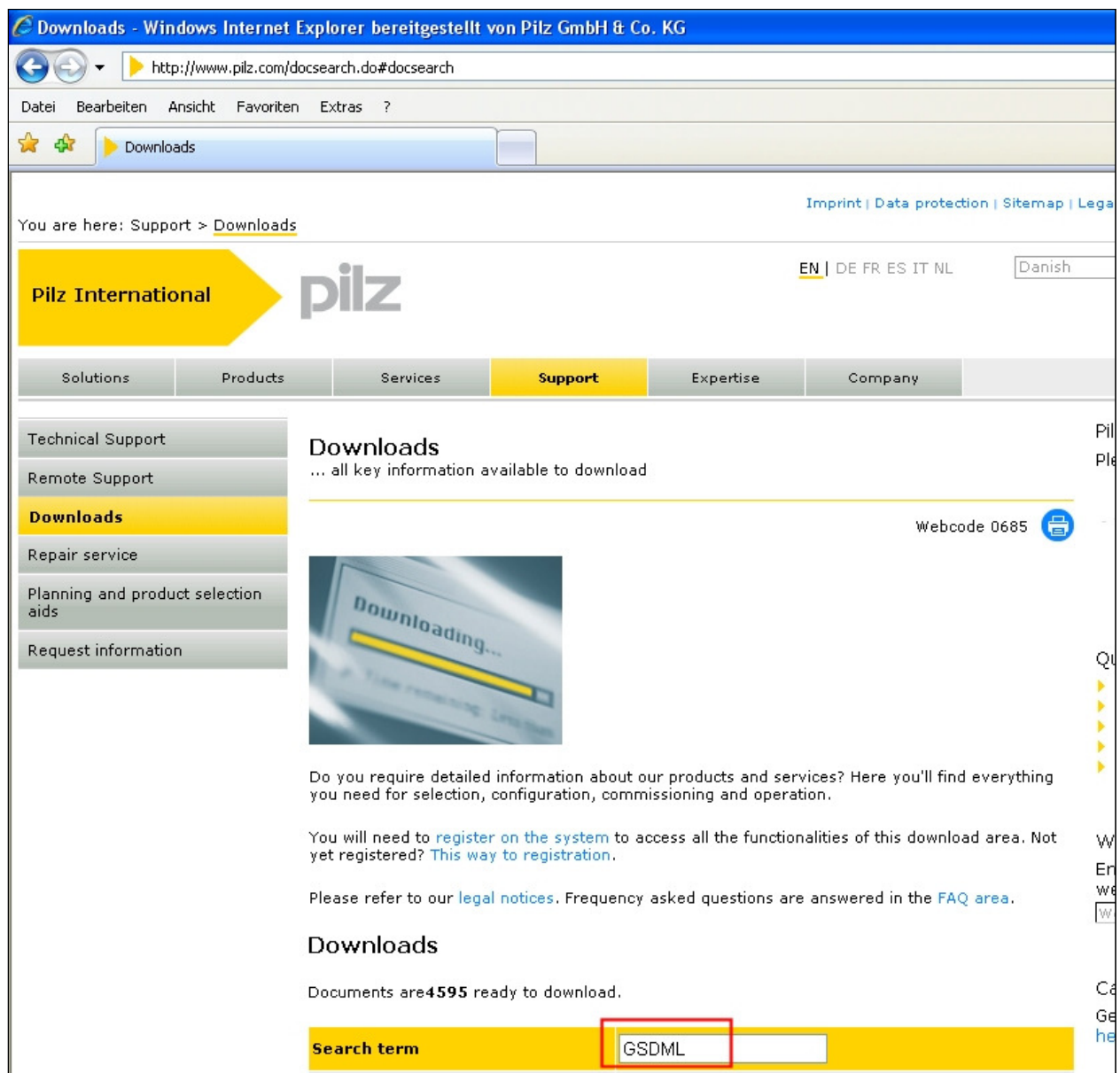


Fig. 19: Pilz Web page – Search for XML-File (“GSDML”) for PSSu-Systems on www.pilz.com (Part 1)

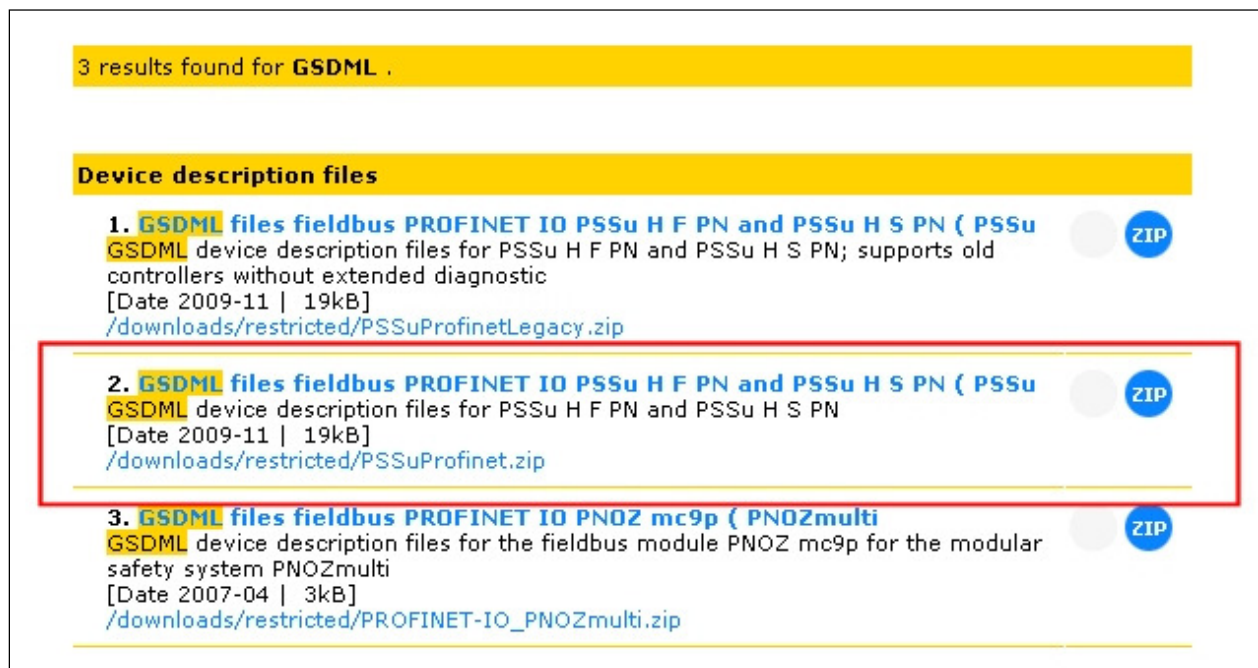


Fig. 20: Pilz Web page – Search for XML-File (“GSDML”) for PSSu-Systems on www.pilz.com (Part 2)

► Notice:

One will need to register on the system to access all the functionalities aof this download area.

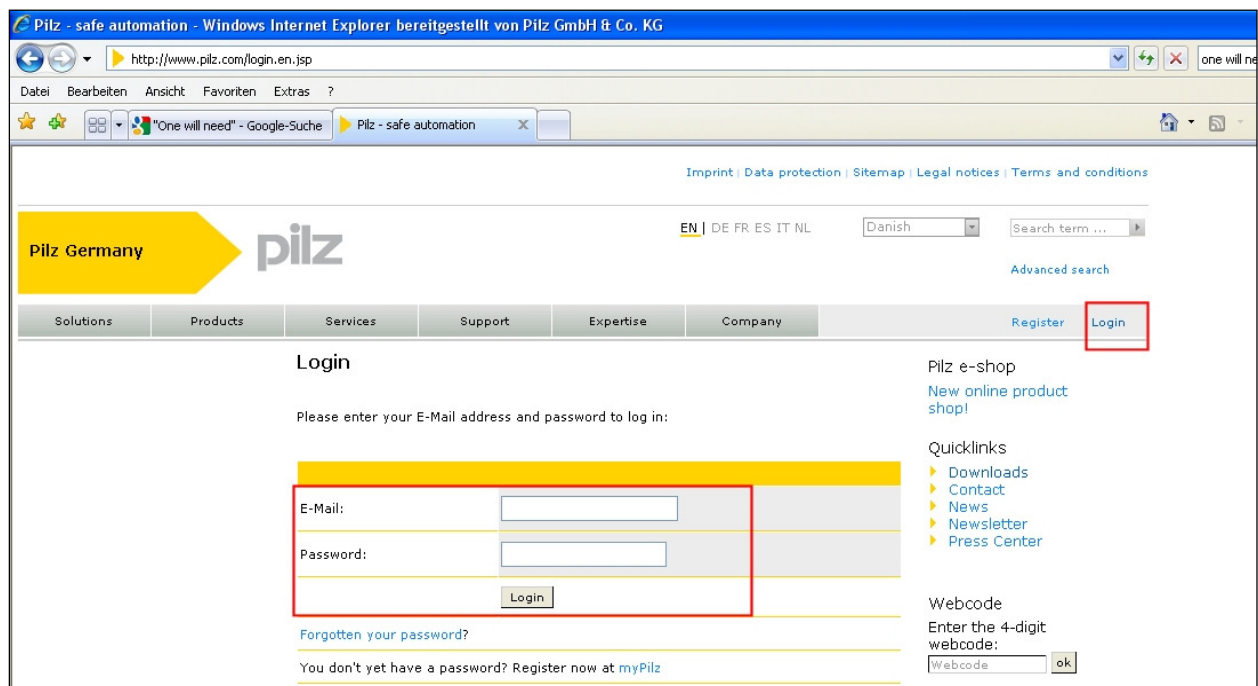


Fig. 21: Pilz Web page – Login on www.pilz.com

7.1. Import the GSDM-file to Siemens Step 7 hardware catalogue

- The first user operation should be the import the last version of the GSDML-file to the S7 Hardware Manager



Fig. 22: S7 HW Config – Install a GSD(ML)-File (Step1)

- Troubleshooting Note:
If one have to open and download a project from a third person one don't need the same GSDML-File version in hardware catalogue.
If there is a difference between PSSu-device GSDML-file of the created PSSu device and GSDML-file of the S7 hardware catalogue, one can't expand the used hardware type of the existing device.
- The first user operation should be the import the last version of the GSDML-File to the Siemens S7 Hardware-Manager.

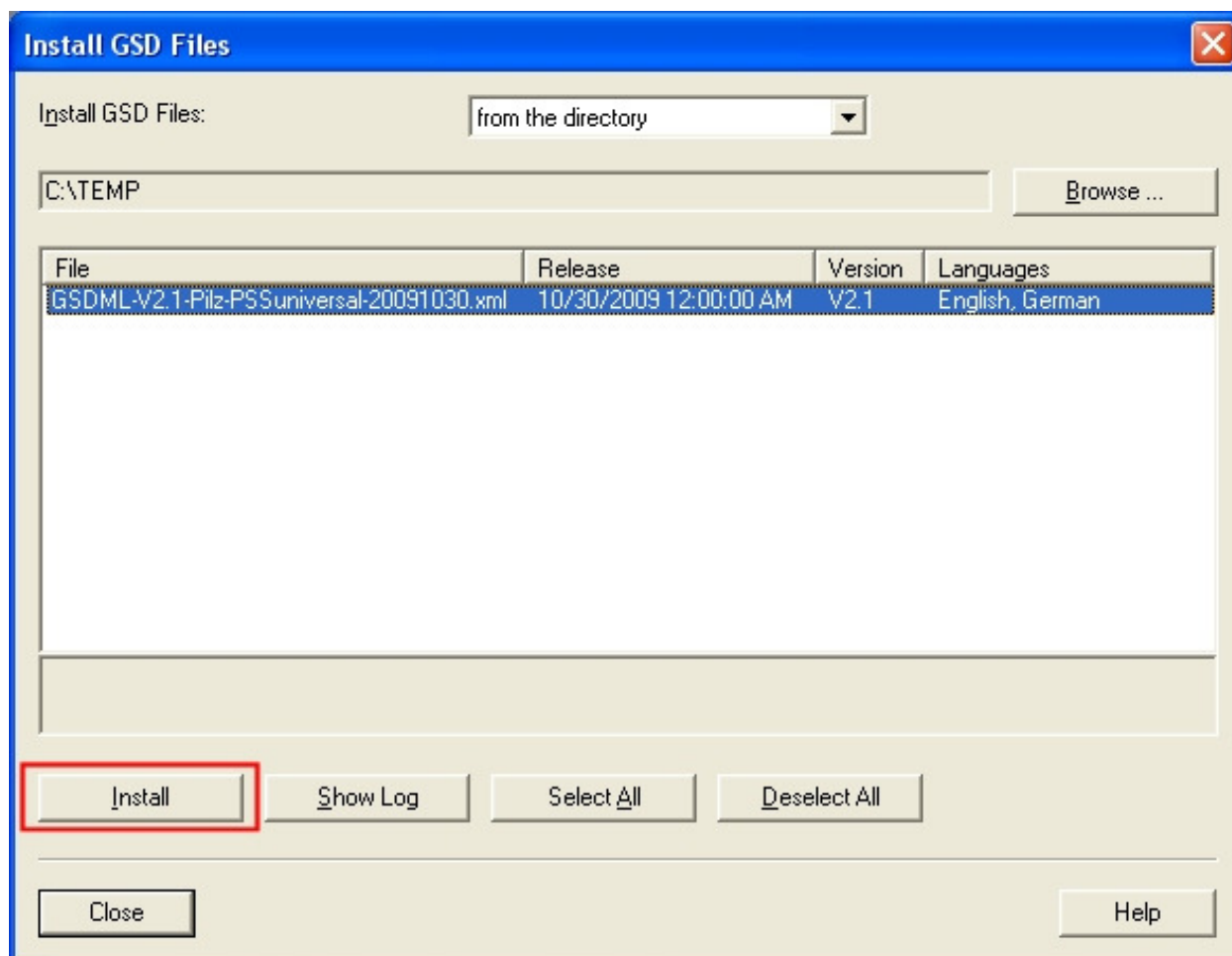


Fig. 23: S7 HW Config – Select a GSD(X)ML-File (Step 2)

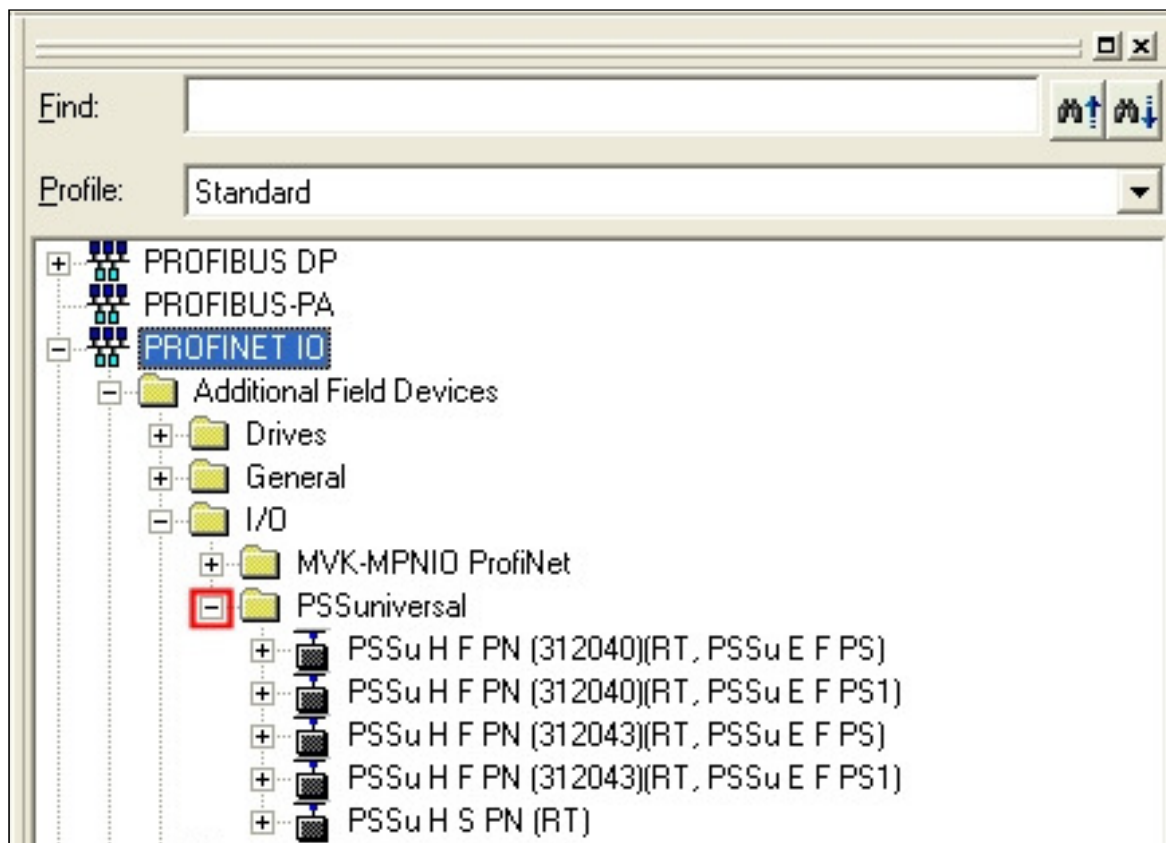


Fig. 24: S7 HW Config – Get the PSSu PN heads in S7 hardware catalogue

- If the GSDML-file is imported there are the different PSSu types in the “Additional Field Devices”-leaflets.

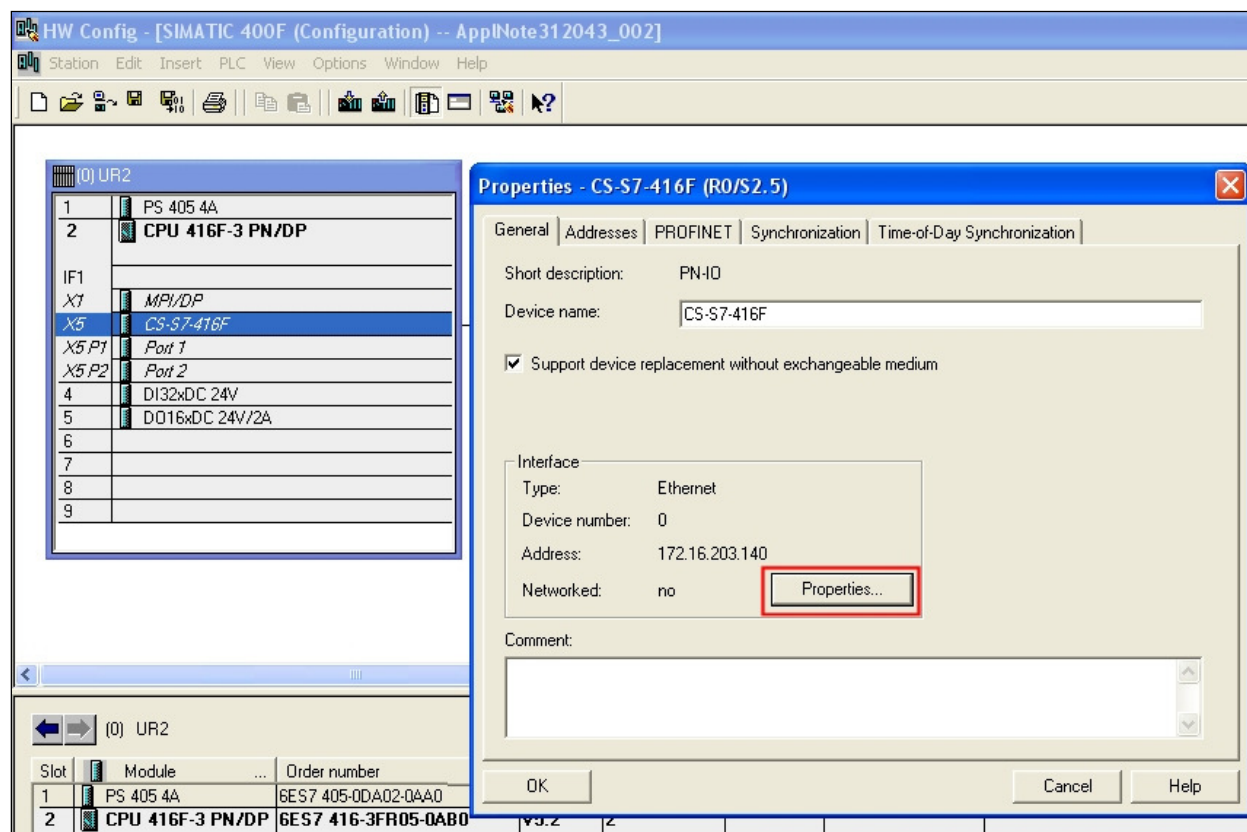


Fig. 25: S7 HW Config – Enable the S7-PROFINET I/O Controller Step 1

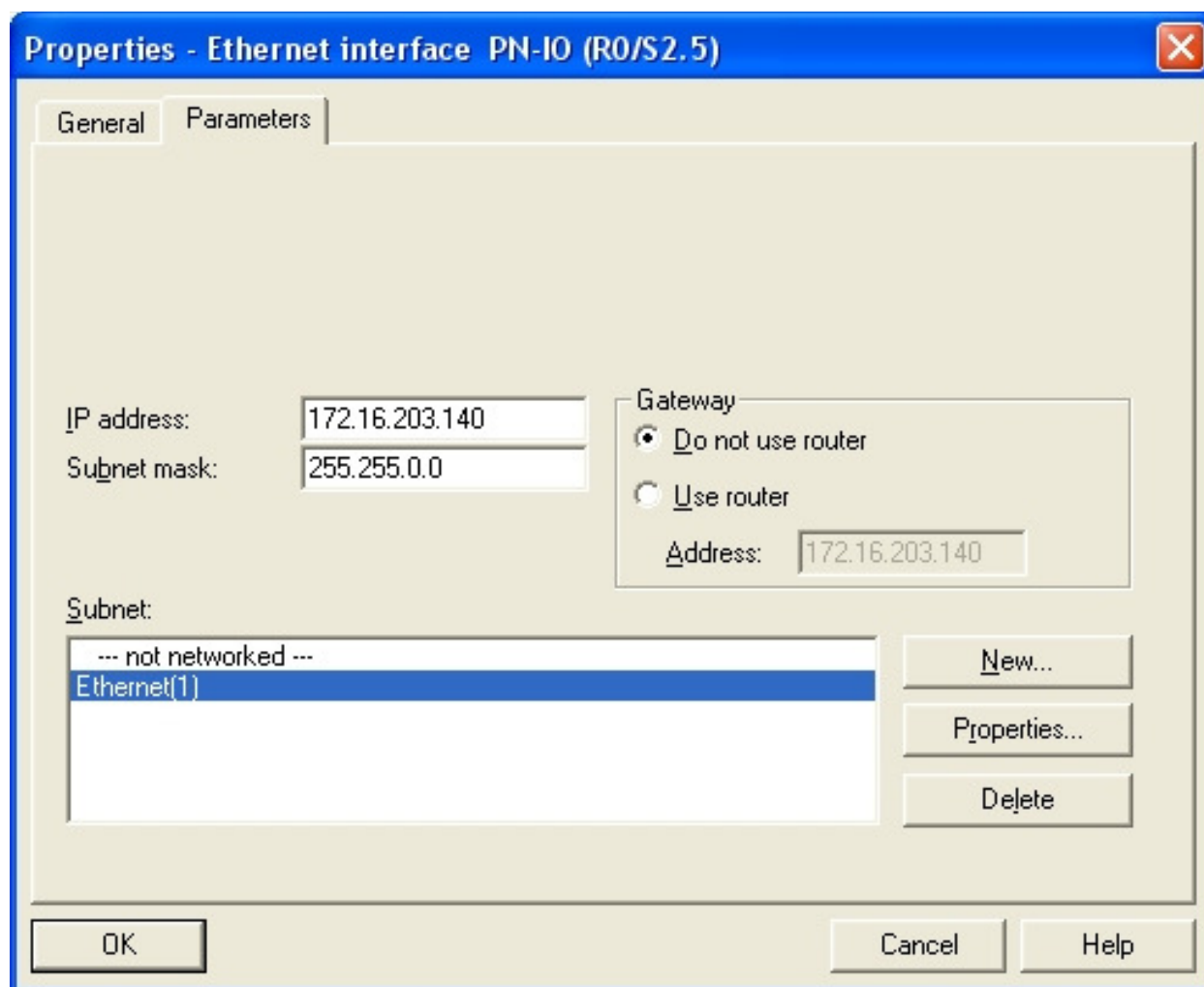


Fig. 26: S7 HW Config. – Enable the S7 PROFINET I/O Controller Step 2

- ▶ One can change the name of PROFINET-I/O-Controller. This name has to be assigned via Ethernet-Online (Edit Ethernet nodes).
- ▶ Note:
One can't use all kinds of characters (e.g. space " ") for the PN-IO Device name. See the Siemens manual please.

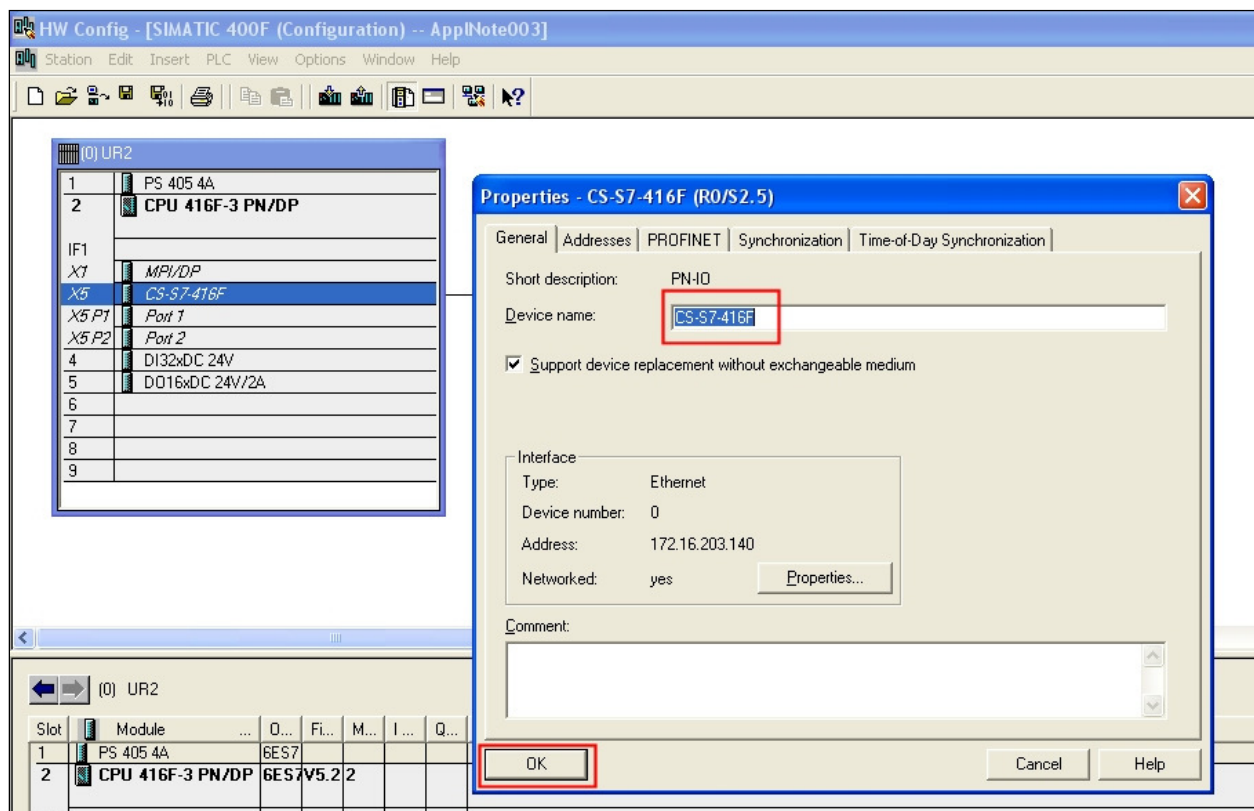


Fig. 27: S7 Hardware Configuration – Change PROFINET name of the PROFINET Controller

Note:

- ▶ Prepare or check your PC Ethernet Connection Settings
If the S7 PROFINET-I/O-Controller uses a default IP-Address, check
 - the IP-address and
 - subnet mask of the PG-PC please.
- ▶ A wrong setting would cause a failed assignment operation.

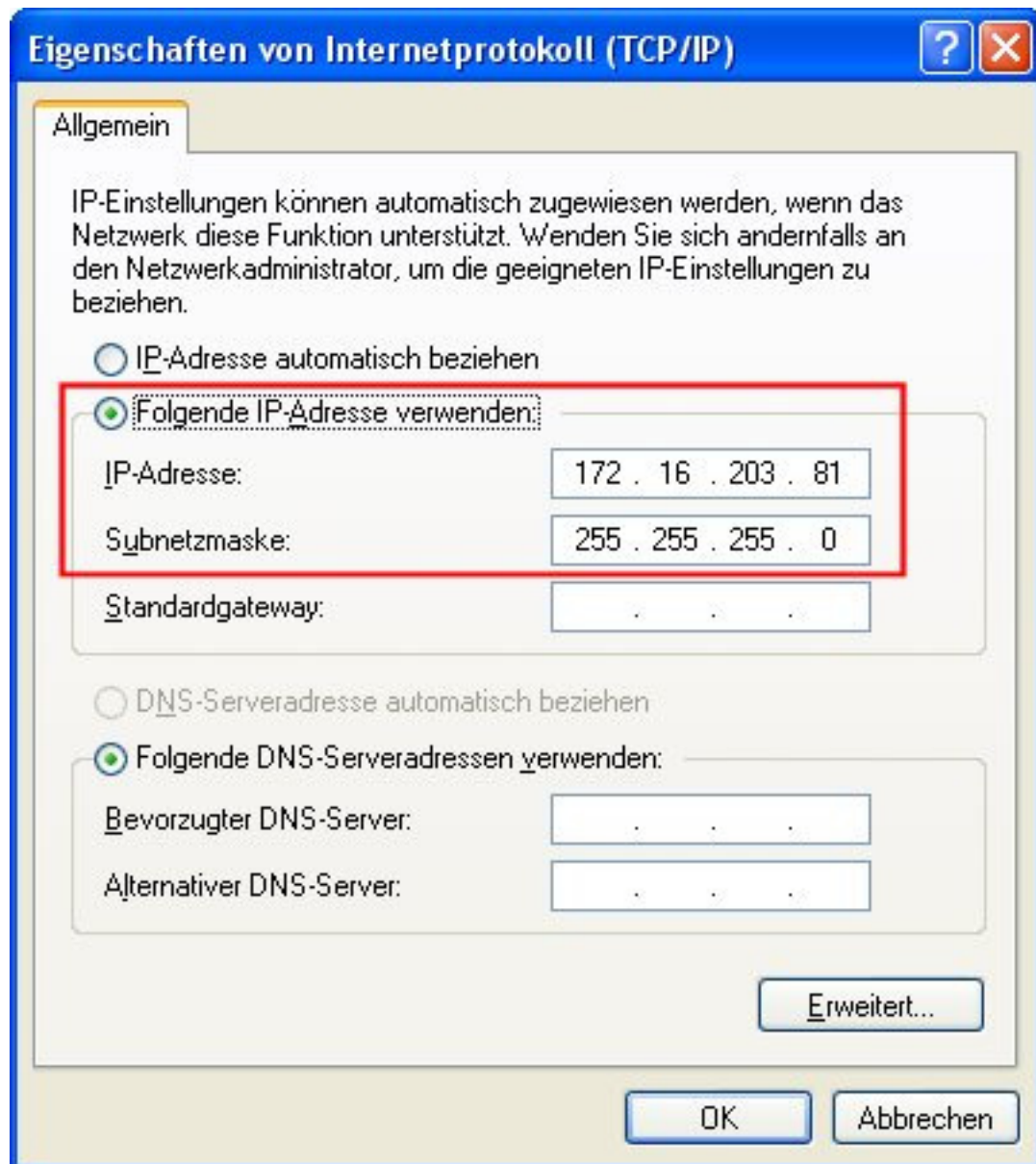


Fig. 28: Windows O/S – Check the Ethernet settings of the PG-PC

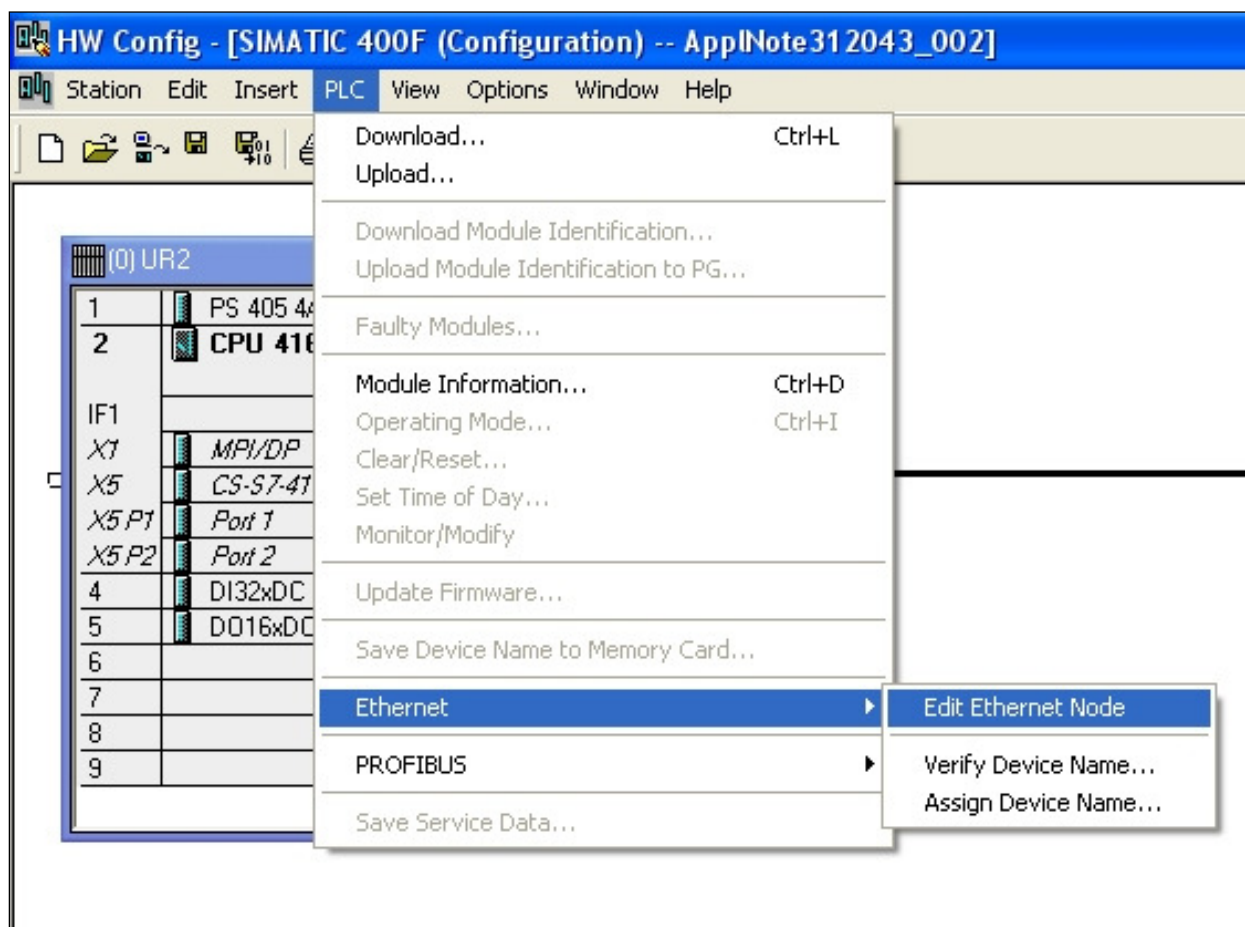


Fig. 29: Ethernet Edit Node

The image shows a software window titled "Edit Ethernet Node" with a standard Windows-style title bar (blue with a close button). The window is divided into several sections:

- Ethernet node**: Contains a "MAC address:" label and a text input field. To the right, under the heading "Nodes accessible online", is a "Browse..." button. This button is highlighted with a red rectangular box.
- Set IP configuration**: Contains two radio buttons: "Use IP parameters" (selected) and "Obtain IP address from a DHCP server".
 - Under "Use IP parameters", there are fields for "IP address:" and "Subnet mask:". To the right, under the heading "Gateway", are radio buttons for "Do not use router" (selected) and "Use router". Below "Use router" is an "Address:" field.
 - Under "Obtain IP address from a DHCP server", there is a section "Identified by" with three radio buttons: "Client ID" (selected), "MAC address", and "Device name". Below these is a "Client ID:" label and a long text input field.
- Assign device name**: Contains a "Device name:" label and a text input field. To the right is an "Assign Name" button.
- Reset to factory settings**: Contains a "Reset" button.

At the bottom of the window are two buttons: "Close" on the left and "Help" on the right.

Fig. 30: Ethernet Edit Node – Open Browse menu

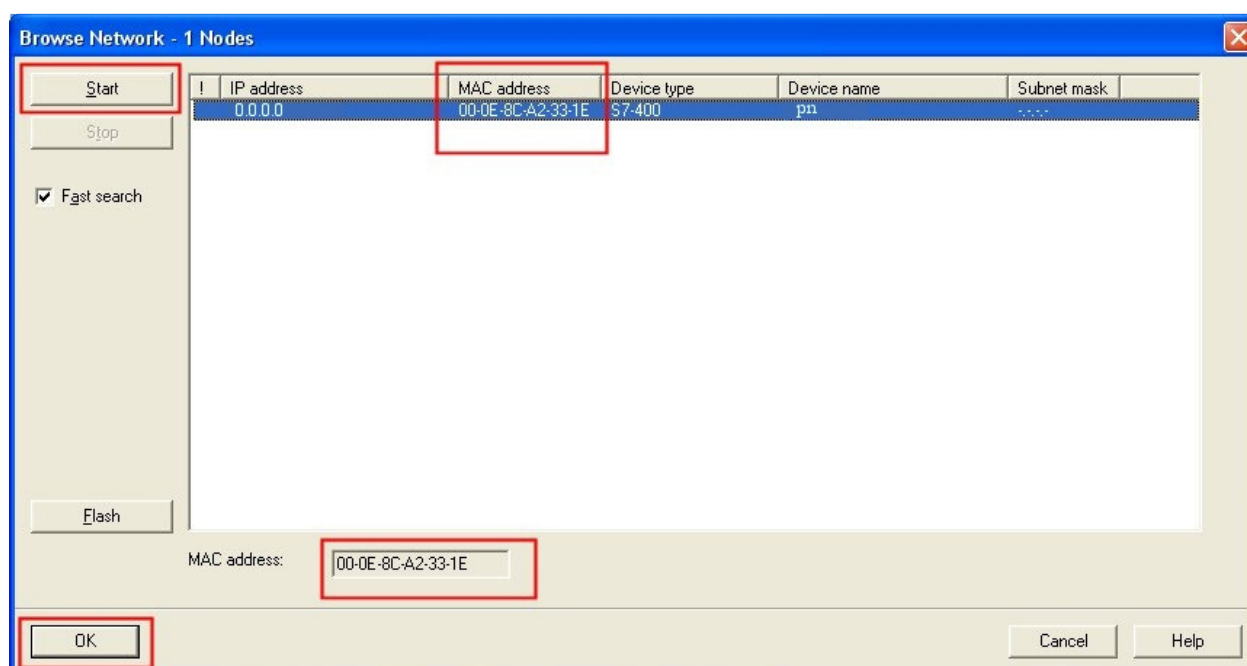


Fig. 31: Enable S7 F PROFINET Controller

Edit Ethernet Node

Ethernet node

MAC address: 00-0E-8C-A2-33-1E Nodes accessible online

Browse...

Set IP configuration

☒ Use IP parameters

IP address: 172.16.203.140 Gateway

Subnet mask: 255.255.0.0 ☒ Do not use router

☐ Use router

Address: 172.16.203.140

☐ Obtain IP address from a DHCP server

Identified by

☒ Client ID ☐ MAC address ☐ Device name

Client ID:

Assign IP Configuration Step 1

Assign device name

Device name: cs-s7-416f Assign Name

Step 2

Reset to factory settings

Reset

Close Help

Fig. 32: S7 HW-Config. – Assign the PROFINET- name to the S7 PN I/O-Controller

- Select the PLC and open the properties of the PLC:
 - Click at the tab “Protection”,
 - insert a new password and
 - enable the “CPU contains a safety program” too.

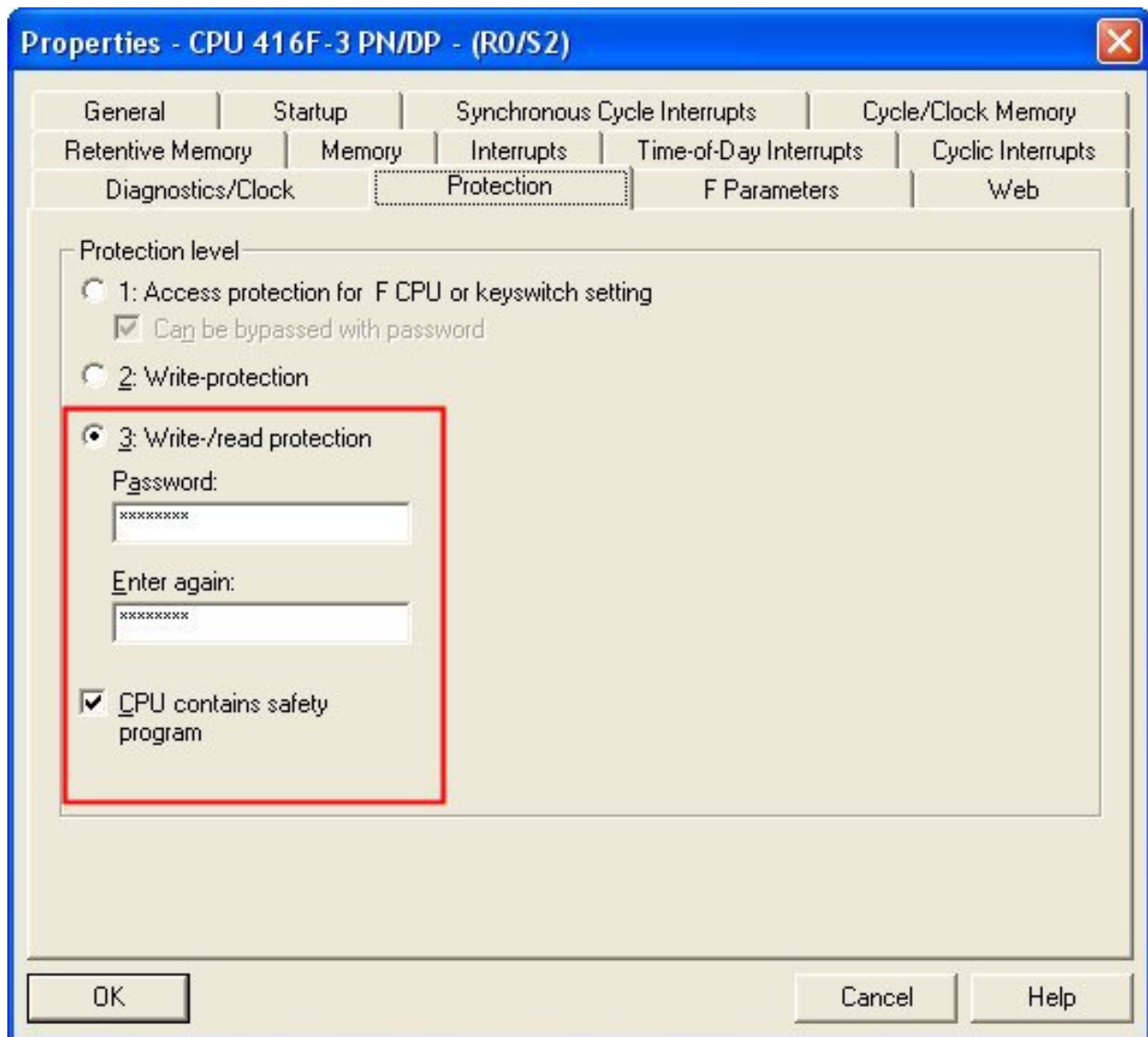


Fig. 33: S7 HW Config. – Insert or change the Failsafe password

At the register "F-parameter" one are able to change settings for the Failsafe program. One can change or use the default-address (2000) of the S7-i/O-Controller. It is not necessary to change the default values.

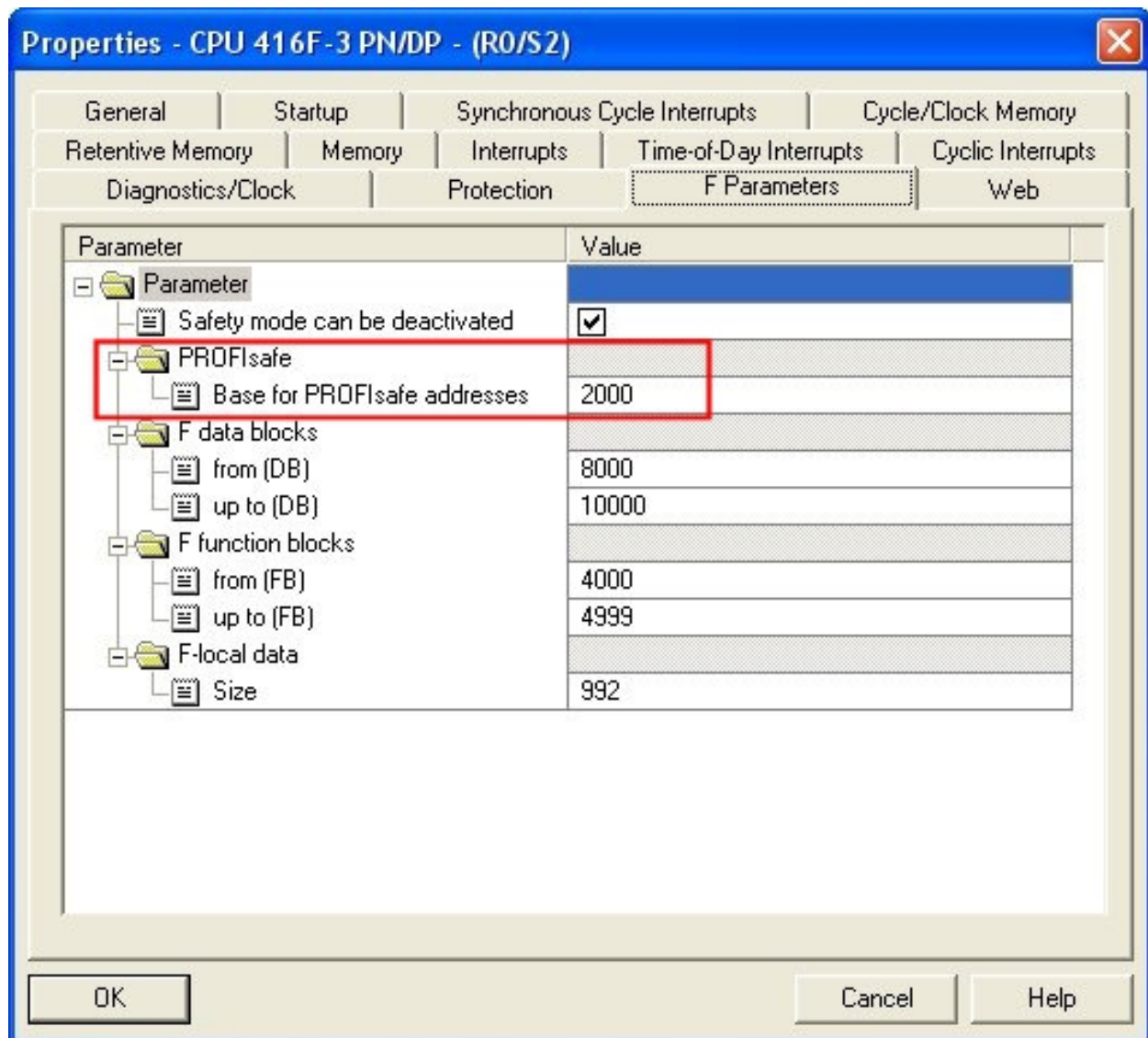


Fig. 34: S7 HW Config. – Failsafe parameters of the S7-I/O Controller

► Note:

This "Application Note" uses NOT the cyclic interrupt OB35 for calling the Failsafe program.
The Failsafe program will be called by the cyclic OB1.

8. PSSu H F PN- IP-Adress and PROFINET Name Assignment

The next working steps:

- ▶ Siemens S7 Hardware Configurator:
IP-Address and PROFINET-Name-Assignment of the PSSu H PN-Systems
- ▶ Siemens S7 Hardware Configurator:
Configure the hardware registry of each PSSu H PN-System
- ▶ PSSu Configurator:
Download of the PSSu FS- & ST-Configuration to the PSSu memory and Chip-Card
- ▶ Siemens S7 Hardware Configurator:
Compile and download the Step 7 Hardware Configuration

IP-Address and PROFINET Assignment of the PSSu H F PN-System

8.1. Insert a new PSSu H PN-Device

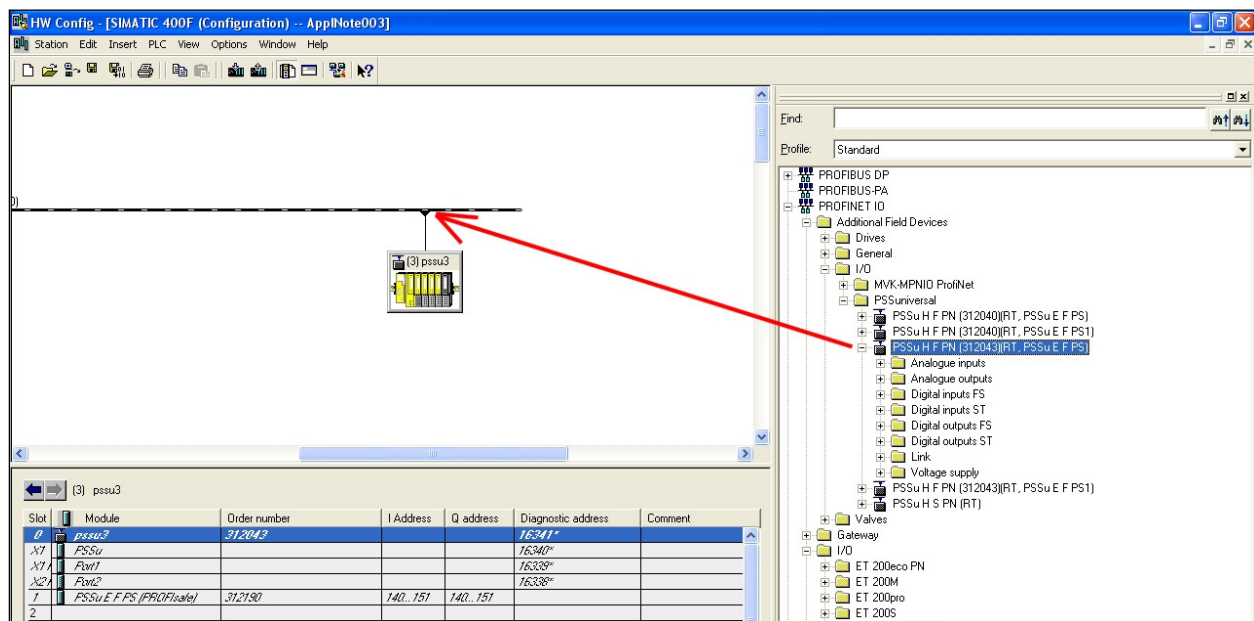


Fig. 35: S7 HW Config. – Insert a new PSSu-System

8.2. Edit the PSSu H PROFINET Name

Enable the PSSu properties dialog and insert a individual PN-I/O name. Like the S7 PROFINET I/O Controller name the PSSu PN-I/O name has to be assigned too.

Properties - pssu3

General

Short description: PSSuniversal
PSSu H F PN (312043)(RT, PSSu E F PS)

Order No. / Firmware: 312043 / 1.0
Family: PSSuniversal

Device name: pssu3

GSD file: GSDML-V2.1-Pilz-PSSuniversal-20091030.xml
Change Release Number...

Node in PROFINET IO System

Device number: 3 PROFINET-ID-System (100)

IP address: 172.16.203.152 Ethernet...

☒ Assign IP address via IO controller

Comment:

OK Cancel Help

Fig. 36: Rename the default PSSu H PROFINET name from "PSSuniversal" to "pssu3"

- In this Dialog you will get the target PSSu IP-Address (172.16.203.152, managed by the PROFINET controller later).

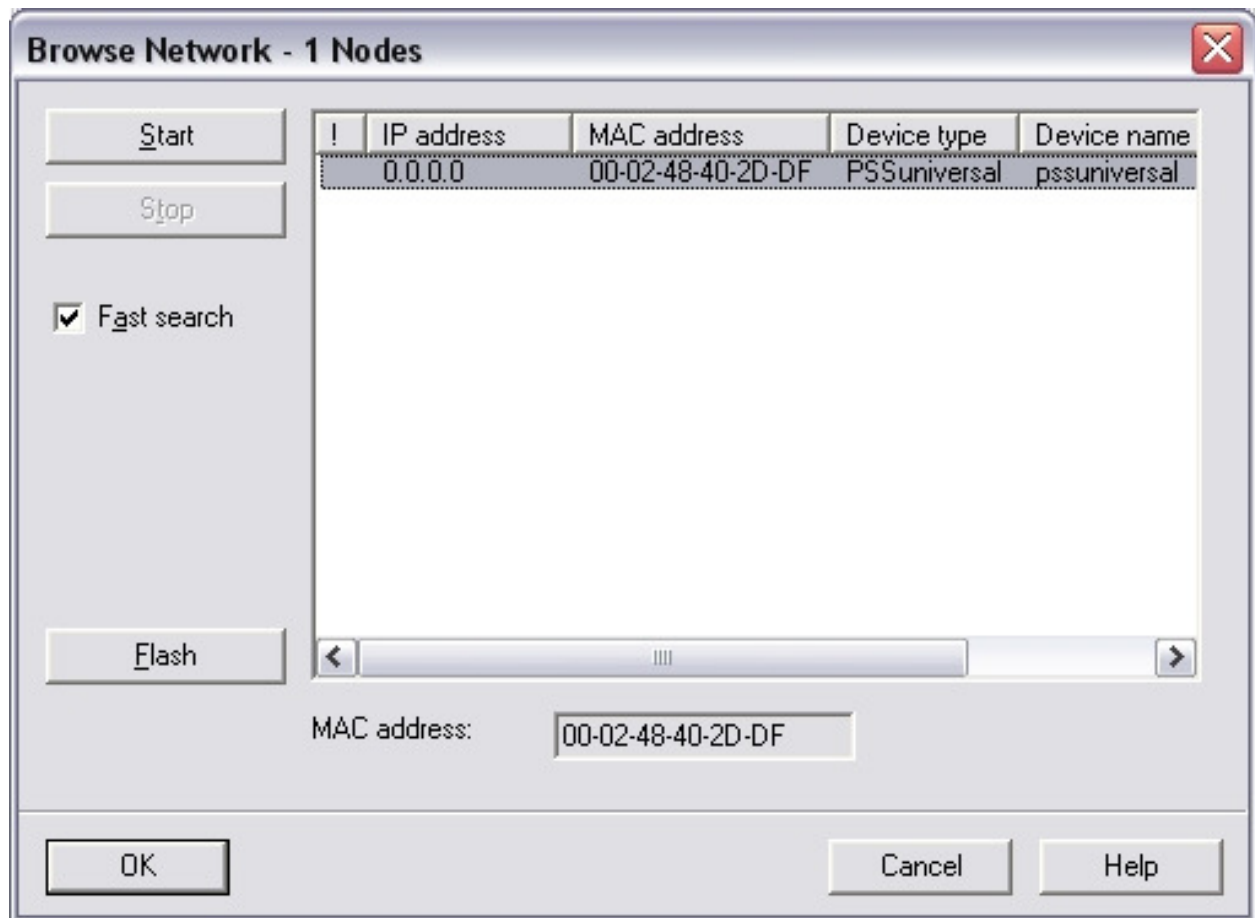


Fig. 37: S7 HW Config. – Broadcast search, use "Flash" for identification on demand

Note:

- ▶ The PROFINET-S7 I/O Controller will assign the IP-Addresses in this application.
- ▶ Since PROFINET specification V2.2 the persistence of the IP-Address will be controlled by the PROFINET I/O Controller. The IP-Address is set to "not remanent" on default. This means after Power off/on the IP-Address is reseted to 0.0.0.0 by the PSSu-Firmware and will be set to the PLC-project address by the PROFINET I/O Controller later.

Edit Ethernet Node

Ethernet node

MAC address: 00-02-48-40-2D-DF Browse...

Nodes accessible online

Set IP configuration

☒ Use IP parameters

IP address: 172.16.203.152

Subnet mask: 255.255.0.0

Gateway

☒ Do not use router

☐ Use router

Address: 172.16.203.152

☐ Obtain IP address from a DHCP server

Identified by

☒ Client ID ☐ MAC address ☐ Device name

Client ID:

Assign IP Configuration **Step 1**

Assign device name

Device name: pssu3 Assign Name

Step 2

Reset to factory settings

Reset

Close Help

Fig. 38: Set the IP-Address and the PSSu H PROFINET name

► Note:

One has to assign the PROFINET name "pssu3" only. The IP-Address-Assignment is needed to enable a PSSu download without a S7F-PLC restart.

- After the PSSu Head module is enabled, add the PSSu I/O Modules to the S7-Configuration.

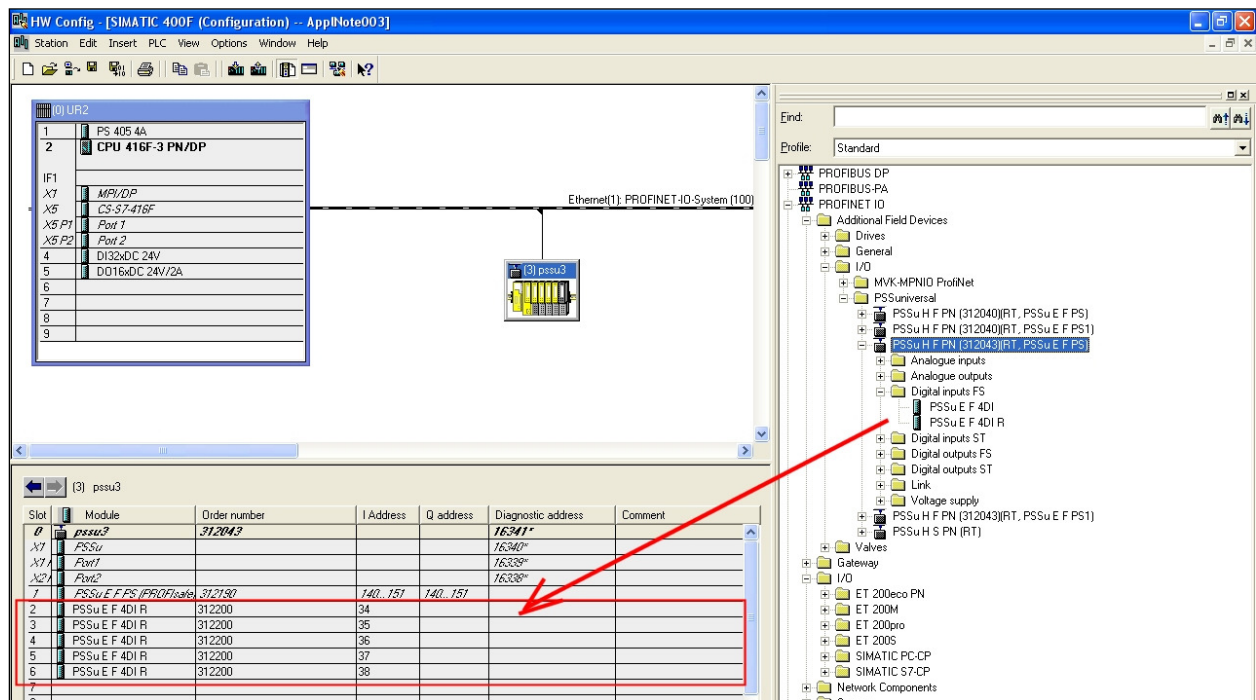


Fig. 39: S7 HW Config. – Insert the PSSu Standard & Failsafe Electronic Modules

- Check the physical PSSu-hardware and drag & drop the needed Electronic Modules to PSSu Hardware Registry.

8.3. Change the default configuration of the PSSu H PN-System

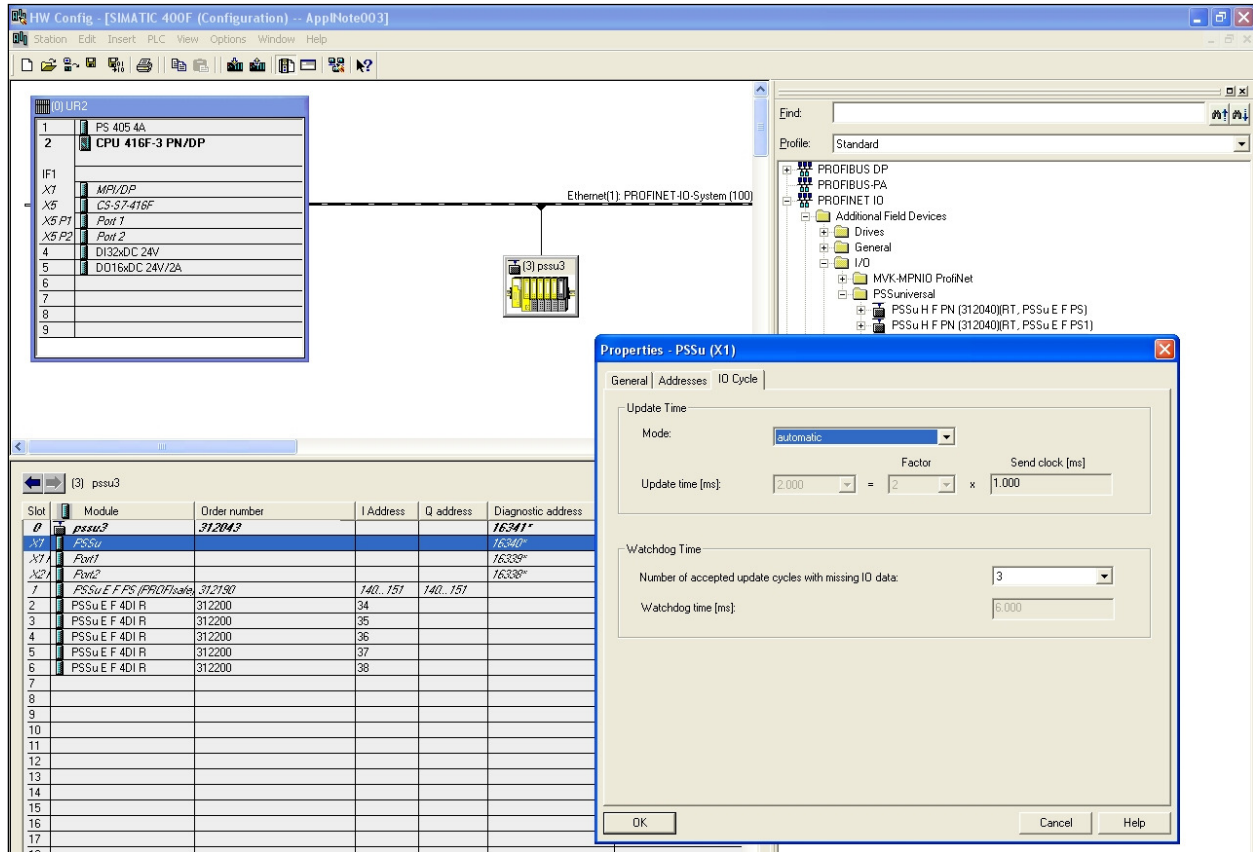


Fig. 40: S7 HW Config. – Change the PSSu “Update Time” on application demand (View 1)

► Note:

This dialog has been modified in Siemens Step 7 V5.4 SP5. The Combo box “Automatic” is a new feature.

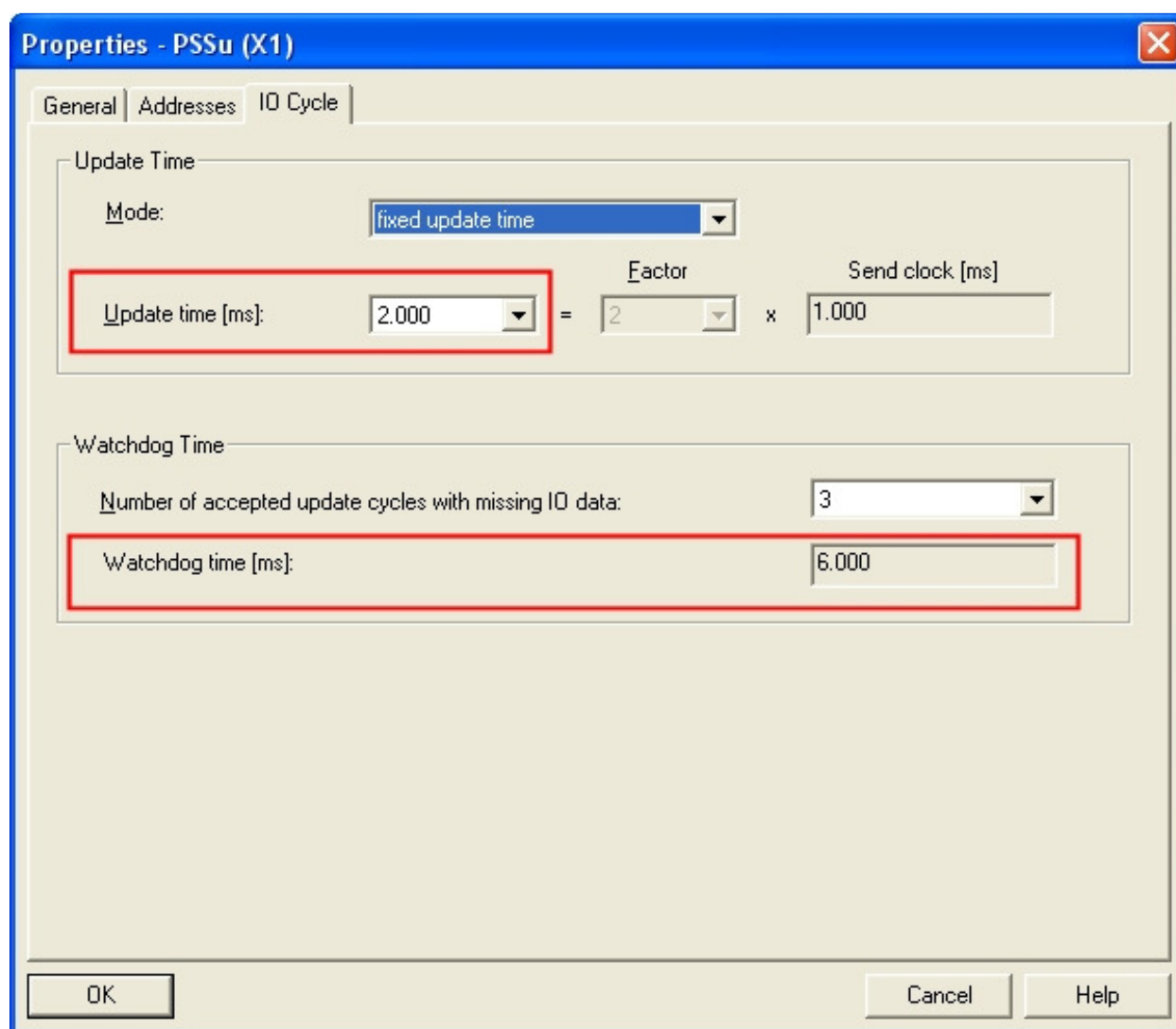


Fig. 41: S7 HW Config. – Change the PSSu- “Update Time” (View 2)

- Change the “Properties” of PSSu Head Module (“Watchdog Time”) an application demand

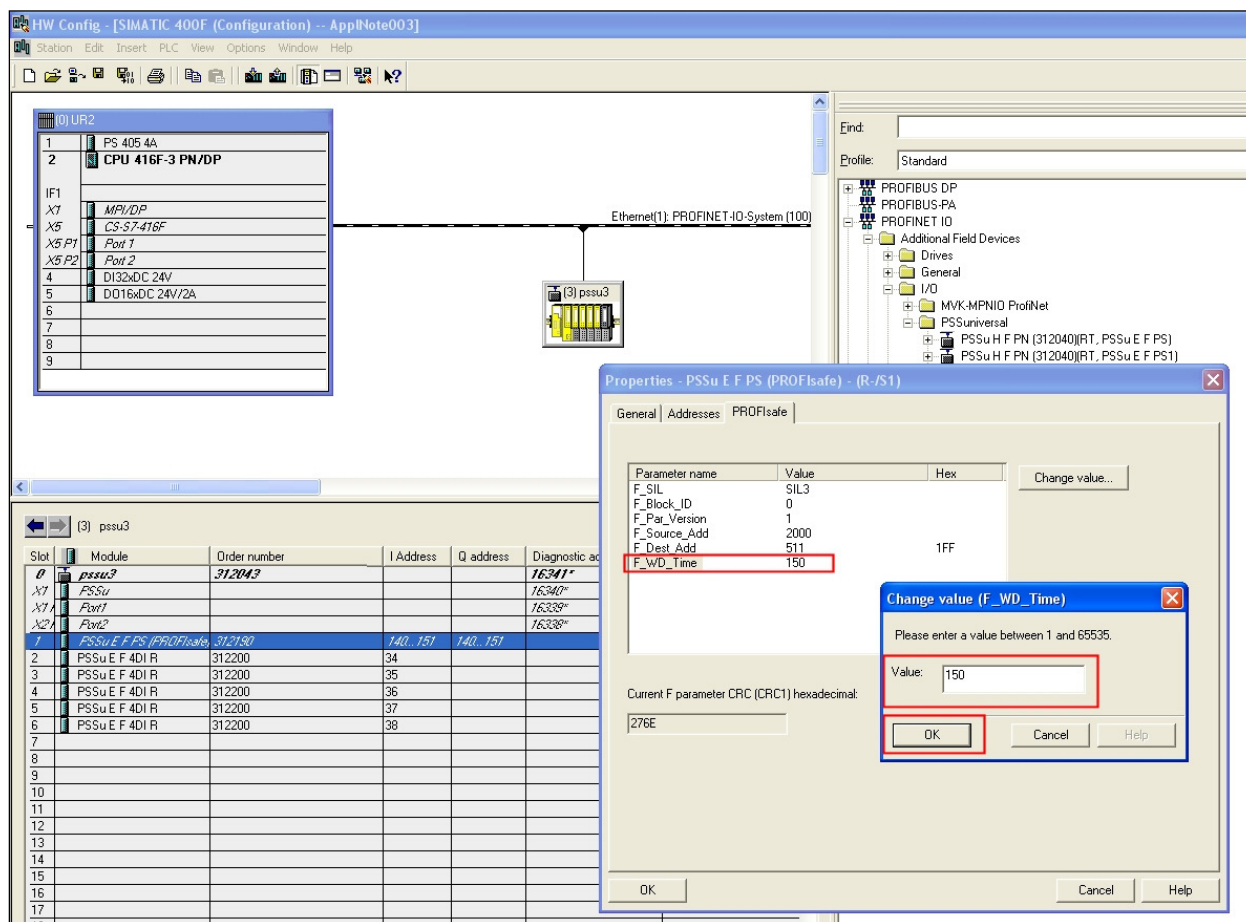


Fig. 42: S7 HW Config – Change PSSu-“Watchdog Time”

- The “F-ADDRESS” are binary coded and permitted in the e range 1D..511D.
A PSSu H PN station address is set via a combination of the relevant binary coded switches:

“F-ADDRESS” DIP switch	Key		Example
	OFF	ON	
Switch designation			Station address 52 _D
256	0	256 _D	
128	0	128 _D	
64	0	64 _D	
32	0	32 _D	
16	0	16 _D	
8	0	8 _D	
4	0	4 _D	
2	0	2 _D	
1	0	1 _D	

Fig. 43: PSSu H F PN – Unique DIP switch setting PROFINET-Failsafe-Address

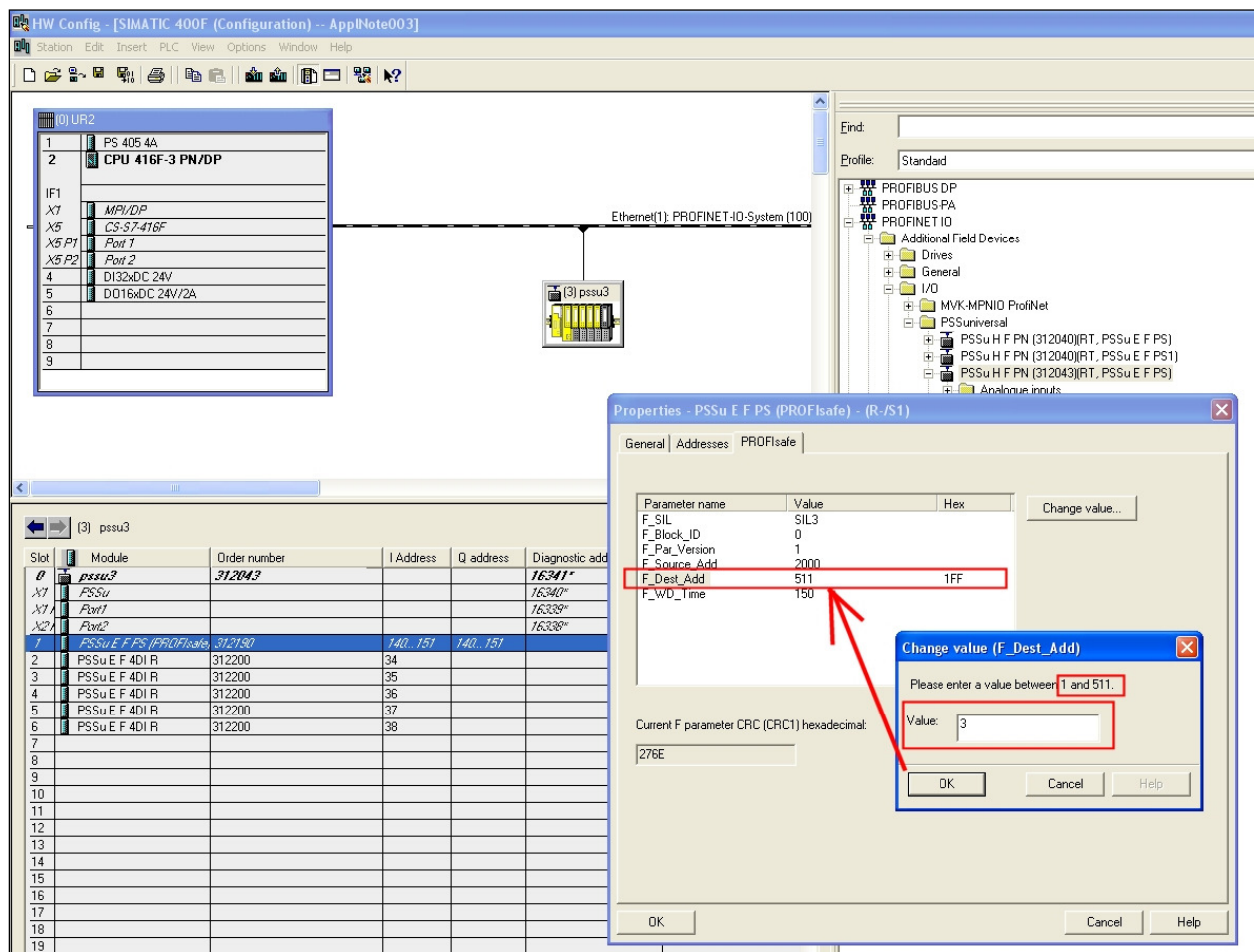


Fig. 44: S7 HW Config – Change PROFINET-Failsafe-Address

Note:

- ▶ The Failsafe-address in the S7-hardware (“F_Dest_Add”) and the PSSu-DIP switch position (“F-ADDRESS”) have to be equal.
- ▶ It is not necessary to reboot the PSSu System. The change of the address is recognized immediately.
But if there are problems, the PSSu system should again be completely initialized by a Reboot (switch power supply off/on)

- Configure the other PSSu-Systems in the same way. Finally I configured the PSSu System “pssu-hello-world”.

The screenshot shows the SIMATIC Manager HW Config interface. At the top, a network diagram shows five PSSu modules connected to an Ethernet(1) PROFINET IO-System (100). The modules are labeled (1) pssu1, (2) pssu2, (3) pssu3, (4) pssu4, and (5) pssu-hello-world. Below the diagram, a table lists the modules and their addresses.

Slot	Module	Order number	I Address	Q address	Diagnostic address
0	pssu-hello-world	312043			16328*
1	PSSu				16329*
2	PSSu E F PS1 (PROFINET)	312191	55..66	55..66	16328*
3	PSSu E F 4DO 0.5	312210			16324*
4	PSSu E F 4DO 0.5	312210			16323*
5	PSSu E F 4DI	312200			16322*
6	PSSu E F 4DI	312200			16321*
7	PSSu E F DI 0Z 2	312220			16320*
8	PSSu E S 4DO 0.5	312405		8	16319*
9	PSSu E S 4DO 0.5	312405		9	
10	PSSu E S 4DI	312400	67		
11	PSSu E S 4DI	312400	68		

The 'Properties - pssu-hello-world' dialog box is open, showing the following information:

- Short description: PSSuniversal
- Order No. / Firmware: 312043 / 1.0
- Family: PSSuniversal
- Device name: pssu-hello-world
- GSD file: GSDML-V2.1-Pilz-PSSuniversal-20091030.xml
- Node in PROFINET IO System: Device number: 5, IP address: 172.16.203.154

Fig. 45: PSSu-System „pssu-hello-world“

9. Configuration of PSSu Failsafe System

9.1. Start the PSSu Configurator via the S7 Hardware Manager

The PSSu Configurator is a plug-in of the S7-Hardware Manager. This means, one have to start it from the S7-Hardware-Manager.

► Note:

If one are using a chip card, the PSSu Cconfiguration data would be stored a this persistent memory. It is possible to exchange ready configured PSSu system memory to a spare PSSu head without using the Siemens-PG.

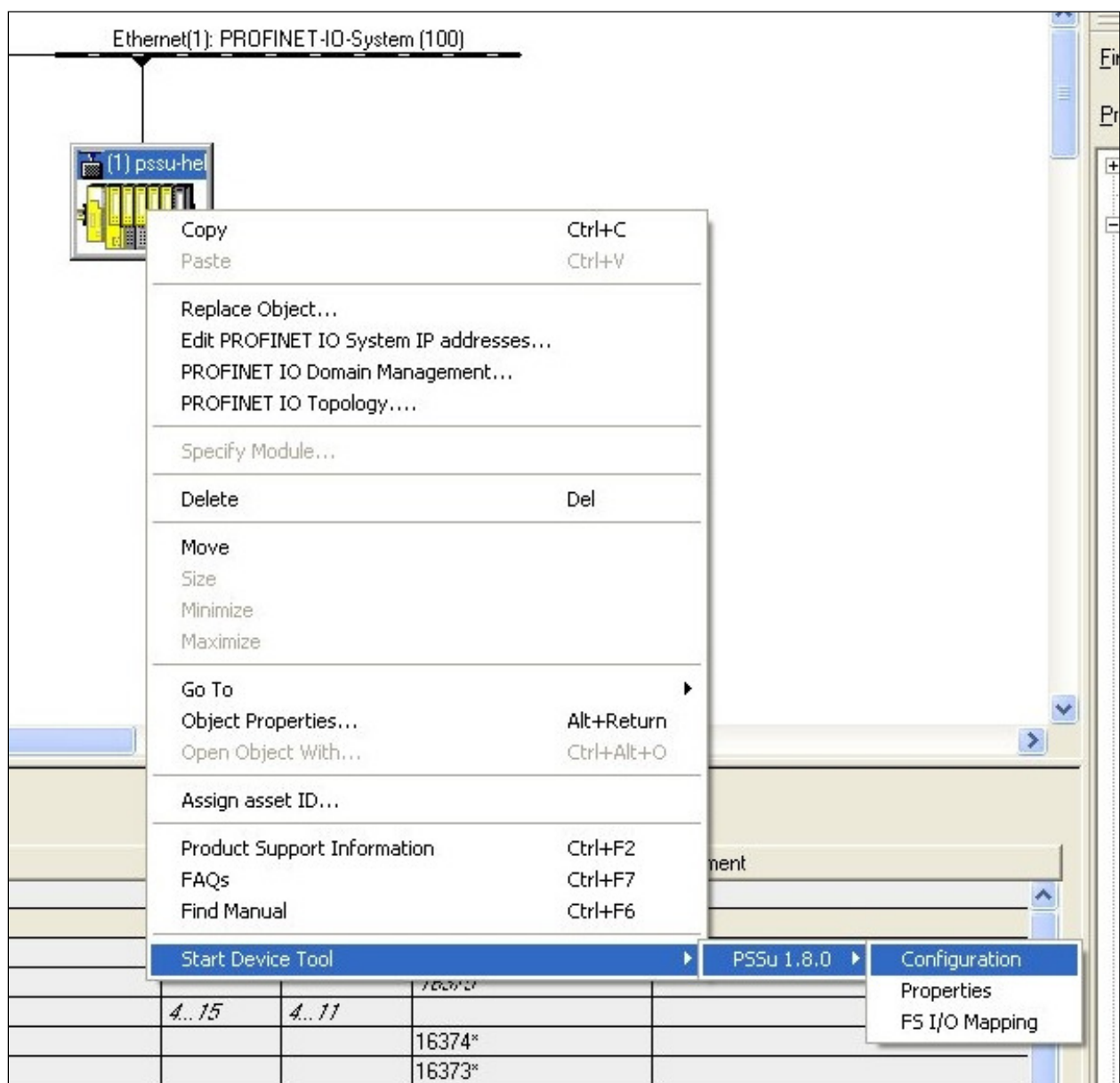


Fig. 46: S7 HW Config – Start PSSu Configurator for Failsafe-configurations

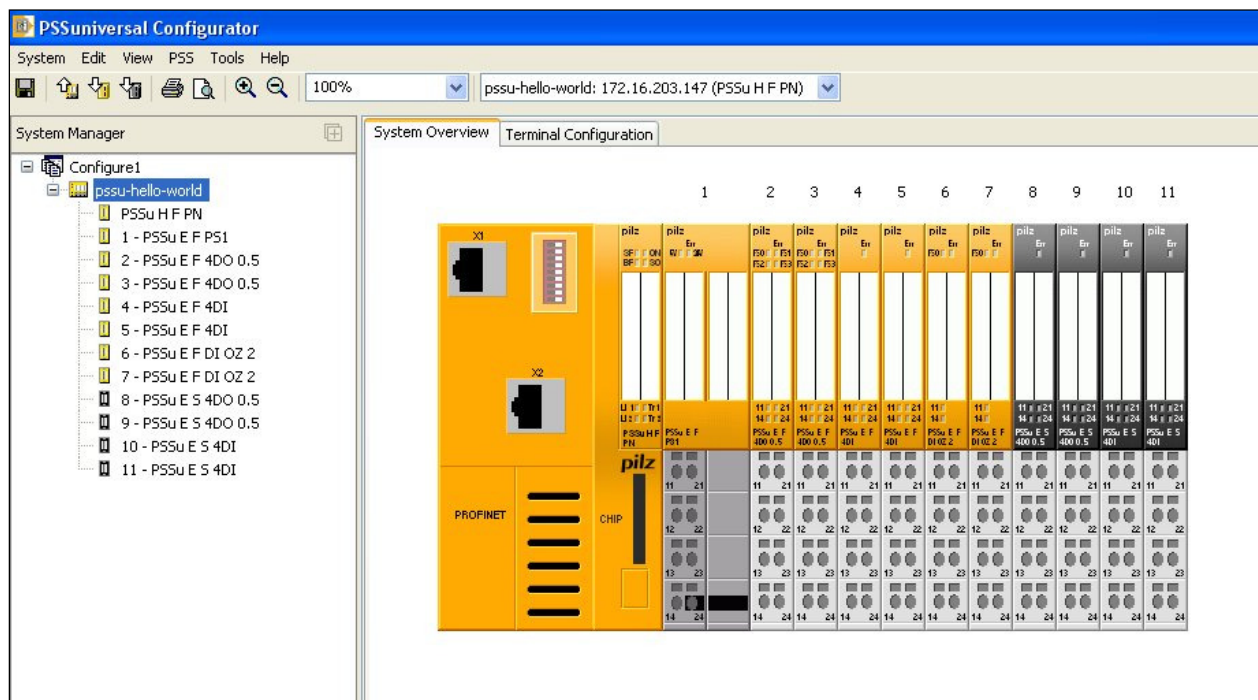


Fig. 47: PSSu Configurator – Overview of implemented Electronic Modules

9.2. Configuration of PSSu system

First start configuration of Failsafe part of PSSu system:

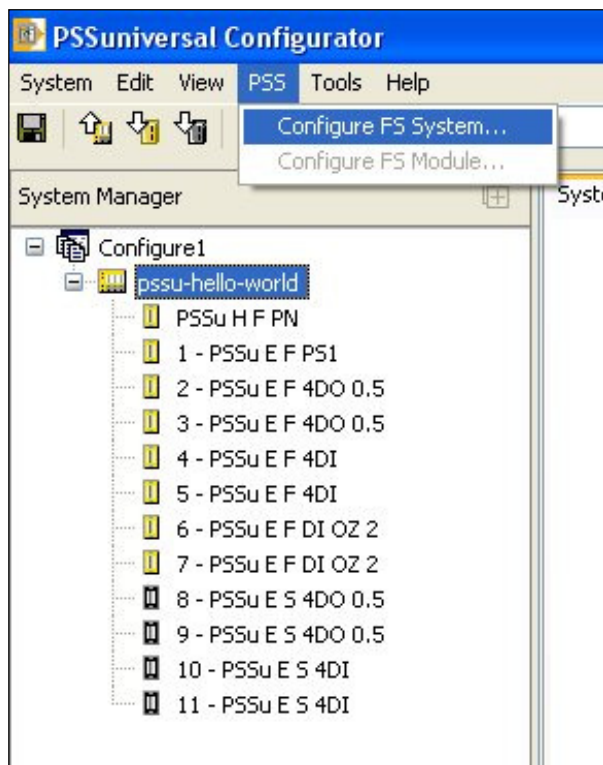


Fig. 48: PSSu Configurator – Start the PSSu Failsafe-configuration

- Enable the dual channel functionality, and get the PSSu clamp information

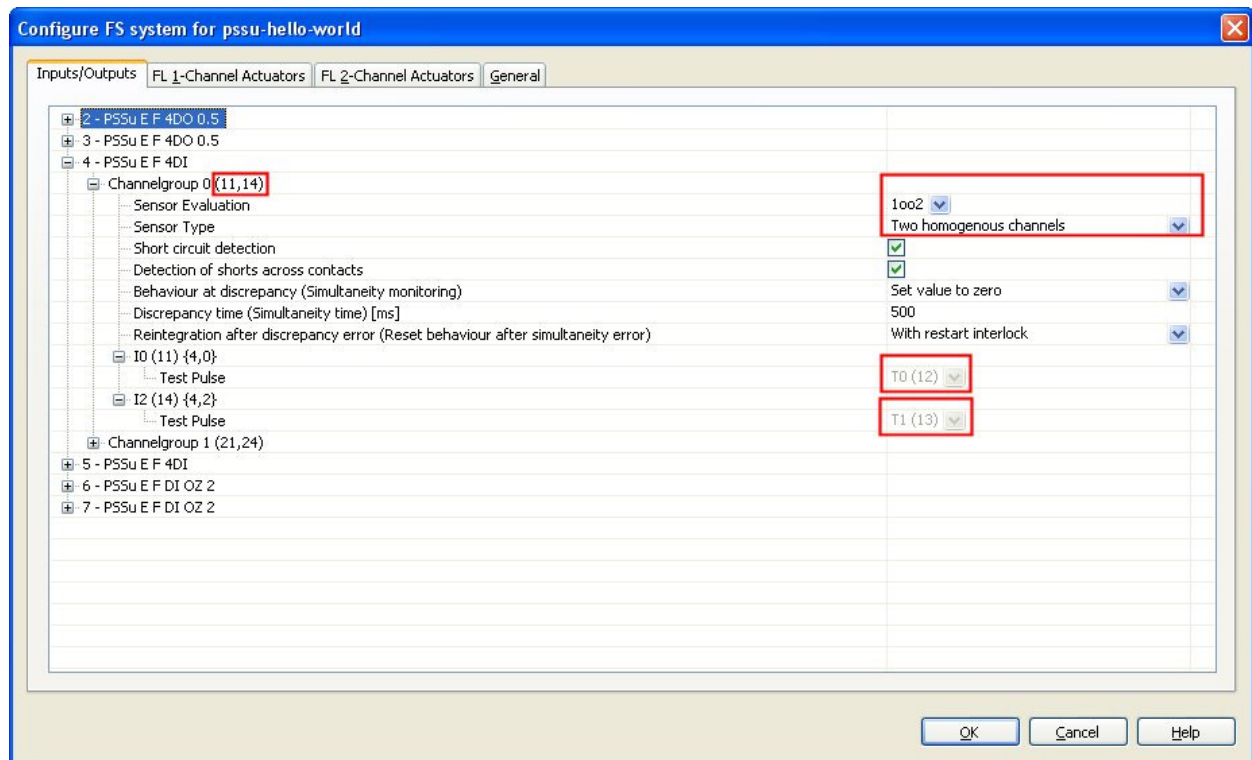


Fig. 49: PSSu Configurator – Enable the dual channel functionality

- Check the wiring especially the used clamps of electrical circuits please. “1 out of 2” means, that one get only one Process Image of Input flag in the PLC-Code.
- Troubleshooting note:
If one want to check the E-Stop configuration, one have to look at these settings and the FB215 E-STOP parameters in the Failsafe-program too.

9.3. Download configuration to PSS and Simatic system

- Download the Failsafe configuration data to the PSSu device:

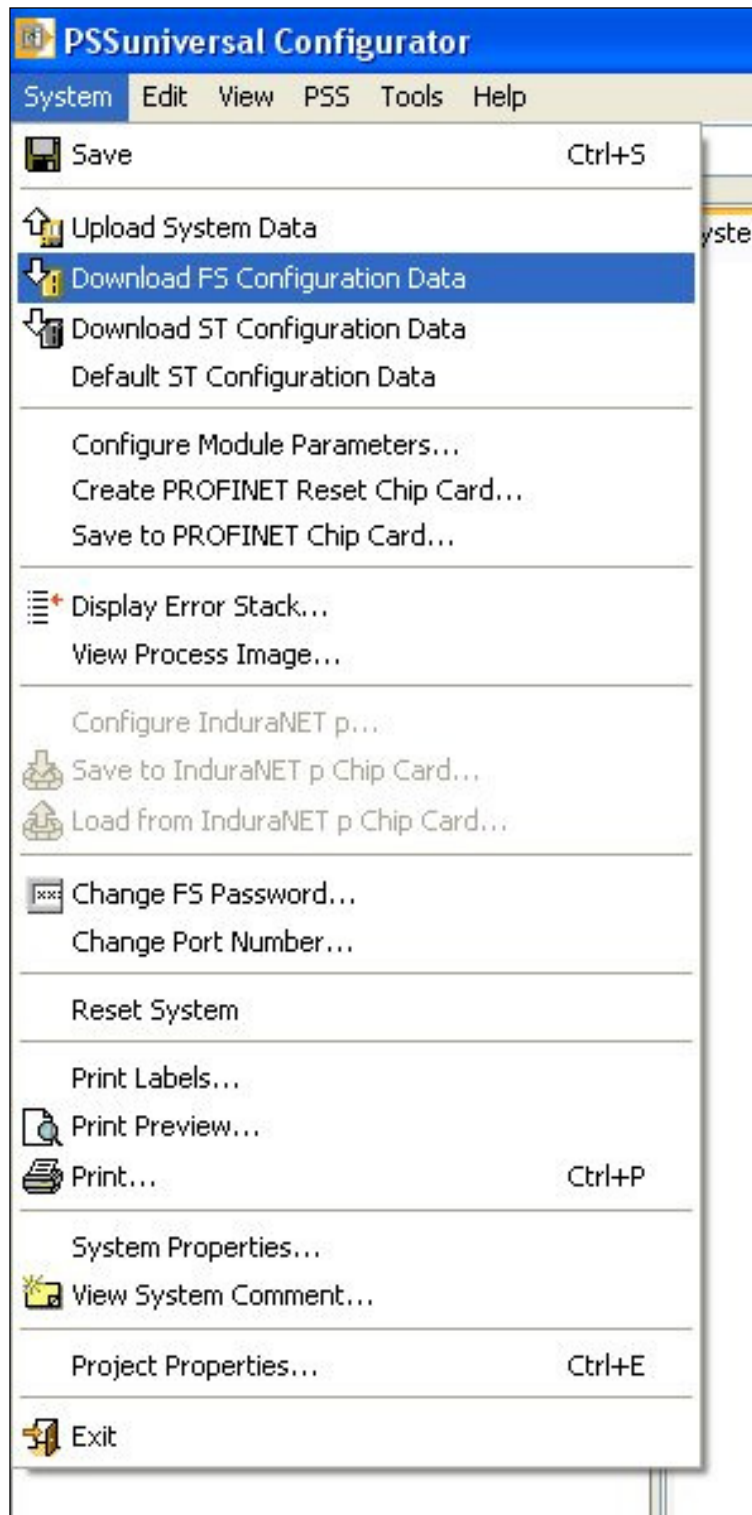


Fig. 50: PSSu Configurator – Download the Failsafe configuration to the PSSu device

Notes:

- ▶ One have to download the Failsafe-part too, if one are using:
 - a PSSu H **F** PN-System with Standard Electric Modules only.
 - a PSSu H **S** PN-head in version smaller than V2.0
- ▶ One can change the Default password of the PSSu-System via the menu System: Change the Failsafe-password in the PSSu Configurator.



Fig. 51: PSSu Configurator – Insert the PSSu-Password (default “pssu”)



Fig. 52: PSSu Configurator – The download was successfully.

- ▶ Download the Standard configuration to the PSSu device

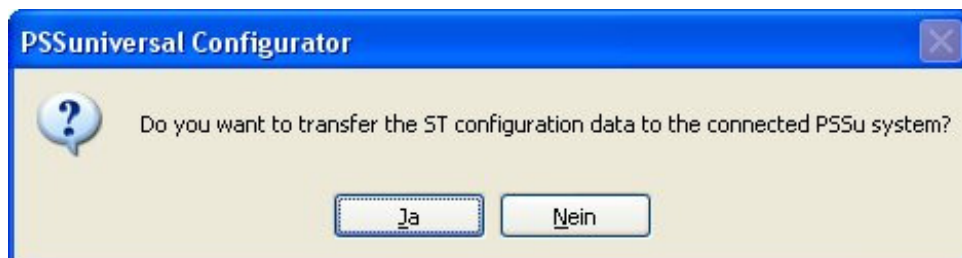


Fig. 53: PSSu Configurator – Download the Standard configuration o the PSSu device too.

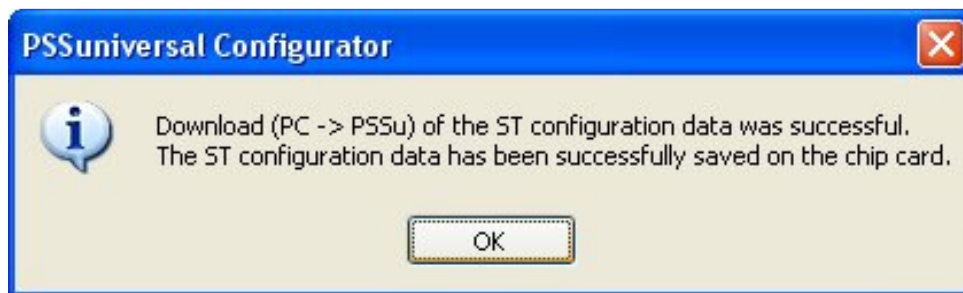


Fig. 54: PSSu Configurator – Standard download is finished.

- The “Save and Compile”-operation will close the hardware configuration work.

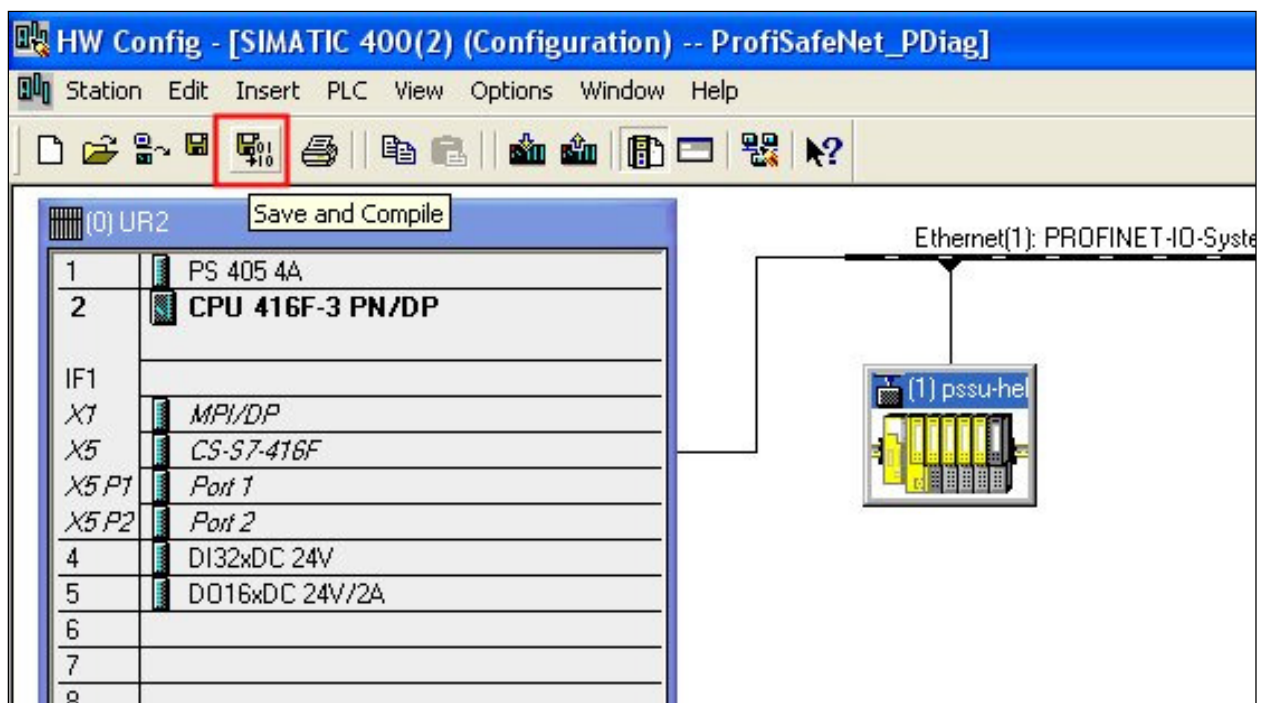
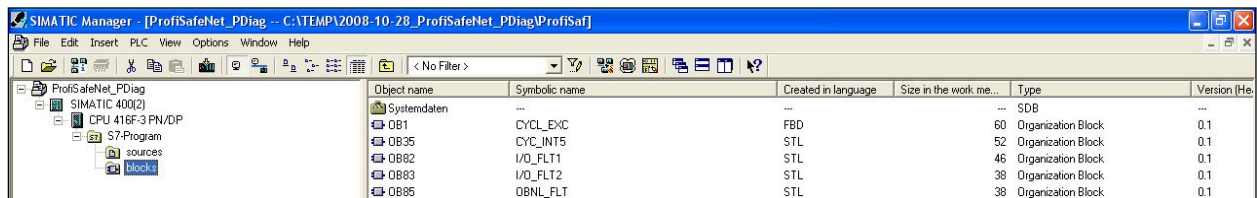


Fig. 55: S7 HW Config. – Save and compile S7 hardware configuration

10. Siemens Step 7 program

10.1. Create the Organisation blocks



Object name	Symbolic name	Created in language	Size in the work me...	Type	Version (He...
Systemdaten	...	...	...	SDB	...
OB1	CYCL_EXC	FBD	60	Organization Block	0.1
OB35	CYCL_INT5	STL	52	Organization Block	0.1
OB82	I/O_FLT1	STL	46	Organization Block	0.1
OB83	I/O_FLT2	STL	38	Organization Block	0.1
OB85	OBNL_FLT	STL	38	Organization Block	0.1

Fig. 56: Simatic Manager – Failsafe OB35 and “Error-Obs”

► Note:

Without the “Error-OBs” the PLC would change to STOP mode in case of a system error (e.g. physical missing of a configured PSSu device).

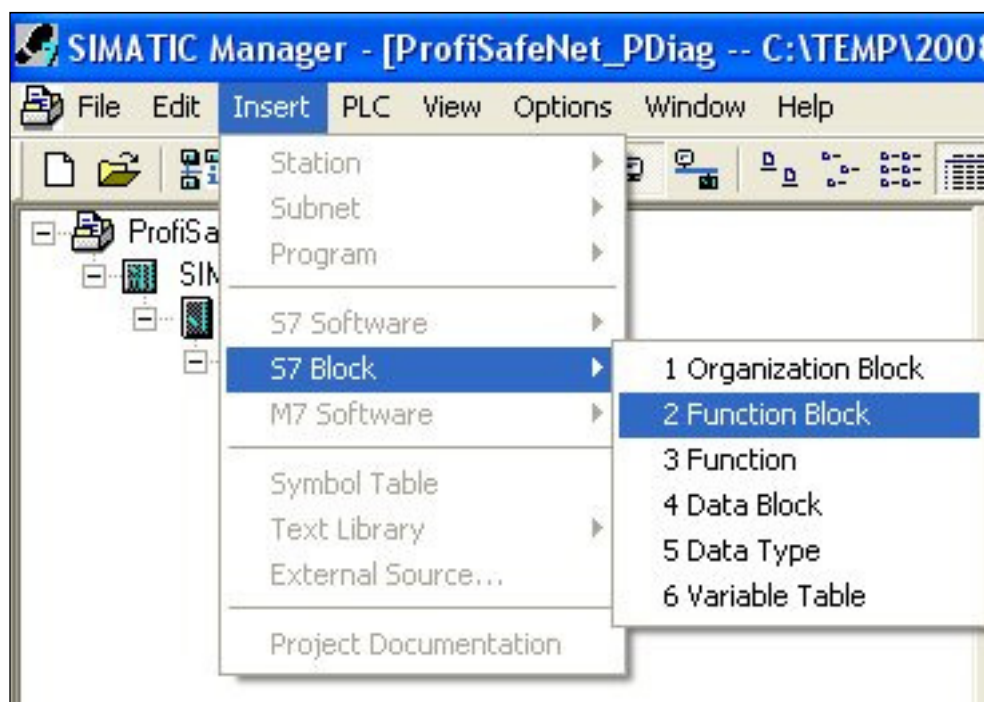


Fig. 57: Simatic-Manager – Create a new Function block (Part 1)

- Set the properties of Function block:

Properties - Function Block

General - Part 1 | General - Part 2 | Calls | Attributes

Name: ☒ Mul. Inst. Cap.

Symbolic Name:

Symbol Comment:

Created in Language: F-FBD ▼

Project path:

Storage location of project:

	Code	Interface
Date created:	03/19/2009 05:45:18 PM	
Last modified:	03/19/2009 05:45:18 PM	03/19/2009 05:45:18 PM

Comment:

OK Cancel Help

Fig. 58: Simatic Manager – Create a new Function block (Part 2)

In this “Application Note” the FB1 will take the functionality like a “Cyclic user Failsafe Organisation Block”. The FC1 will be the “FS-Master configuration block” that include the Function block and assigned instance data blocks.

The cyclic interrupt OB35 will call the Failsafe-program

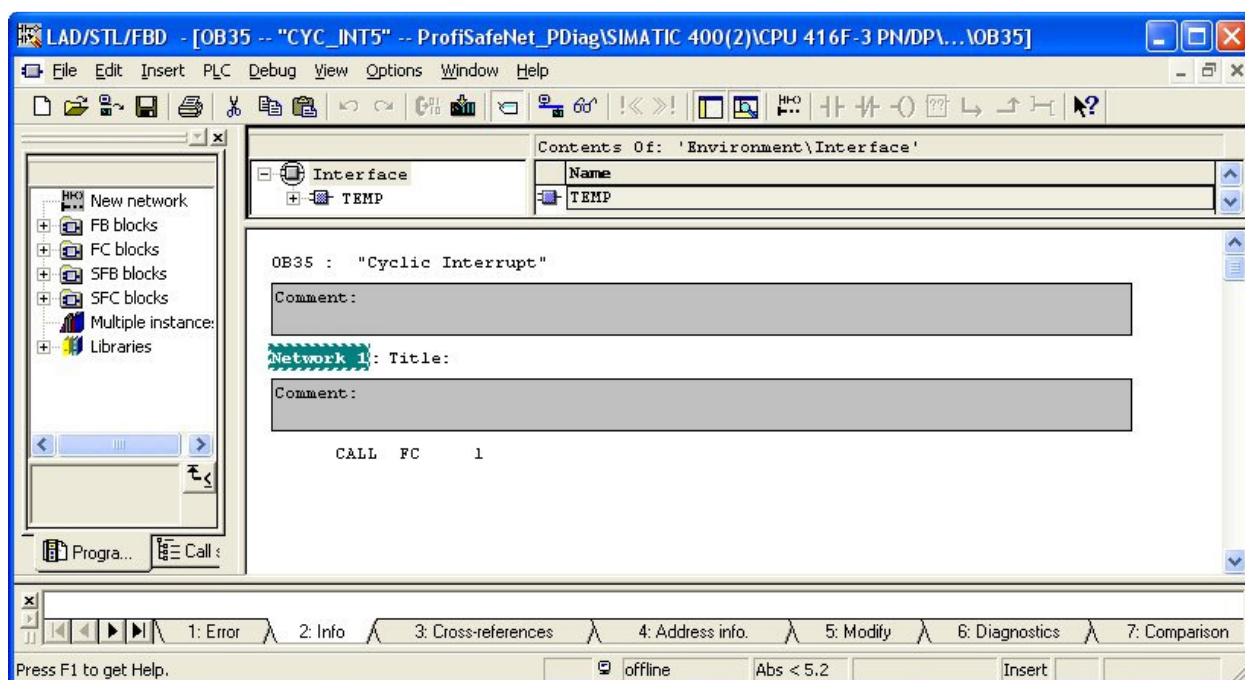


Fig. 59: Simatic Program Editor – Call the Failsafe function block

10.2. Create and open FC1

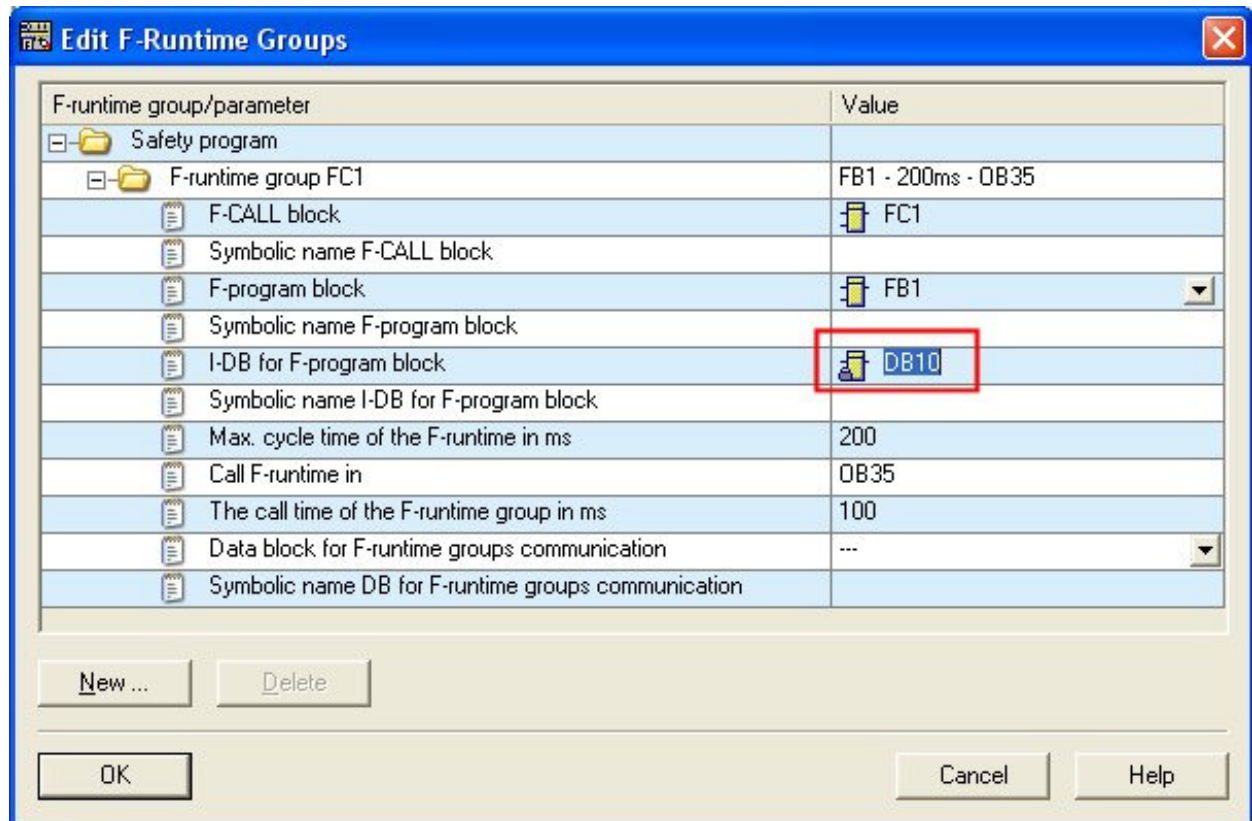


Fig. 60: Simatic Program Editor – Assign the Failsafe program block

- Change the F-program block.

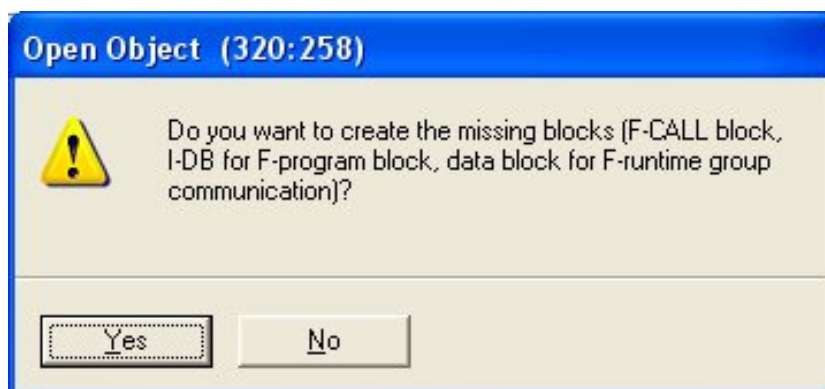


Fig. 61: Simatic Program Editor – Confirm the DB creation

10.3. Insert the E-Stop block to Failsafe-Program

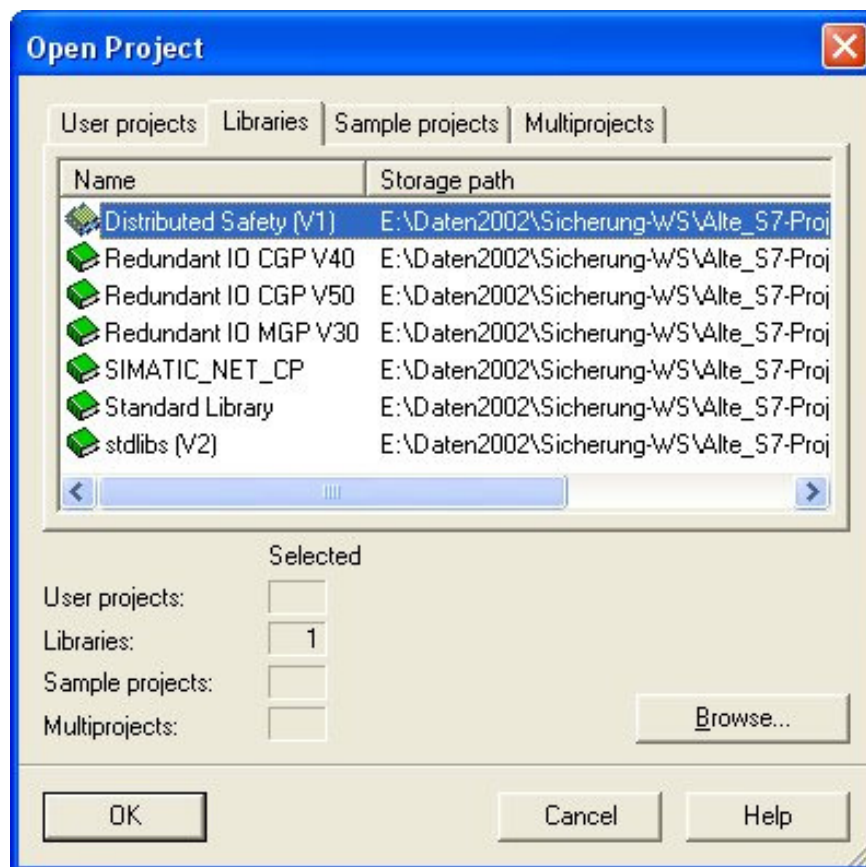


Fig. 62: Simatic Program Editor – Open the Failsafe-library

The E-Stop block is part of the Distributed Safety library.

- Copy the needed Failsafe-blocks to project block directory (e.g. via drag & drop):

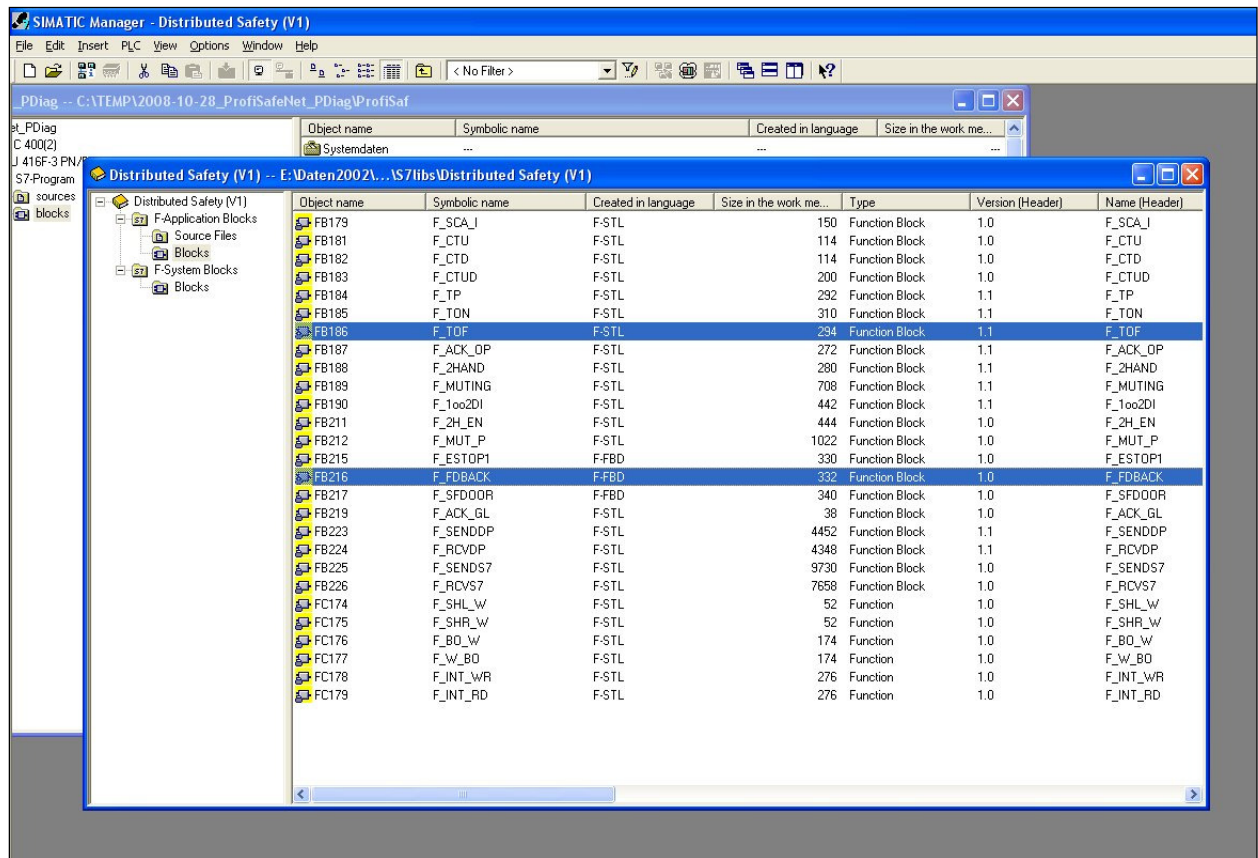


Fig. 63: Simatic Manager – Copy the Failsafe E-Stop blocks to project

10.4. User defined Failsafe-data block memory

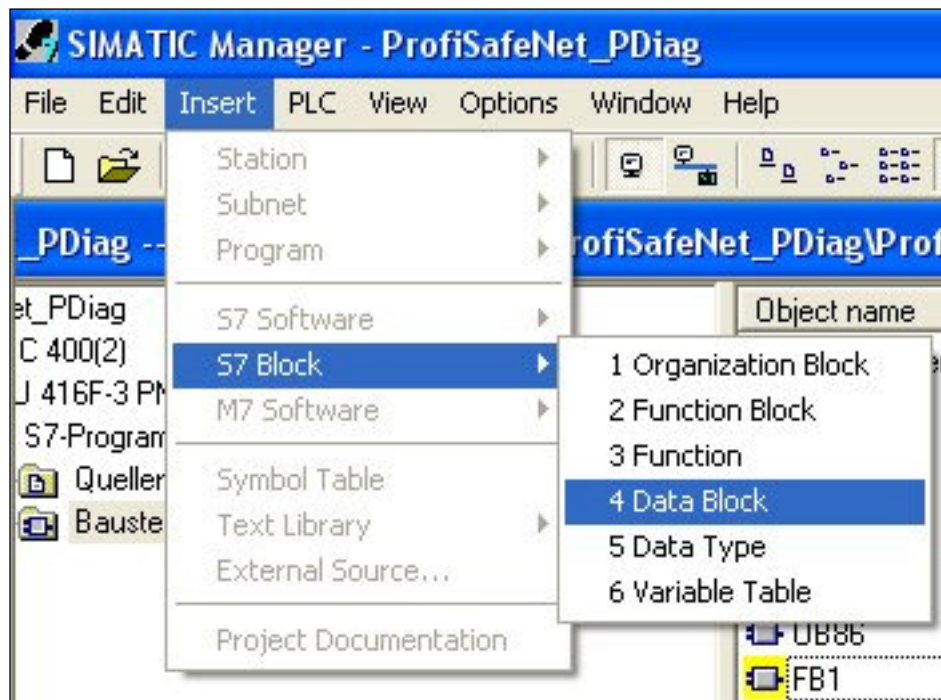


Fig. 64: Simatic Manager – Create a Failsafe user block (Step 1)

- Create a Failsafe user data block

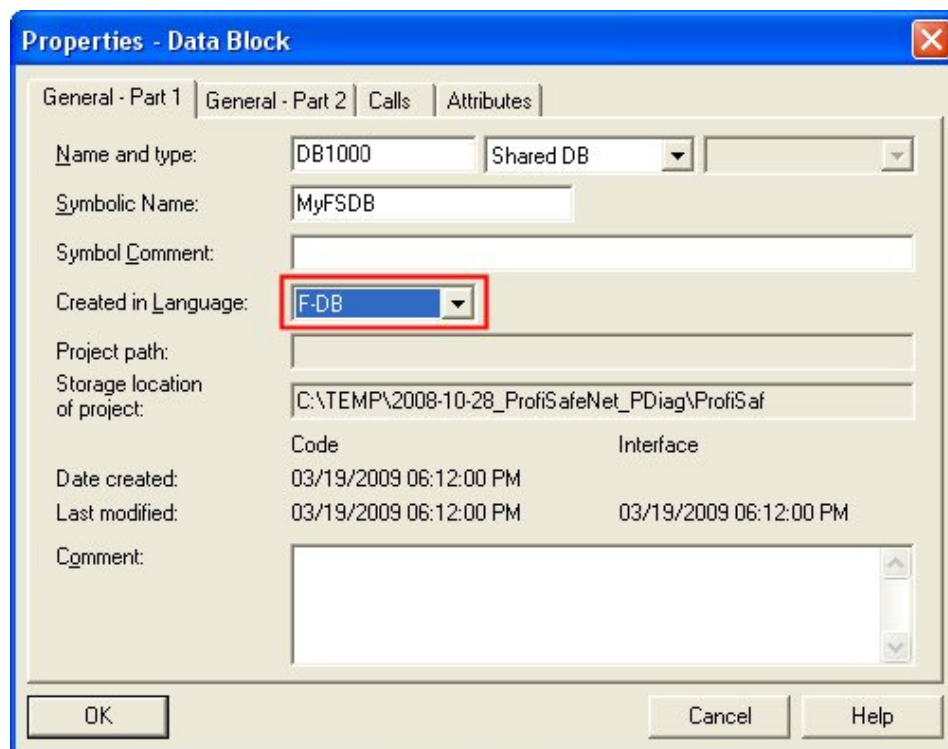


Fig. 65: Simatic Manager – Create a Failsafe user data block (Step 2)

Address	Name	Type	Initial val.	Comment
0.0		STRUCT		
+0.0	ESTOP1	BOOL	FALSE	not used
+0.1	ENABLE	BOOL	FALSE	
=2.0		END_STRUCT		

Fig. 66: Simatic Program Editor – Insert a data block bool declaration

The Failsafe data block 1000 “MyFSDB” includes the user bool declaration “ENABLE”.

- Create a program code like the figure below and close the FB1 edit mode.

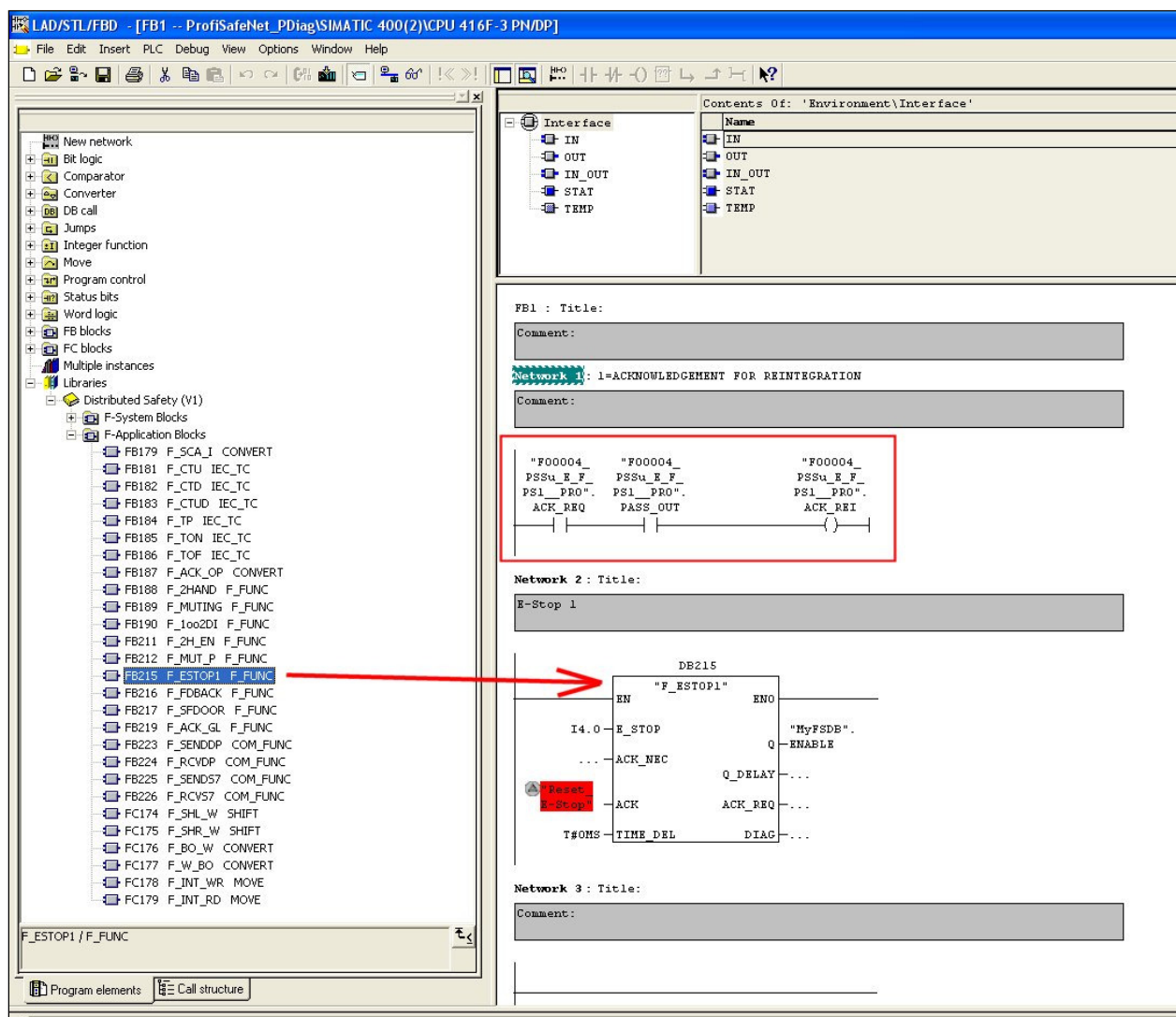


Fig. 67: Simatic Program Editor – Program a E-Stop and the PROFINET Safe “reintegration”

Note:

It is possible to reintegrate all the Failsafe Addresses via a global reintegration function block FB219.

“The FB 219 “F_ACK_GL”: Global acknowledgment of all F-I/Os in an F-Runtime group

This F-application block creates an acknowledgment for the simultaneous reintegration of all F I/Os/channels of the F I/O of an F-runtime group after communication errors or F I/O/channel errors.”

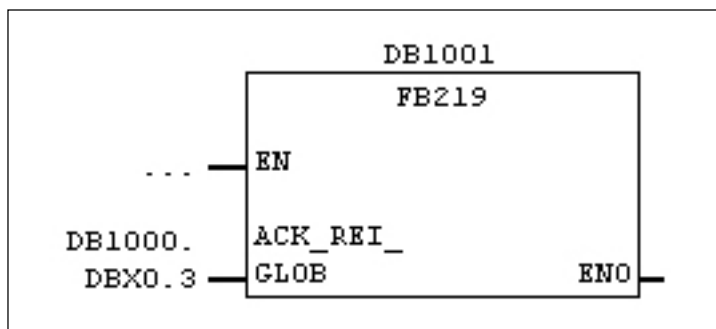


Fig. 68: Simatic Manager – Function Block “F_ACK_GL” (Global acknowledgment)

- Back to the Simatic Manager one have to activate the block directory and...

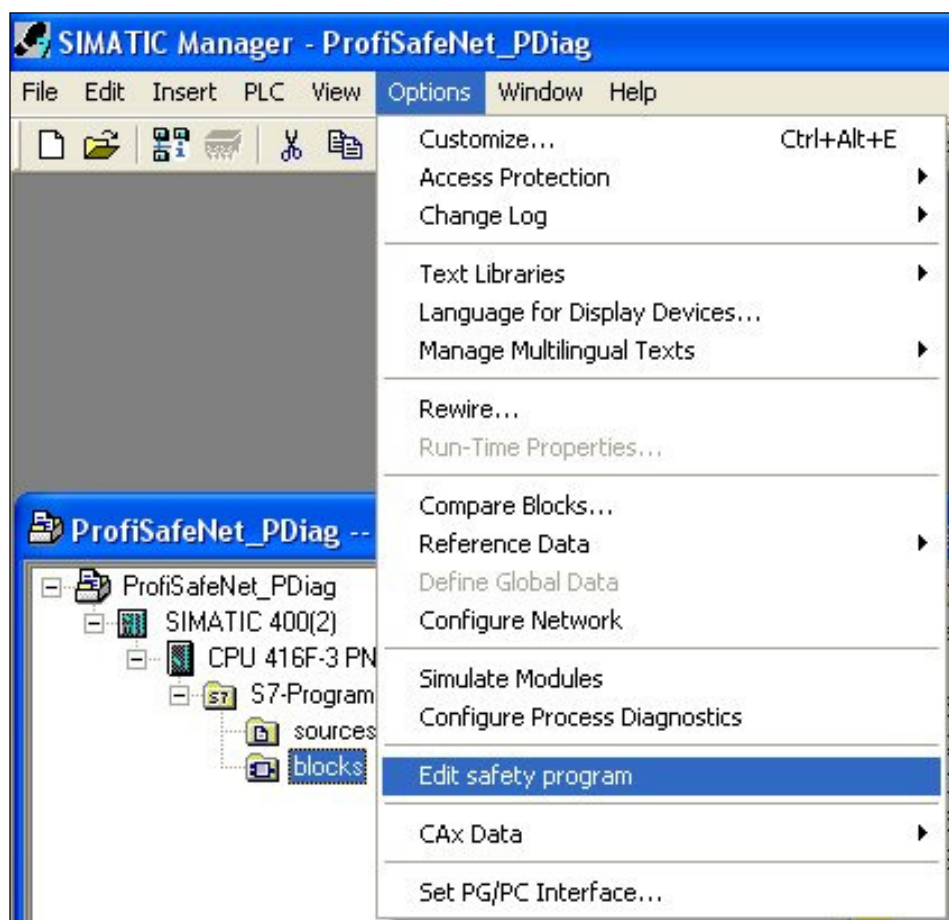


Fig. 69: Simatic Manager – “Start safety program” menu

... and start the Safety program dialog to compile (and download) the Failsafe program:

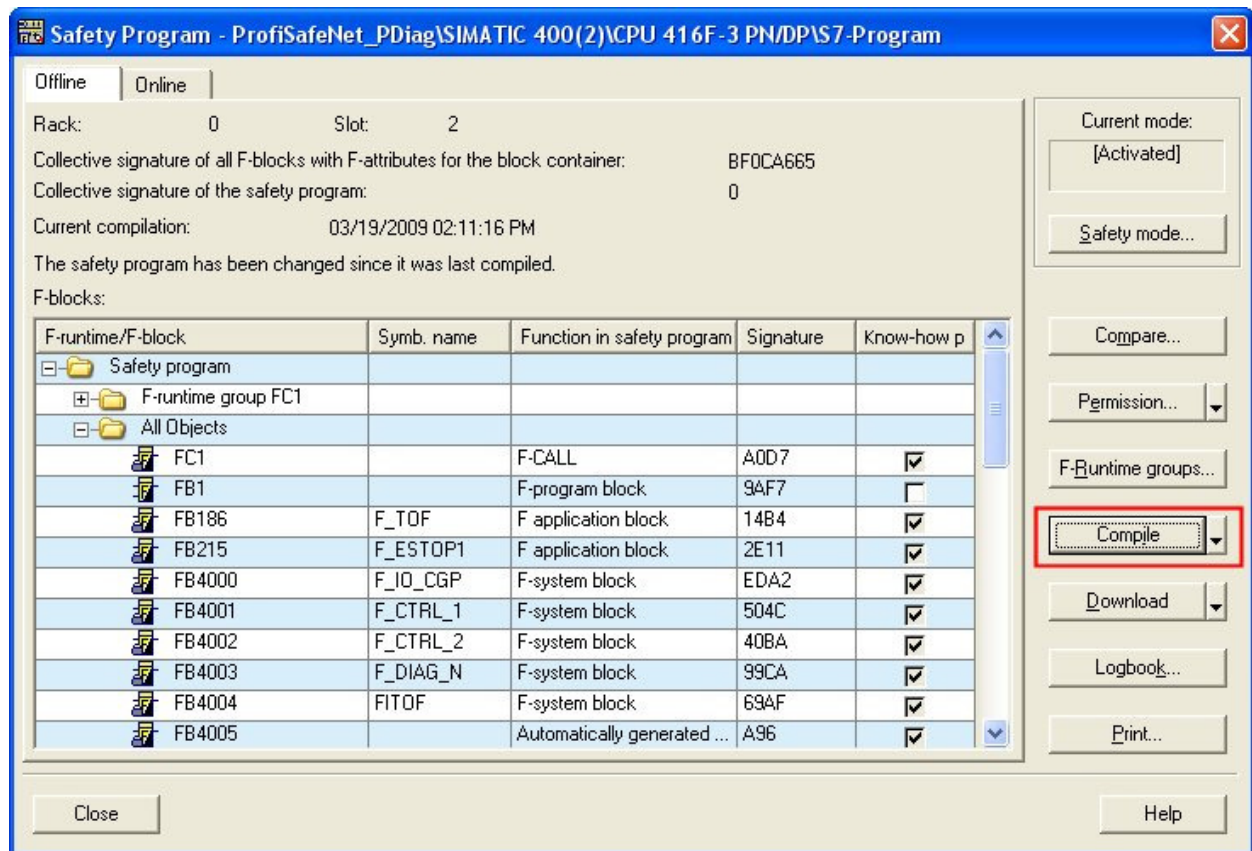


Fig. 70: Simatic Safety Program – Compile the Failsafe-program

- The compilation will create further write protected Failsafe Function blocks a FB Data block instance of it.

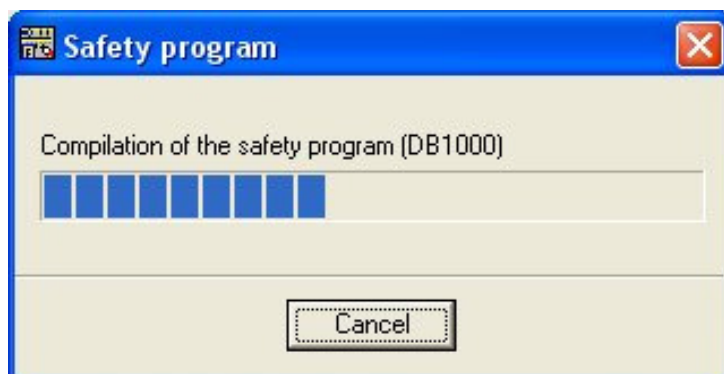


Fig. 71: Simatic Safety Program – Compiling the Failsafe-program

- One has to compile Failsafe program without errors.

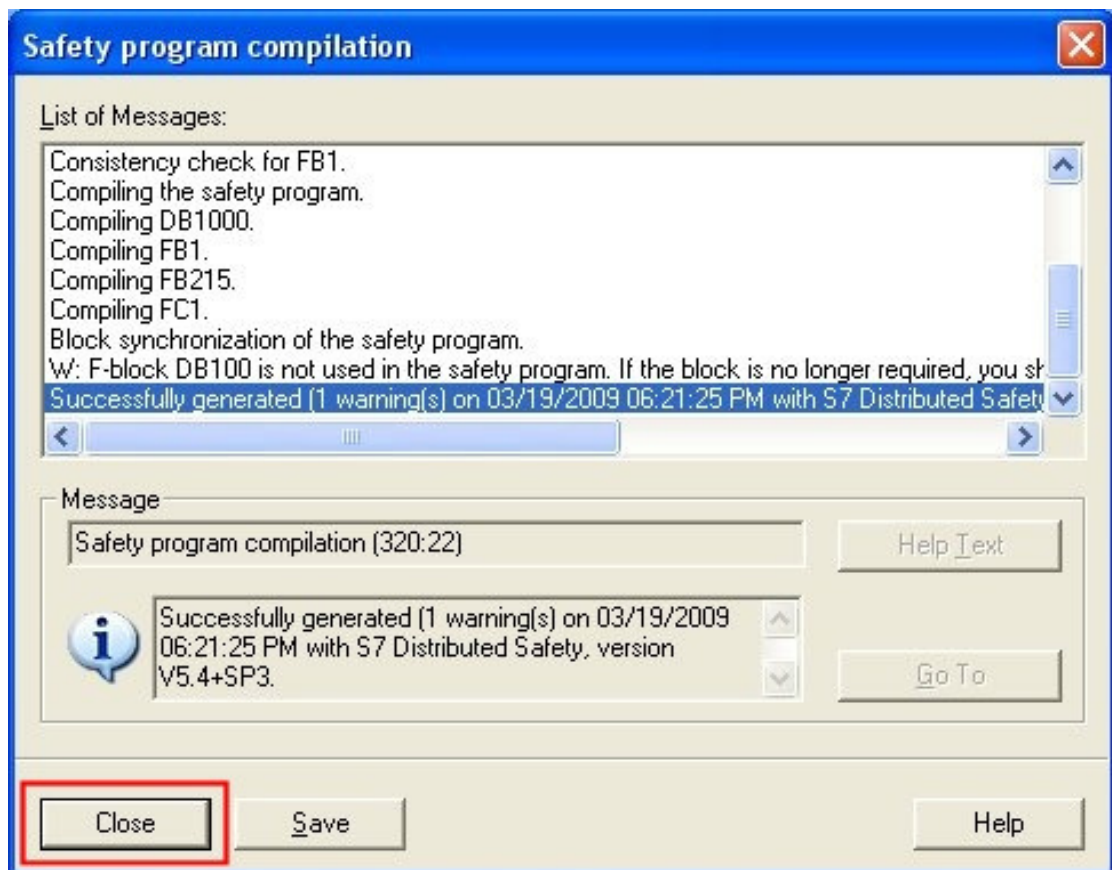


Fig. 72: Simatic Safety Program – Compiling Failsafe program without errors

- Road junction decision: Siemens 416F with memory card or 3XXF-CPU?

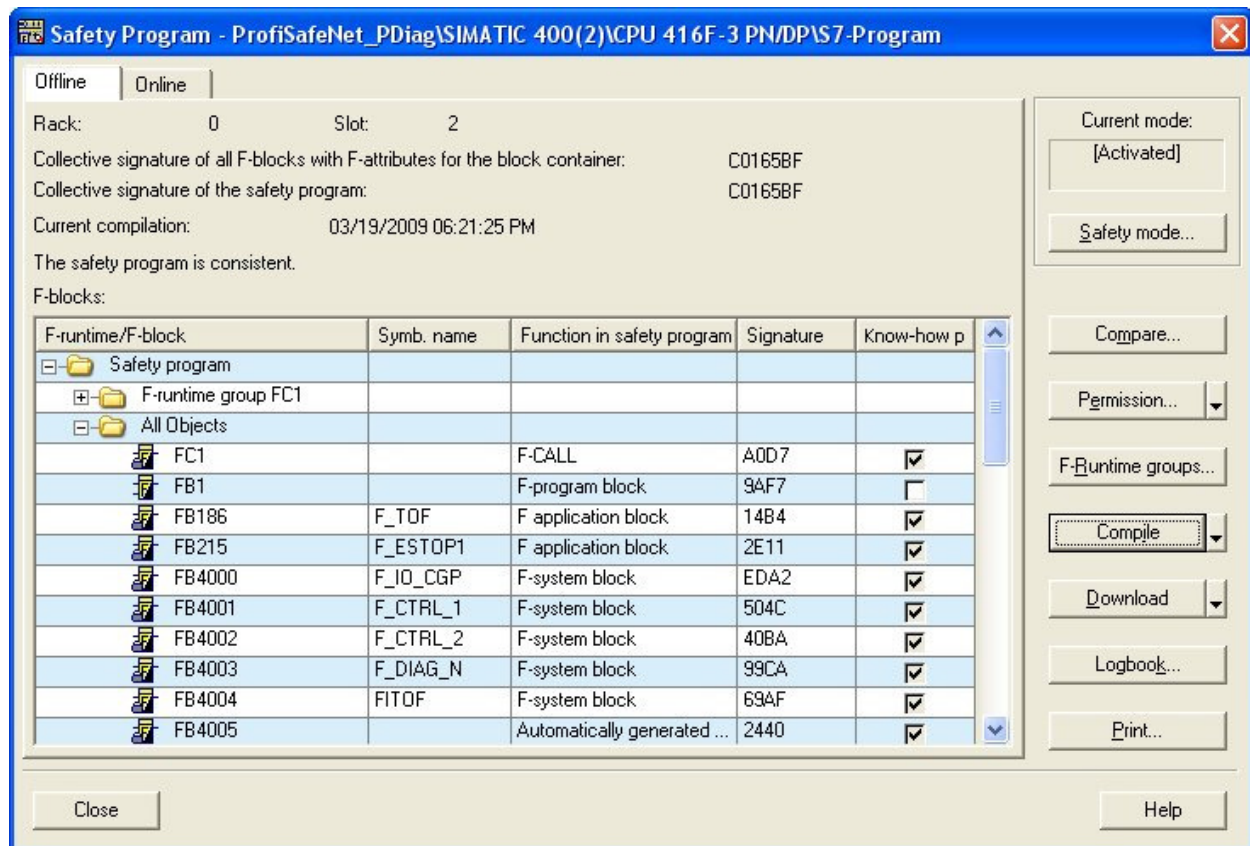


Fig. 73: Simatic Safety Program – Road junction decision

- If one modified the Failsafe program, there is the need to save it to the memory card. Otherwise one would get a error "download of DB xxx failed".

Note:

If one are using a S7-F3xx CPU have to use the Download button of this dialog.



Fig. 74: Simatic Manager – Save current project to memory card (view 1)

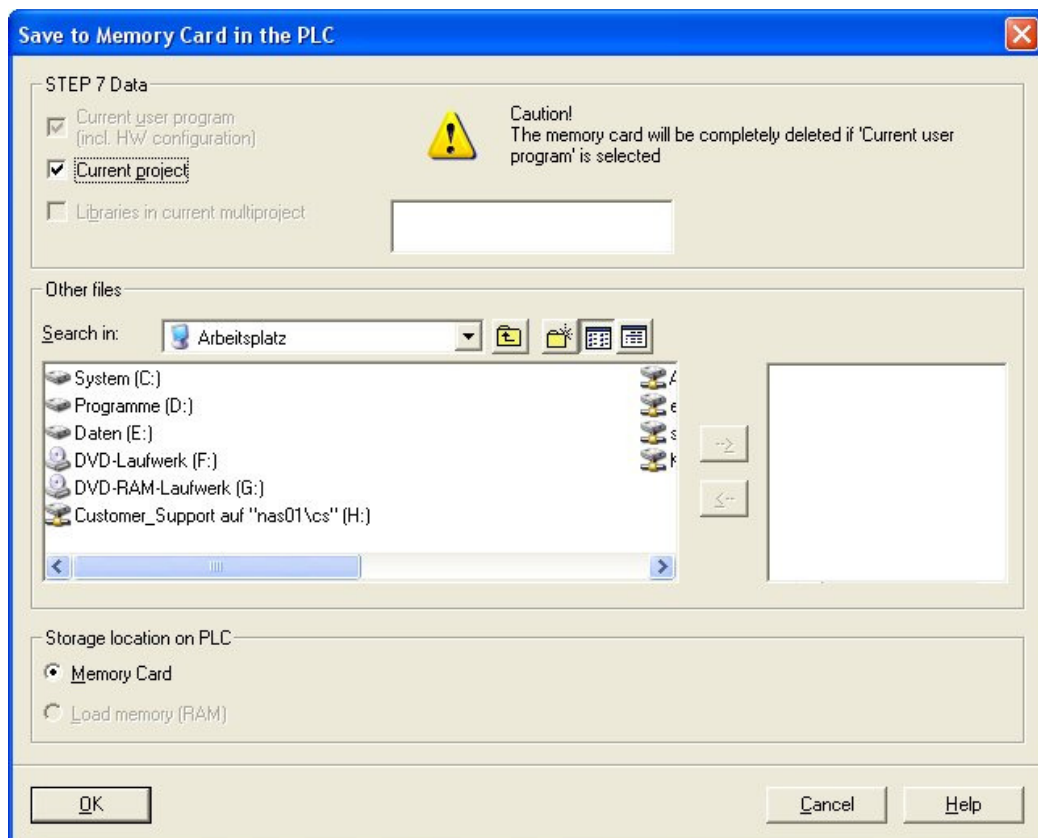


Fig. 75: Simatic Manager – Save current project to memory card (view 2)

- Close all blocks and the S7 Hardware-Manager project. Otherwise one will get errors.

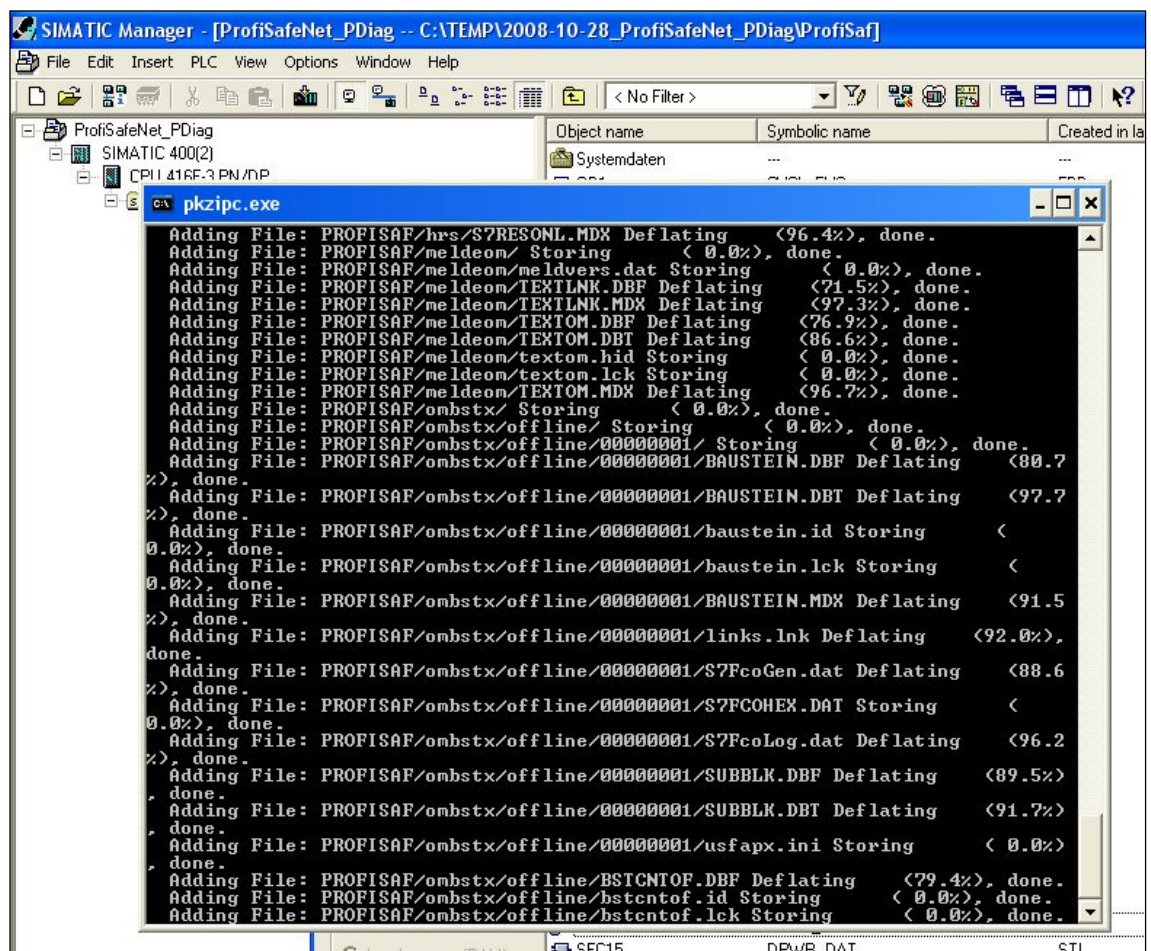


Fig. 76: Simatic Manager – S7 Compressing project data via PKZIP (default ZIP-application)

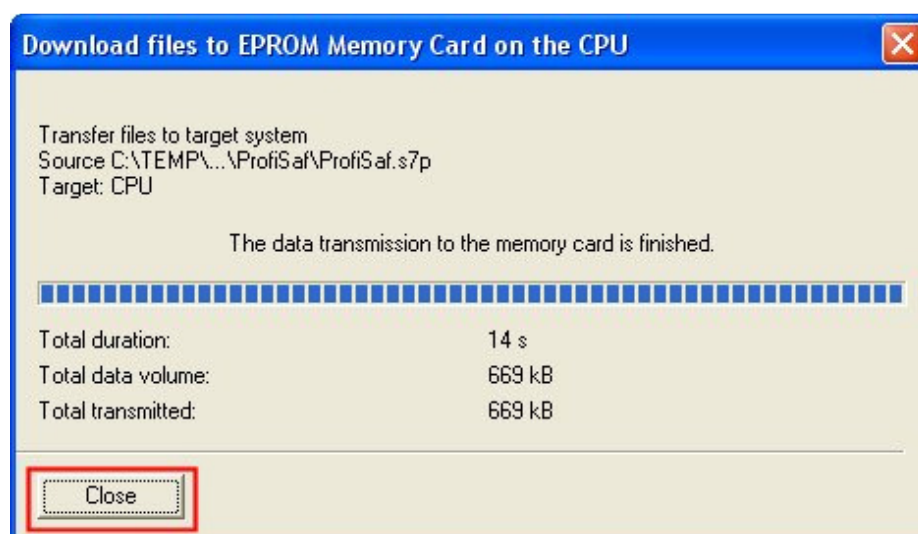


Fig. 77: Simatic Manager – download to memory card is ready

- Switch to CPU to "RUN", open the FB1 and enable the dynamic display ("Power flow")

10.5. PSSu Failsafe-Mapping

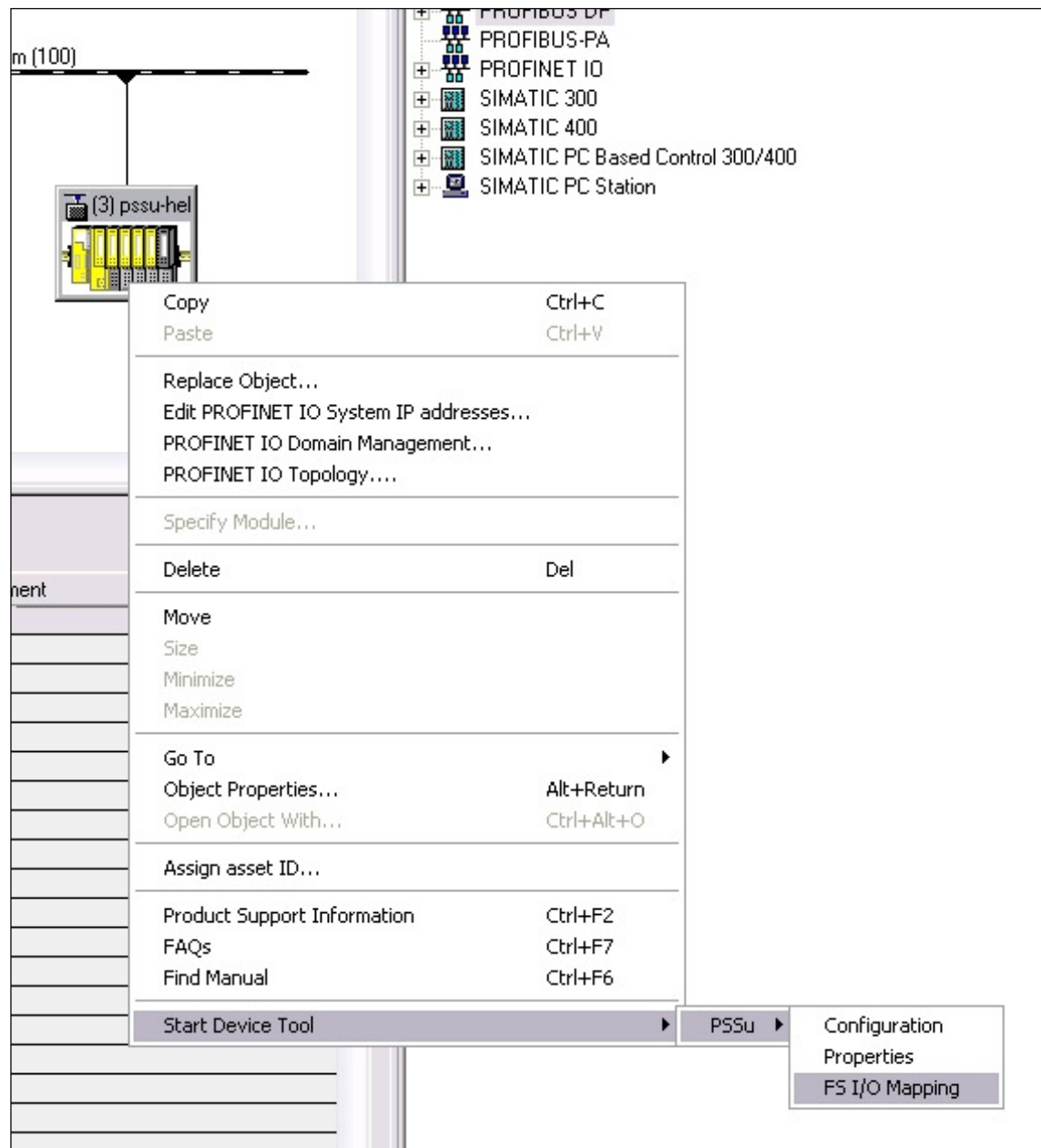


Fig. 78: S7 HW Config. – Check the PSSu I/O Mapping

Note:

If the PSSu System is big, one can get the Failsafe address mapping of a PSSu Electronic Module via the PSSu Configurator.

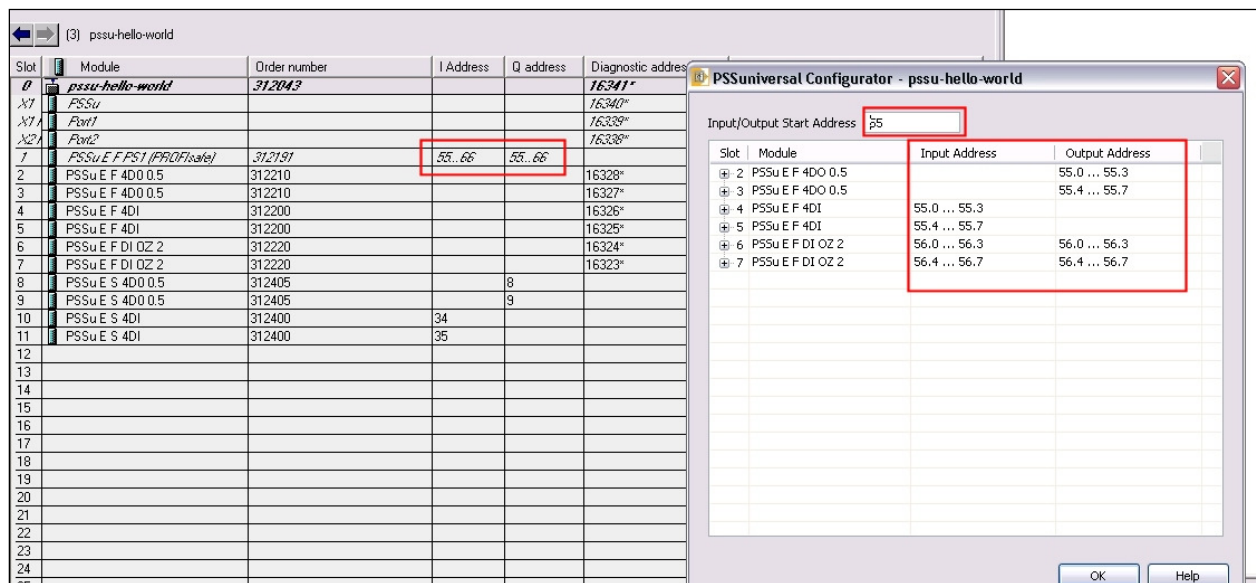


Fig. 79: PSSu Configurator – Input 4.0 will be used for the E-STOP

Note:

- Insert the PSSu Failsafe-Start address and the PSSu Configurator will calculate the Failsafe address using this offset.

► Reintegration

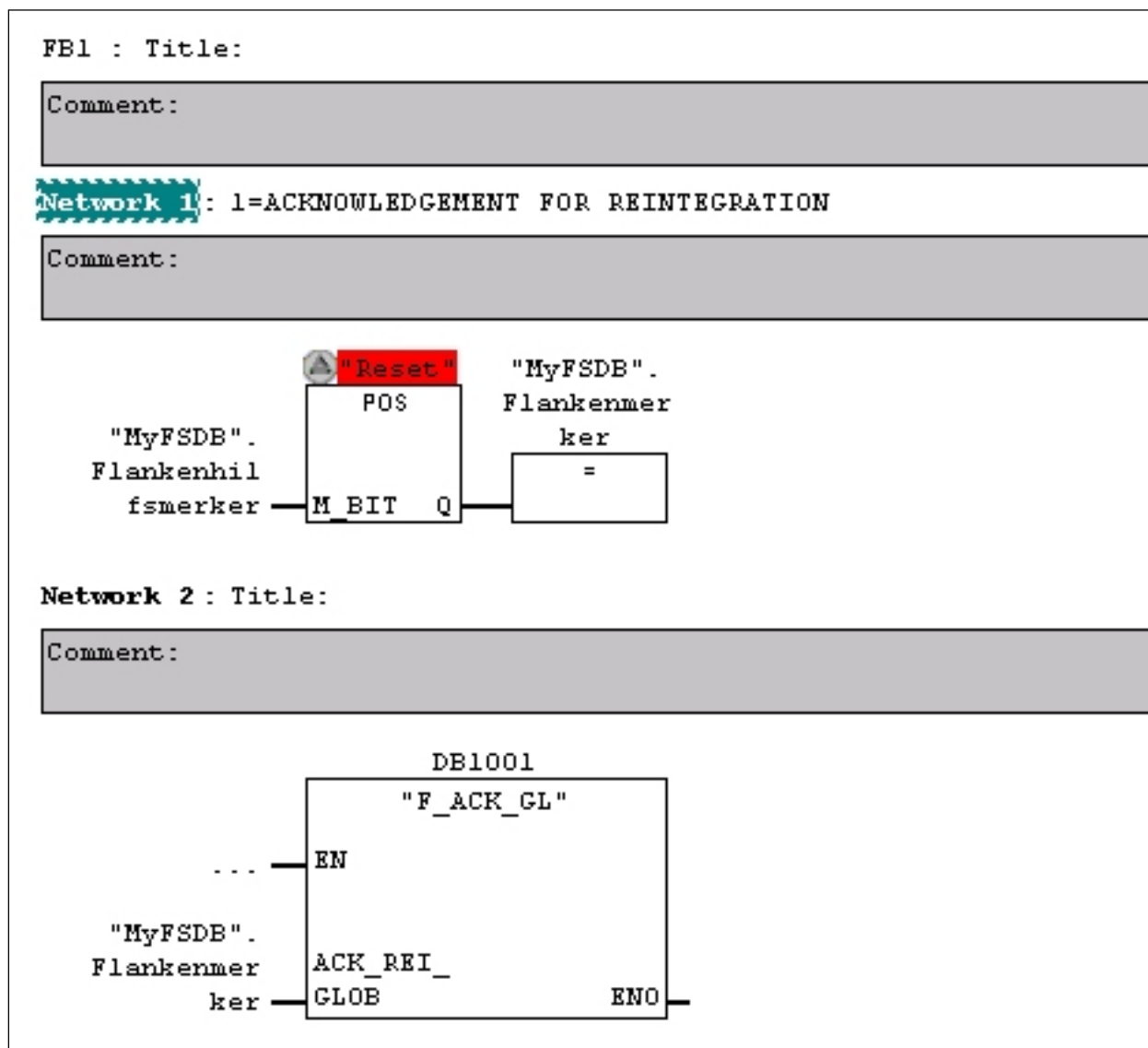


Fig. 80: Global Reintegration

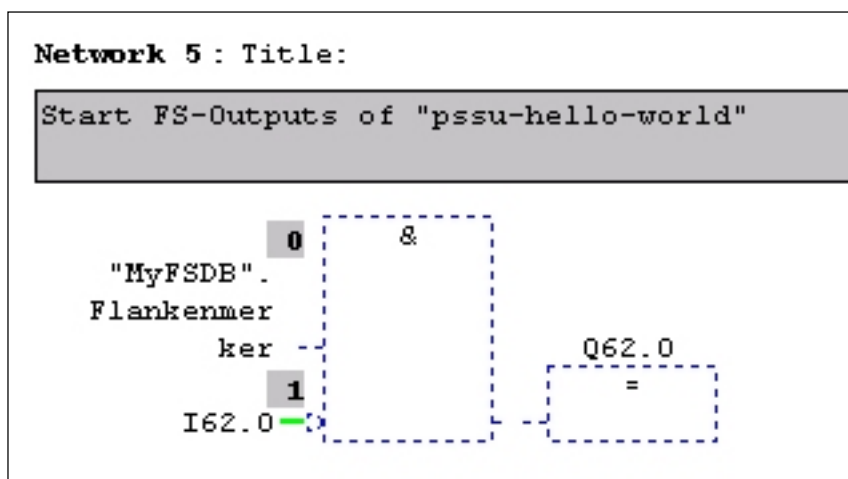


Fig. 81: State of PSSu FS-Outputs and Reset (FS-Output enabled)

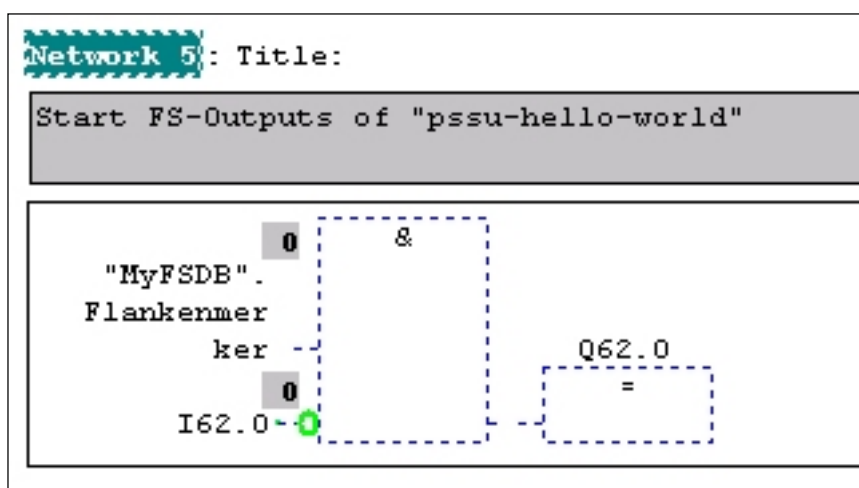


Fig. 82: State of PSSu FS-Outputs and Reset (FS-Output disabled)

PSSu Error Stack					
Time Stamp	Class	Num...	Priority	Location	Description
0d_00h_00m_16s	F-80	22	Status	CPU A	All FS outputs have switched to a RUN state
0d_00h_00m_15s	F-80	23	Status	CPU A	All FS inputs have switched to a RUN state
0d_00h_00m_15s	F-80	1A	Status	CPU B	All configuration errors have been rectified
0d_00h_00m_02s	F-80	01	Error	CPU A and B	Electronic module or base module on slot 2 is defective (PILZ: slot 1)
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_23m_02s	F-20	02	Error	CPU A and B	I/O-Group was stopped because the module on slot 2 is faulty (PILZ: slot 1)
0d_00h_23m_01s	F-21	05	Error	CPU A and B	Module on slot 2: Internal error (PILZ: slot 1)
0d_00h_17m_42s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSS
0d_00h_17m_16s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master
0d_00h_15m_42s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSS
0d_00h_15m_37s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master
0d_00h_00m_02s	F-80	22	Status	CPU A	All FS outputs have switched to a RUN state
0d_00h_00m_02s	F-80	23	Status	CPU A	All FS inputs have switched to a RUN state
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_42m_52s	F-86	02	Status	CPU B	Request to start device
0d_00h_00m_02s	F-86	00	Warn...	CPU A	Cannot start the I/O-Group because the device has not been reset
0d_00h_00m_02s	F-76	00	Error	CPU A and B	Configuration is faulty
0d_00h_00m_02s	S-71	40	Error	CPU C	Module on slot 1: Hardware registry is invalid (PILZ: slot 0)
0d_00h_00m_02s	S-71	53	Status	CPU C	FS or ST hardware registry has been changed
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_00m_02s	F-76	00	Error	CPU A and B	Configuration is faulty
0d_00h_00m_02s	S-71	40	Error	CPU C	Module on slot 1: Hardware registry is invalid (PILZ: slot 0)
0d_00h_00m_02s	S-71	53	Status	CPU C	FS or ST hardware registry has been changed
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_00m_02s	F-76	00	Error	CPU A and B	Configuration is faulty
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_00m_02s	F-76	00	Error	CPU A and B	Configuration is faulty
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
0d_00h_00m_02s	F-76	00	Error	CPU A and B	Configuration is faulty
0d_00h_00m_02s	S-81	48	Status	CPU C	New ST parameter setup data has been saved
0d_00h_00m_02s	S-81	47	Status	CPU C	New module parameters have been saved
0d_00h_00m_00s	F-86	01	Status	CPU A	Device has been restarted
1d_01h_04m_51s	F-8A	03	Warn...	FS Module	Module on slot 1: "Module Supply" is too low (PILZ: slot 0)
0d_05h_48m_27s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSS
0d_05h_48m_16s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master
0d_00h_03m_52s	S-50	01	Status	CPU C	Error has been rectified: "Standard bus system, cannot transfer data between the PSS
0d_00h_00m_44s	S-50	00	Error	CPU C	Standard bus system: Cannot transfer data between the PSSu system and the Master
0d_00h_00m_02s	F-80	23	Status	CPU A	All FS inputs have switched to a RUN state

Fig. 83: PSSu Configurator - PSSu FS-Inputs & Outputs changed 16 seconds after PSSu Power Supply on

► E-Stop initial position:

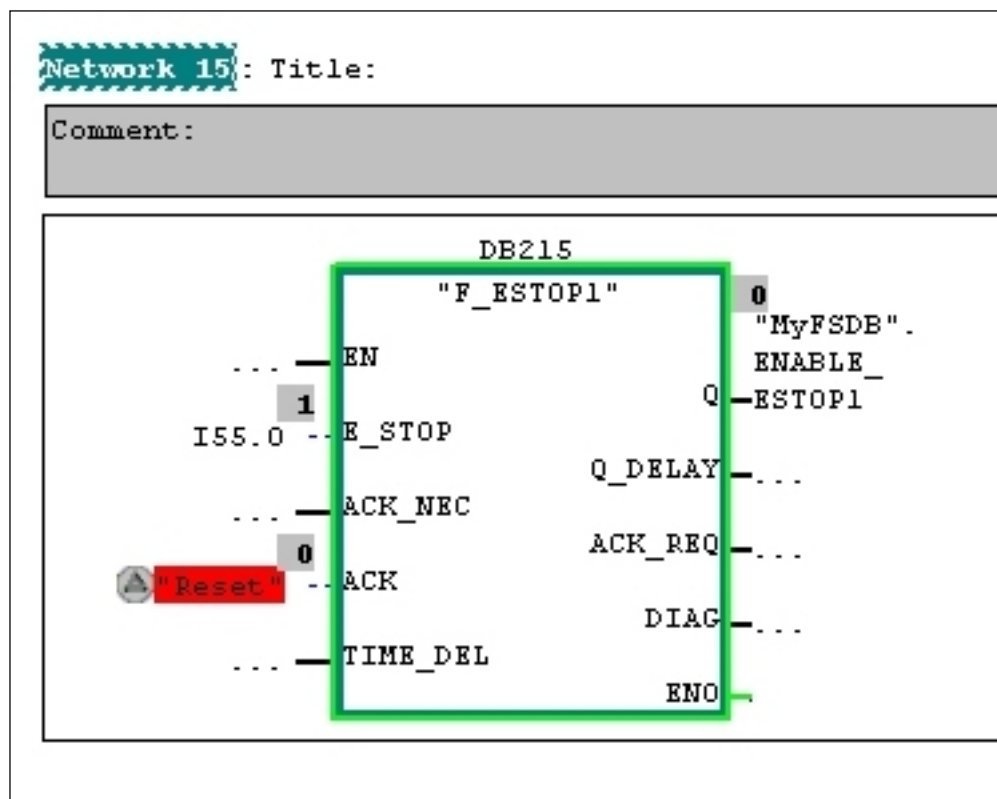


Fig. 84: Simatic Program Editor Online – E-Stop in initial position

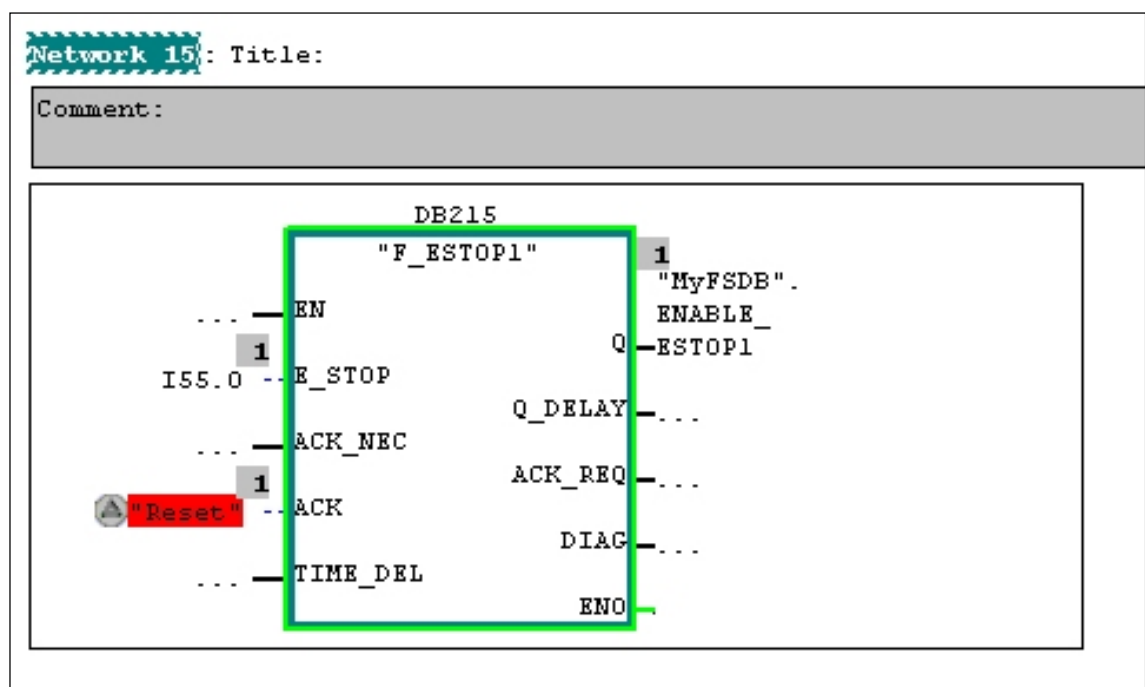


Fig. 85: Simatic Program Editor Online – E-Stop enabled after Reset Input signal

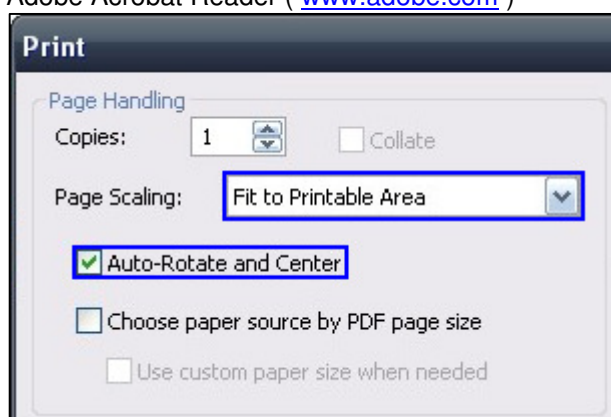
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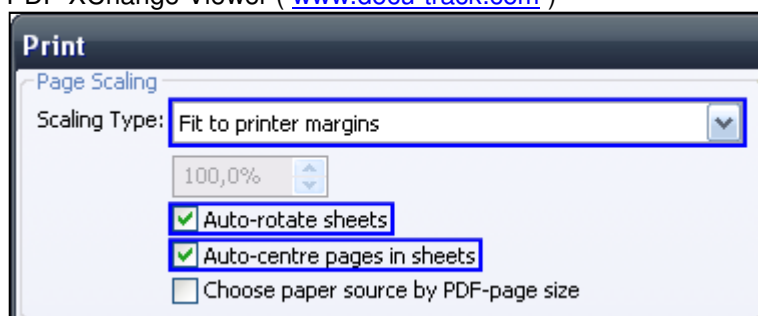
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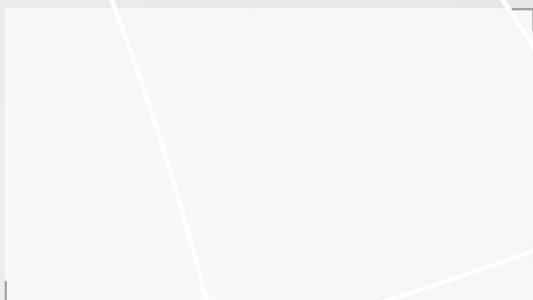
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Adobe Acrobat Reader (www.adobe.com)



PDF-XChange Viewer (www.docu-track.com)





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