



PNOZ m ES Ethernet/IP with Allen Bradley ControlLogix

PILZ
THE SPIRIT OF SAFETY

Product

Type: PNOZ m ES Ethernet/IP
Name: PNOZ multi 2 series
Manufacturer: Pilz GmbH & Co. KG, Safe Automation

Document

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Validity of Application Note

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The [Pilz newsletter](#) is free of charge and keeps you up to date on all the latest issues and trends in safe automation.

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February 2024

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Industrial Security

To secure plants, systems, machines and networks against cyberthreats it is necessary to implement (and continuously maintain) an overall [Industrial Security concept](#) that is state of the art. Perform a risk assessment in accordance with VDI/VDE 2182 or IEC 62443-3-2 and plan the security measures with care. If necessary, seek advice from [Pilz Customer Support](#).

Abbreviations

Abbreviation / term	Description	Source
AN	A pplication N ote	 AN content (1002400)">www.pilz.com > AN content (1002400)
PNOZ	Pilz E-STOP positive-guided (DE: P ilz N OT-AUS- Z wangsgeführt)	 PNOZ">www.pilz.com > PNOZ
PSS	Programmable control system (DE: P rogrammierbares S teuerungssystem)	 PSS">www.pilz.com > PSS
PSS u2	PSS universal, 2 nd generation	 PSS u2">www.pilz.com > PSS u2
POU	P rogram O rganisation U nit	
NC	N ormally C losed	
NO	N ormally O pen	

Definition of Symbols

- Information that is particularly important is identified as follows:



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.



INFORMATION

This gives advice on applications and provides information on special features.

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1 Useful documentation

Reading the documentation listed below is necessary for understanding this Application Note. The availability of the software used, and its safe handling are also presupposed for the user.

1.1 Documentation from Pilz GmbH & Co. KG

No.	Description	Item No. /Download
1	Pilz international homepage, download section	www.pilz.com
2	PNOZmulti 2 Communication Interfaces	www.pilz.com > Download 1002971
3	Technical Catalogue PNOZmulti	www.pilz.com > Download 1001153
4	Operating Manual PNOZ m B0	www.pilz.com > Download 1002660
5	Operating Manual PNOZ m ES Ethernet/IP	www.pilz.com > Download 1003387

1.2 Documentation from other sources of information

No.	Description	Item No. / Download
1	Allen-Bradley portal (international) Internet-Link to "ab.rockwellautomation.com"	-
2	Product catalogue of Allen-Bradley ControlLogix System (PLC) Internet-Link to product catalogue "ControlLogix System"	-
3		
4		

2 Configuration

2.1 Used Hardware

2.1.1 Pilz products

No.	Descriptions	Order number	Version	Number
1	PNOZ m B0	772100	1.2	1
2	PNOZ m ES Ethernet/IP	772137	1.2	1
3				
4				

2.1.2 Third-party products

No.	Descriptions	Order number	Version	Number
1	CPU ControlLogix 1756-L71S	-	23.12	1
2	Ethernet/IP Scanner 1756-EN2TR	-	10.1	1
3				
4				

2.2 Used IP addresses

2.2.1 Pilz products

No.	Descriptions	IP address
1	PNOZ m ES Ethernet/IP	192.168.1.131
2		

2.2.2 Third-party products

No.	Descriptions	IP address
1	Ethernet/IP Scanner 1756-EN2TR	192.168.1.10
2		

2.3 Hardware configuration

2.3.1 Pilz products

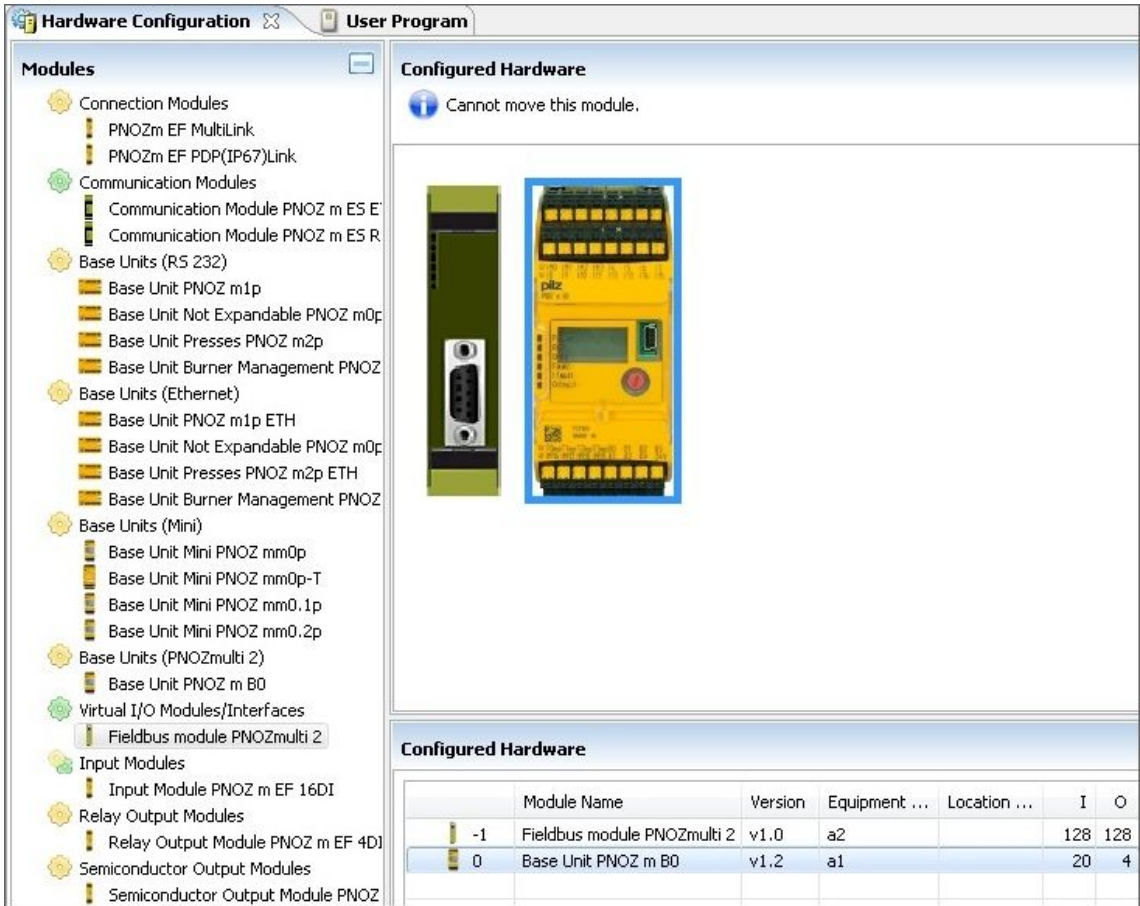


Figure 1: PNOZ multi Configurator – Hardware Configuration

2.3.2 Rockwell products

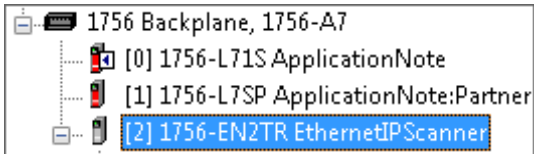


Figure 2: Studio 5000 – Hardware Configuration Allen-Bradley ControlLogix PLC

2.4 Used Software

2.4.1 Pilz products

No.	Descriptions	IP address
1	PNOZmulti Configurator	9.6.0 Build 20
2	PNOZ_m_ES_EtherNetIP.eds	-
3		
4		

2.4.2 Third-party products

No.	Descriptions	IP address
1	Studio 5000	23.00
2	EDS Hardware Installation Tool	-
3	BOOTP-DHCP Server	2.3.2.0
4		

3 Application Task

Create a connection with EtherNet/IP to communicate between PNOZ m ES Ethernet/IP and Allen-Bradley ControlLogix PLC.

The initial ControlLogix Hardware configuration is not implemented in this "Application Note". You can get further details if you read the Allen-Bradley ControlLogix manuals, e.g.:

- ▶ Allen-Bradley User Manual "EtherNet/IP Network Configuration"
- ▶ Allen-Bradley Quick Start "Logix5000 Control Systems: Connect POINT I/O Modules Over an EtherNet/IP"

In this application note is described how to

- ▶ Import EDS file
- ▶ Setting IP address on PNOZ m ES Ethernet/IP
- ▶ Configure the PNOZ m ES Ethernet/IP module in Allen-Bradley ControlLogix PLC
- ▶ Configure the PNOZmulti
- ▶ Download user program to the PNOZmulti

3.1 Steps before you can start

3.1.1 Set IP address of your PC

- ▶ In this example the IP address for the PC is 192.168.1.100

IP-Adresse:	192 . 168 . 1 . 100
Subnetzmaske:	255 . 255 . 255 . 0
Standardgateway:	. . .

Figure 3: PC – Set IP address

3.1.2 Import EDS file

- ▶ Start „EDS Hardware Installation Tool“

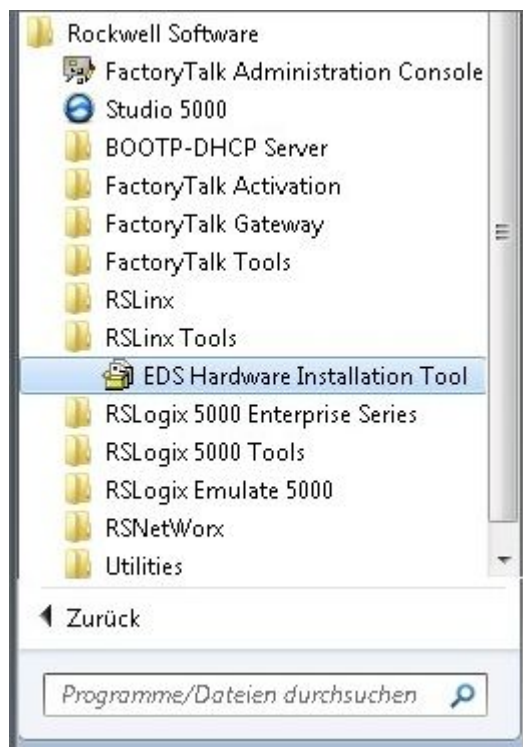


Figure 4: Start "EDS Hardware Installation Tool"

- ▶ Click "Add"

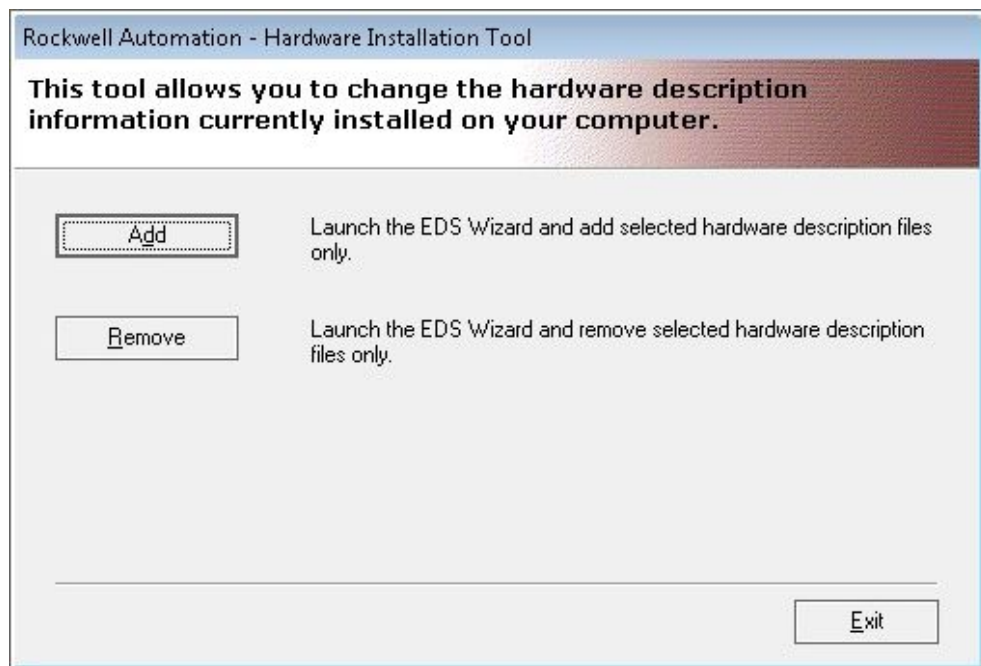


Figure 5: EDS Hardware Installation Tool

► Select EDS file

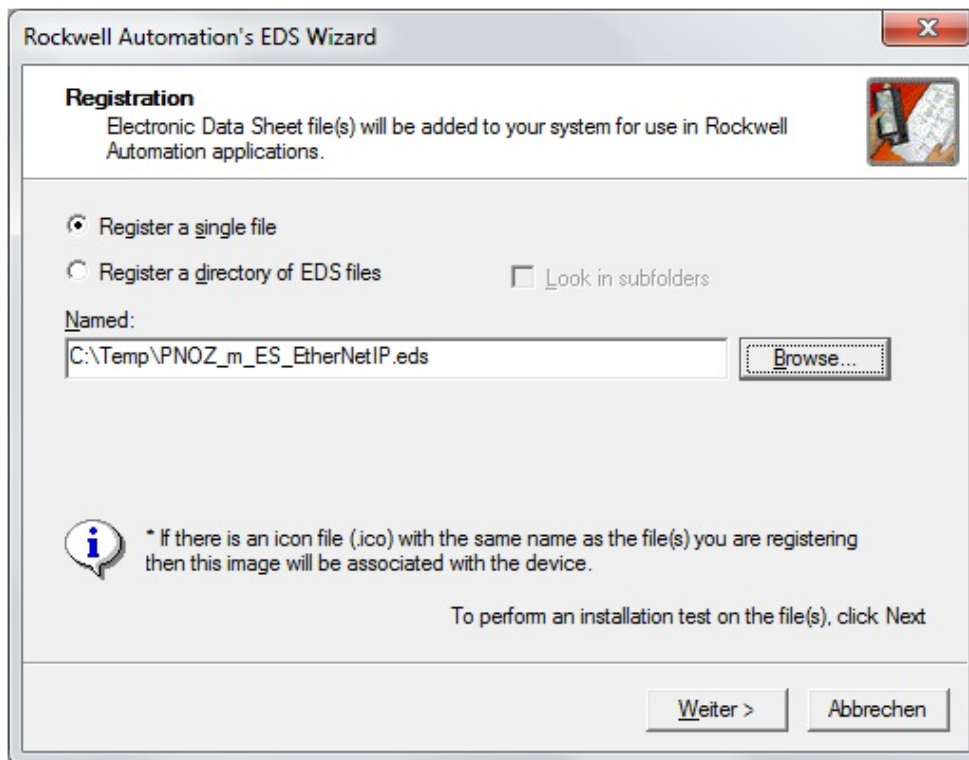


Figure 6: EDS Hardware Installation Tool – Select the EDS file

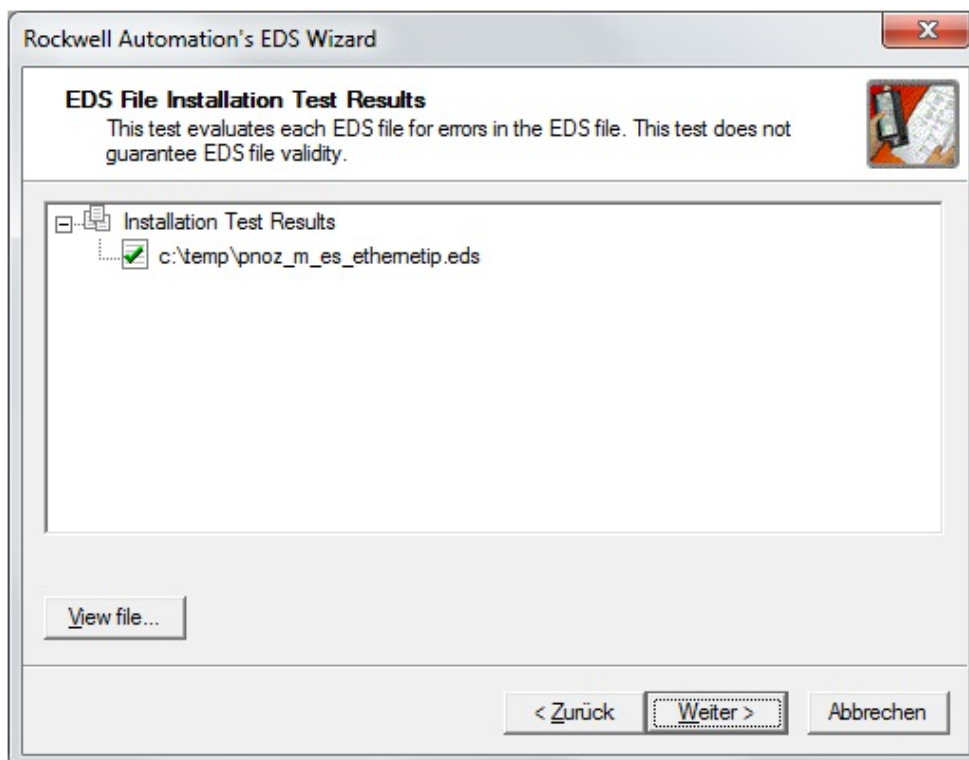


Figure 7: EDS Hardware Installation Tool – Installing EDS file (1)

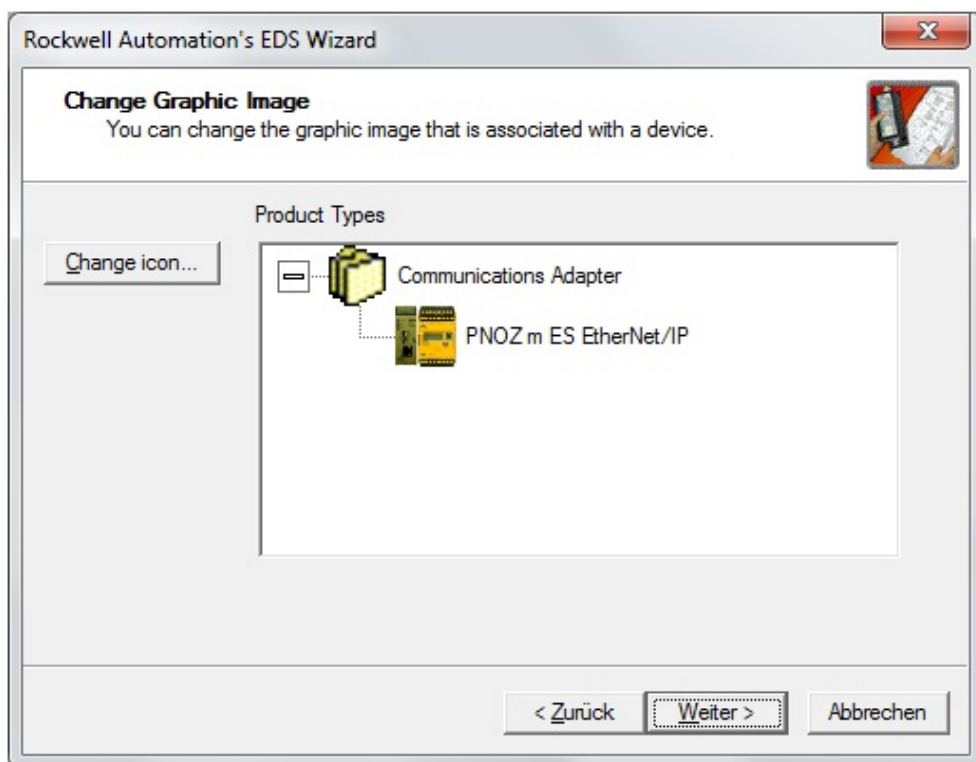


Figure 8: EDS Hardware Installation Tool – Installing EDS file (2)

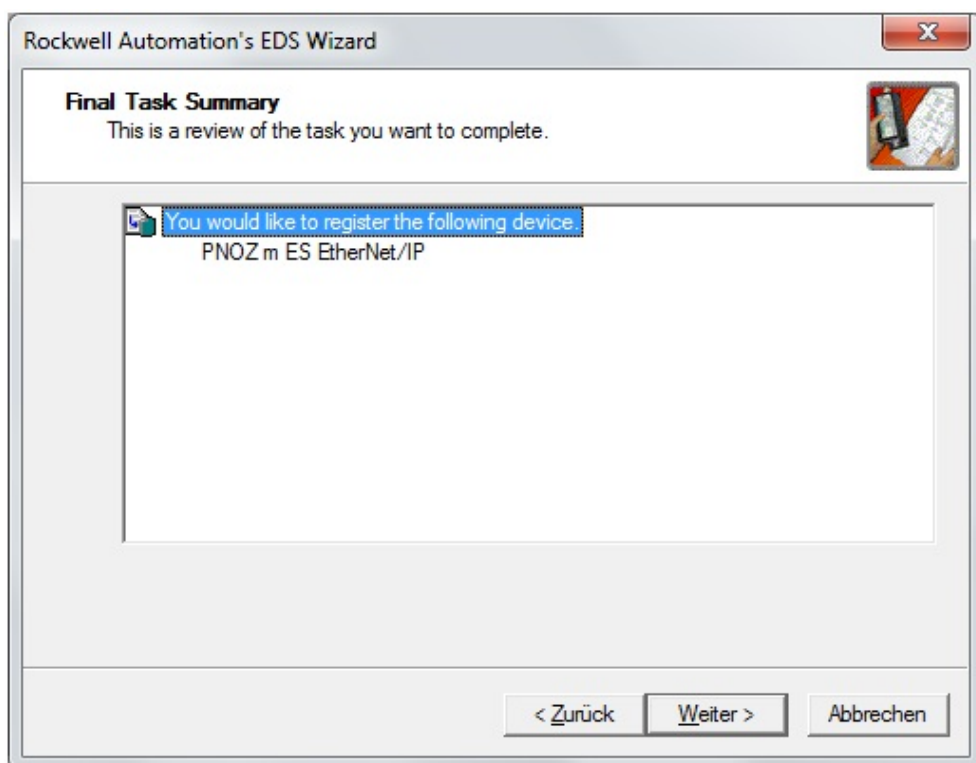


Figure 9: EDS Hardware Installation Tool – Installing EDS file (3)

3.2 Setting IP address on PNOZ m ES Ethernet/IP

You can set the IP address via

- ▶ DHCP
- ▶ DIP Switch
- ▶ Web-Server

3.2.1.1 Setting the IP address via BOOTP/DHCP Server

- ▶ Select the device with the correct MAC Address, Add to Relation List.
Enter the desired IP Address.

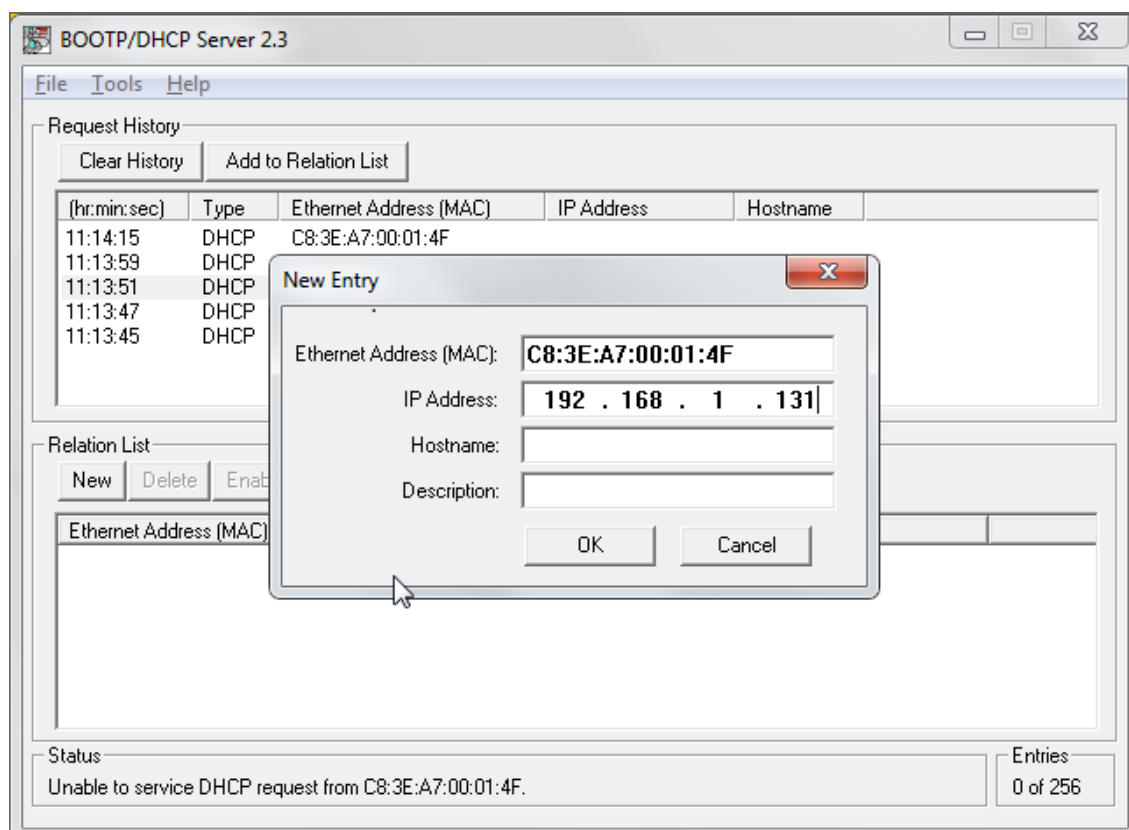


Figure 10: BOOTP/DHCP Server – Enter the desired IP Address

- ▶ IP Address is set to 192.168.1.131

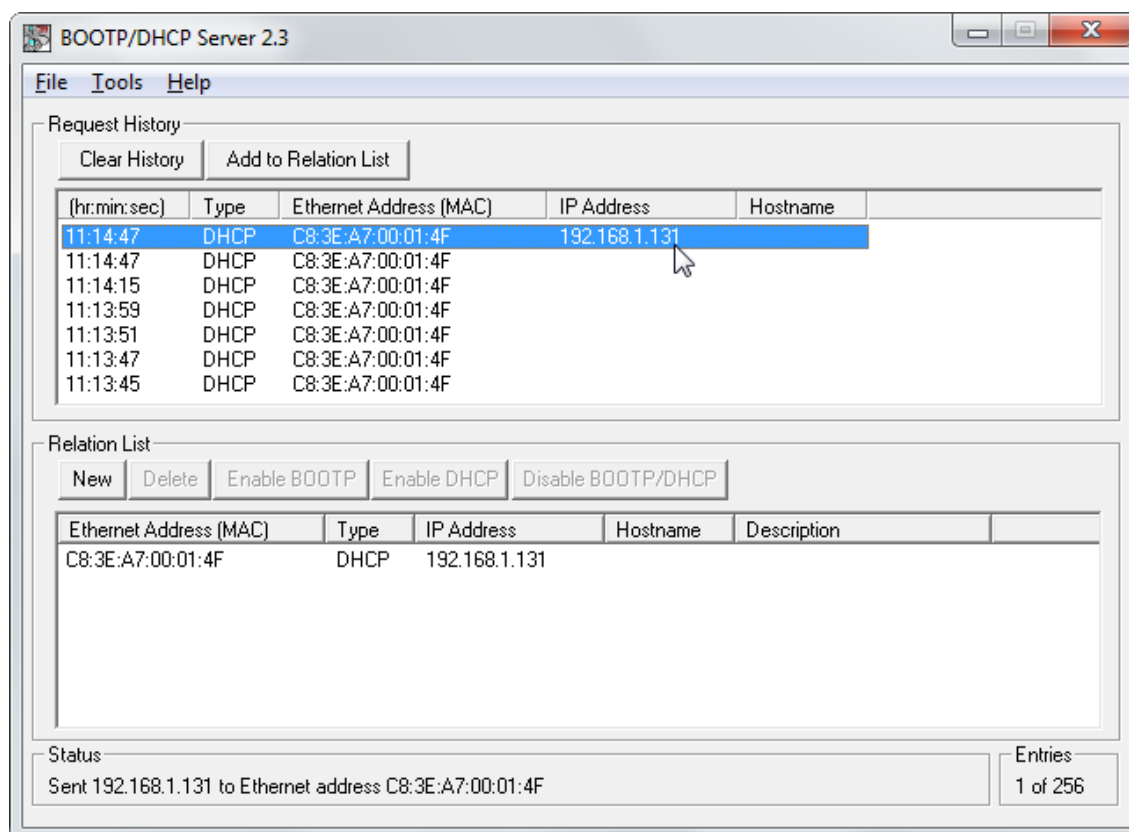


Figure 11: BOOTP/DHCP Server – IP Address is set to 192.168.1.131

- ▶ Disable the BOOTP/DHCP in the Module.

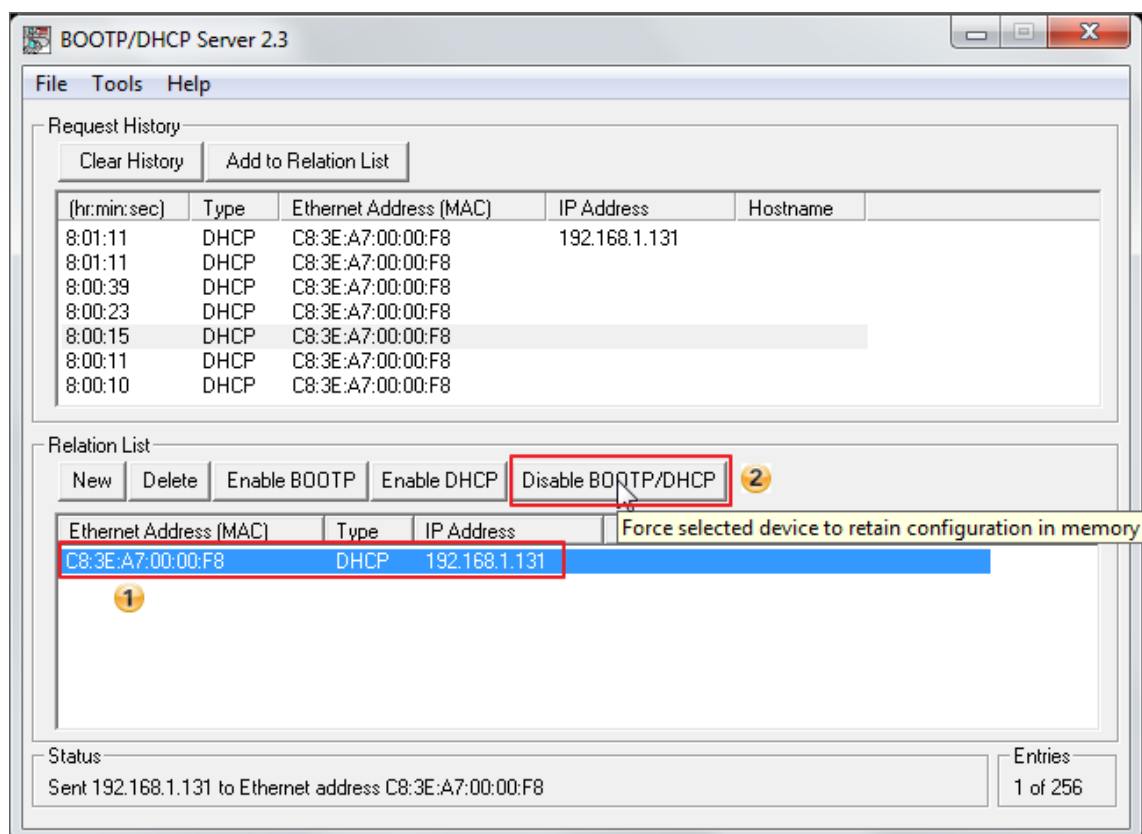


Figure 12: BOOTP/DHCP Server – Disable BOOTP/DHCP

3.2.1.2 Setting the IP address via DIP Switch

DIP Switch	Description
Adress 1 2 3 4 5 6 7 8 128 64 32 16 8 4 2 1 ON OFF	DHCP on
Adress 1 2 3 4 5 6 7 8 128 64 32 16 8 4 2 1 ON OFF	IP address is 192.168.1.20
Adress 1 2 3 4 5 6 7 8 128 64 32 16 8 4 2 1 ON OFF	Configuration via Web-Server

Figure 13: Setting IP address via DIP Switch

More information how to set the IP address you can find in the User Manual.

3.2.1.3 Setting the IP address via Web-Server

- ▶ Enter the IP Address of the PNOZ m ES Ethernet/IP Module

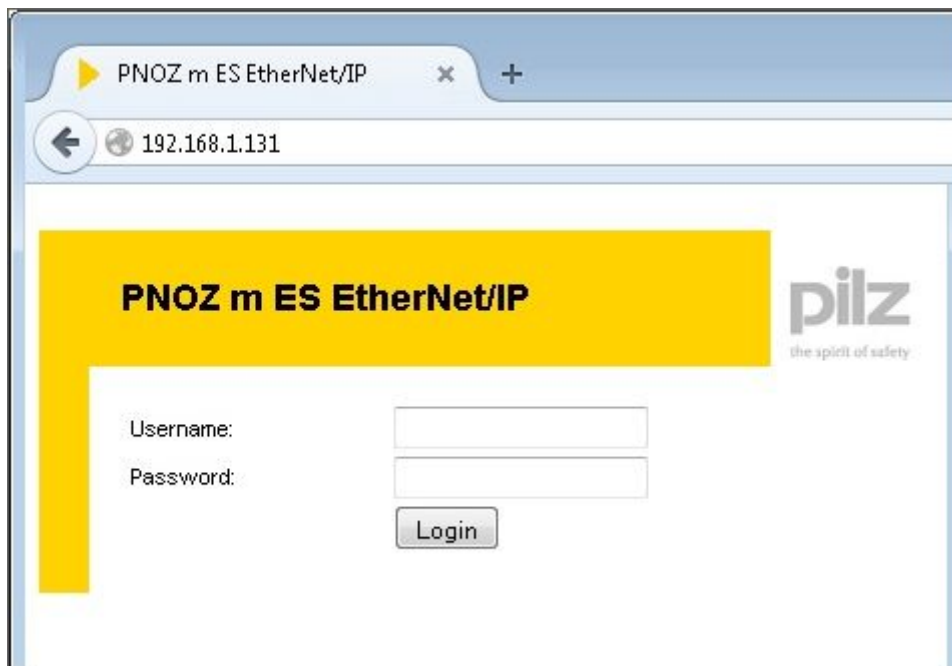


Figure 14: Web-Server: Login Screen

PNOZ m ES Ethernet/IP
Log Out


Input Byte 00	0	Send	Output Byte 00	0	LED Status	0xb0	176
Input Byte 01	0	Send	Output Byte 01	0	Tabelle	0	Send
Input Byte 02	0	Send	Output Byte 02	0	Segment	0	Send
Input Byte 03	0	Send	Output Byte 03	0	Data 00		0
Input Byte 04	0	Send	Output Byte 04	0	Data 01		0
Input Byte 05	0	Send	Output Byte 05	0	Data 02		0
Input Byte 06	0	Send	Output Byte 06	0	Data 03		0
Input Byte 07	0	Send	Output Byte 07	0	Data 04		0
Input Byte 08	0	Send	Output Byte 08	0	Data 05		0
Input Byte 09	0	Send	Output Byte 09	0	Data 06		0
Input Byte 10	0	Send	Output Byte 10	0	Data 07		0
Input Byte 11	0	Send	Output Byte 11	0	Data 08		0
Input Byte 12	0	Send	Output Byte 12	0	Data 09		0
Input Byte 13	0	Send	Output Byte 13	0	Data 10		0
Input Byte 14	0	Send	Output Byte 14	0	Data 11		0
Input Byte 15	0	Send	Output Byte 15	0	Data 12		128

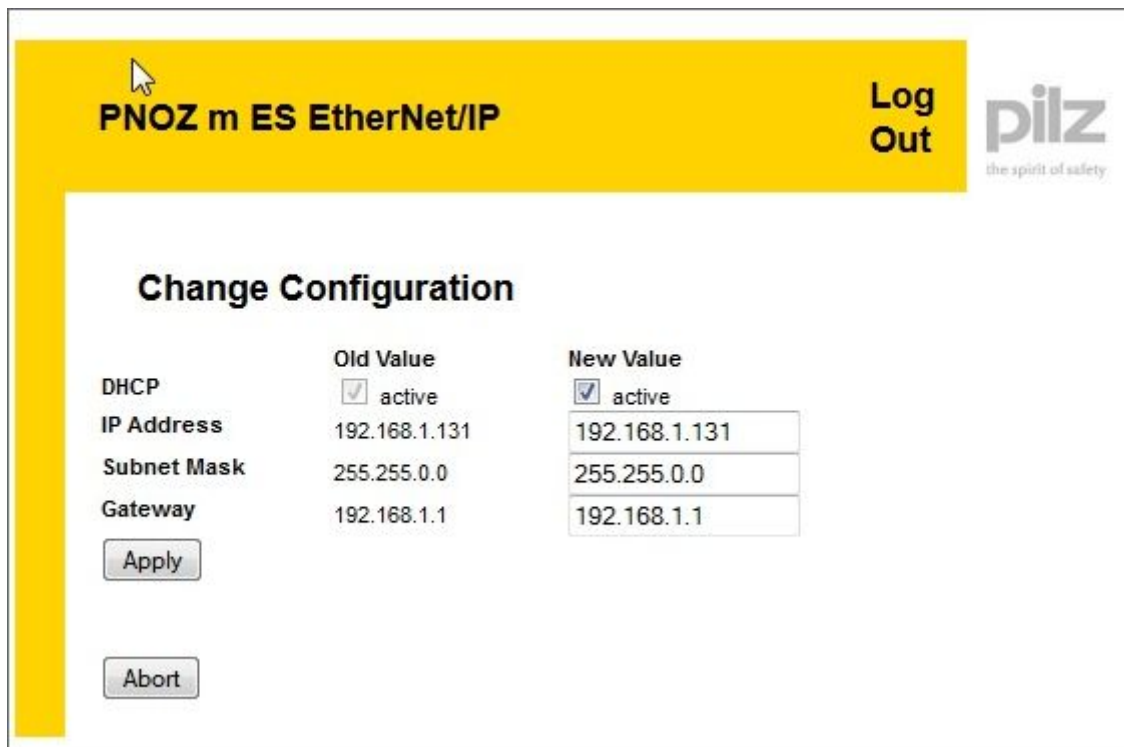
Configuration

Serial number	123456
Software Version	1.1
MAC Address	c8:3e:a7:00:01:4f
DHCP	☐ active
IP address	192.168.1.30
Subnet mask	255.255.255.0
Gateway	192.168.1.1

Figure 15: Web-Server: Overview

- ▶ Select "Change Configuration" to setup a new IP Address

- ▶ Enter an IP Address and select "Apply", set all DIP-Switches in the OFF position and restart the device



PNOZ m ES EtherNet/IP Log Out 

Change Configuration

	Old Value	New Value
DHCP	☒ active	☒ active
IP Address	192.168.1.131	192.168.1.131
Subnet Mask	255.255.0.0	255.255.0.0
Gateway	192.168.1.1	192.168.1.1

Figure 16: Web-Server: Setup a new IP Address

3.3 Steps for Allen-Bradley ControlLogix PLC

- ▶ Start software "Studio 5000"

3.3.1 Ethernet/IP Scanner / Adapter Configuration

Create new Module Type (for EtherNet/IP Scanner):

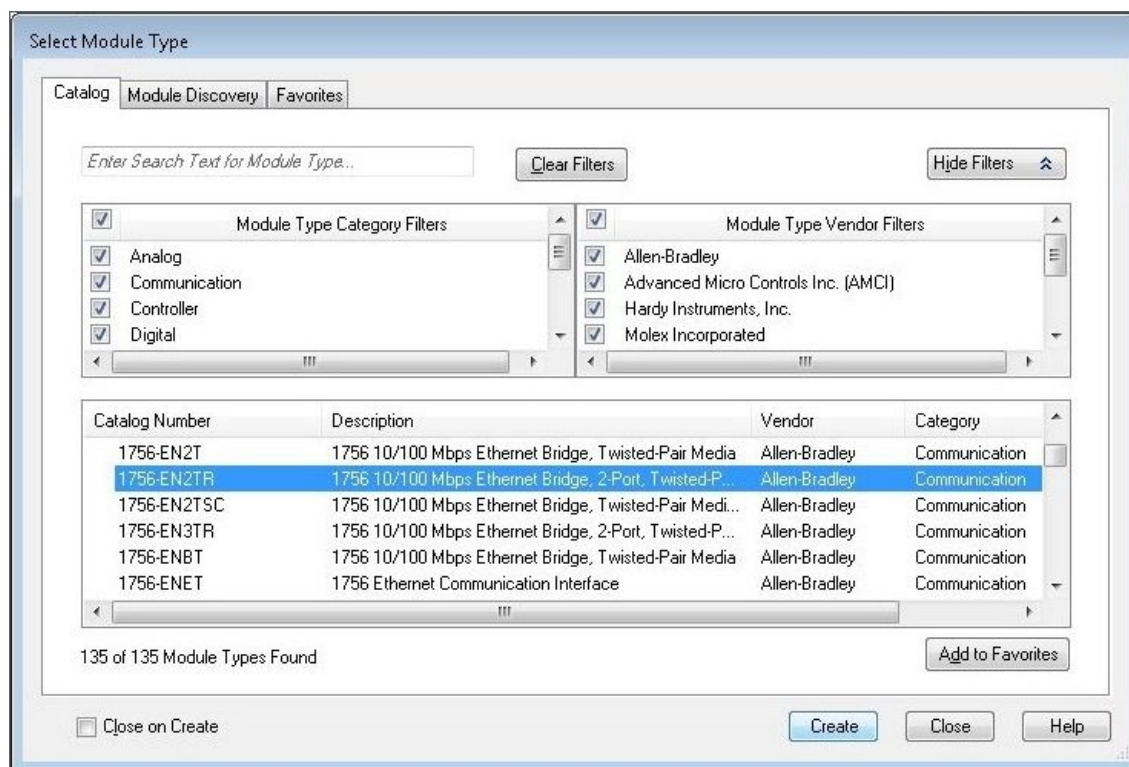


Figure 17: Studio 5000 – Create new Module Type for Ethernet/IP Scanner (1)

- ▶ Enter a Name and the IP Address of the Ethernet/IP Scanner

New Module

General* Connection RSNetWorx Module Info Internet Protocol Port Configuration Network Time Sync

Type: 1756-EN2TR 1756 10/100 Mbps Ethernet Bridge, 2-Port, Twisted-Pair Media Change Type... ←

Vendor: Allen-Bradley

Parent: Local

Name: EthernetIPScanner

Description:

Ethernet Address

☒ Private Network: 192.168.1.10

☐ IP Address:

☐ Host Name:

Slot: 2

Module Definition Change ...

Revision: 10.1

Electronic Keying: Compatible Module

Connection: None

Time Sync Connection: None

Status: Creating OK Cancel Help

Figure 18: Studio 5000 – Create new Module Type for Ethernet/IP Scanner (2)

- ▶ Add a PNOZ m ES Ethernet/IP Module

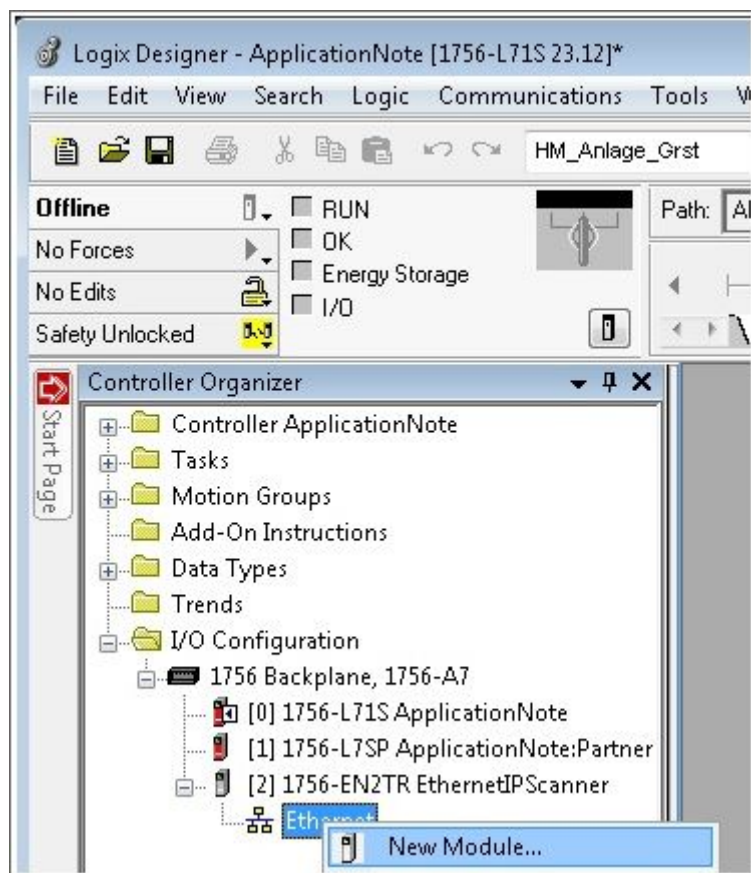


Figure 19: Studio 5000 – Create new PNOZ m ES Ethernet/IP Module (1)

► Add the PNOZ m ES Ethernet/IP Module

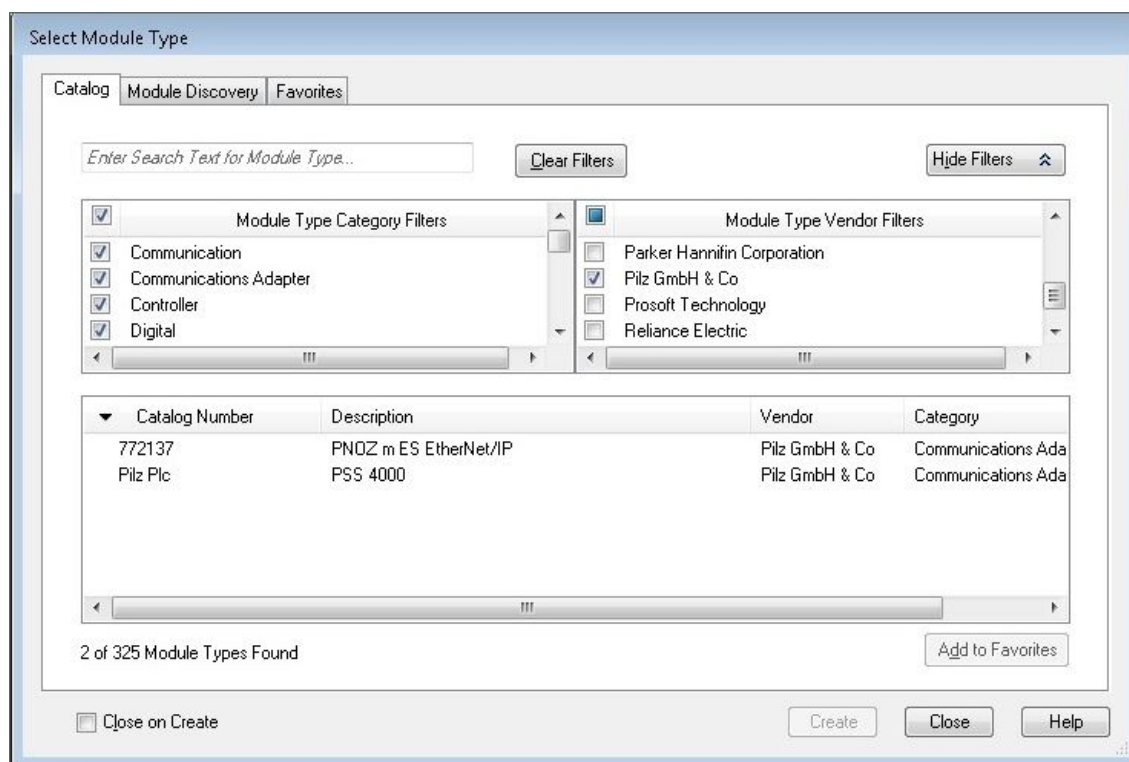


Figure 20: Studio 5000 – Create new PNOZ m ES Ethernet/IP Module (2)

- ▶ Enter a Name and the IP Address of the Ethernet/IP Adapter
- ▶ More about the IP Address of the Module you can find in Chapter 5.2

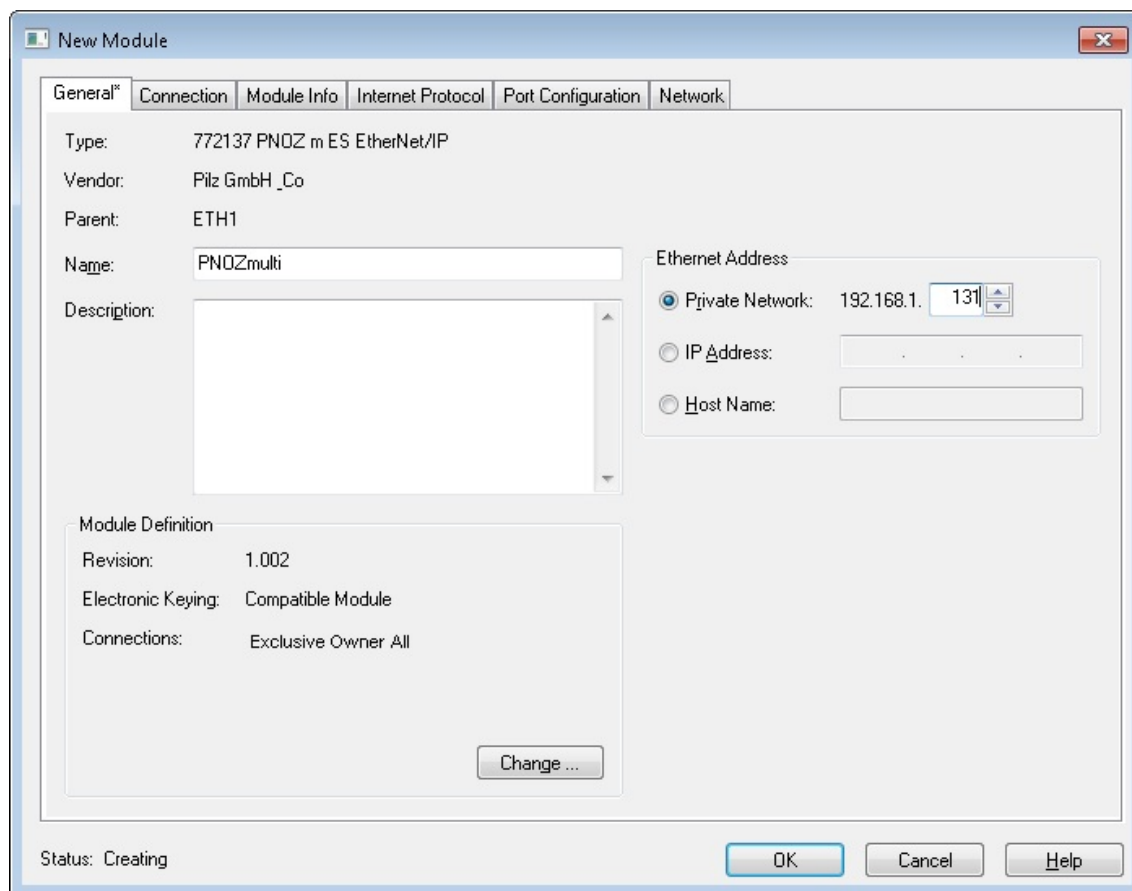


Figure 21: Studio 5000 – Create new PNOZ m ES Ethernet/IP Module (3)

- ▶ Click to "Change" - If necessary disable keying and change the length of transferred IO/Data

You can select between

- ▶ "Exclusive Owner All" with 32 Bytes (virtual I/Os, LED Status of Base Modul and table segments)
- ▶ "Exclusive Owner Assembly" with 17 Bytes (virtual I/Os and LED Status)
- ▶ The Structure of the cyclic transferred data is explained in Chapter 5.3.4

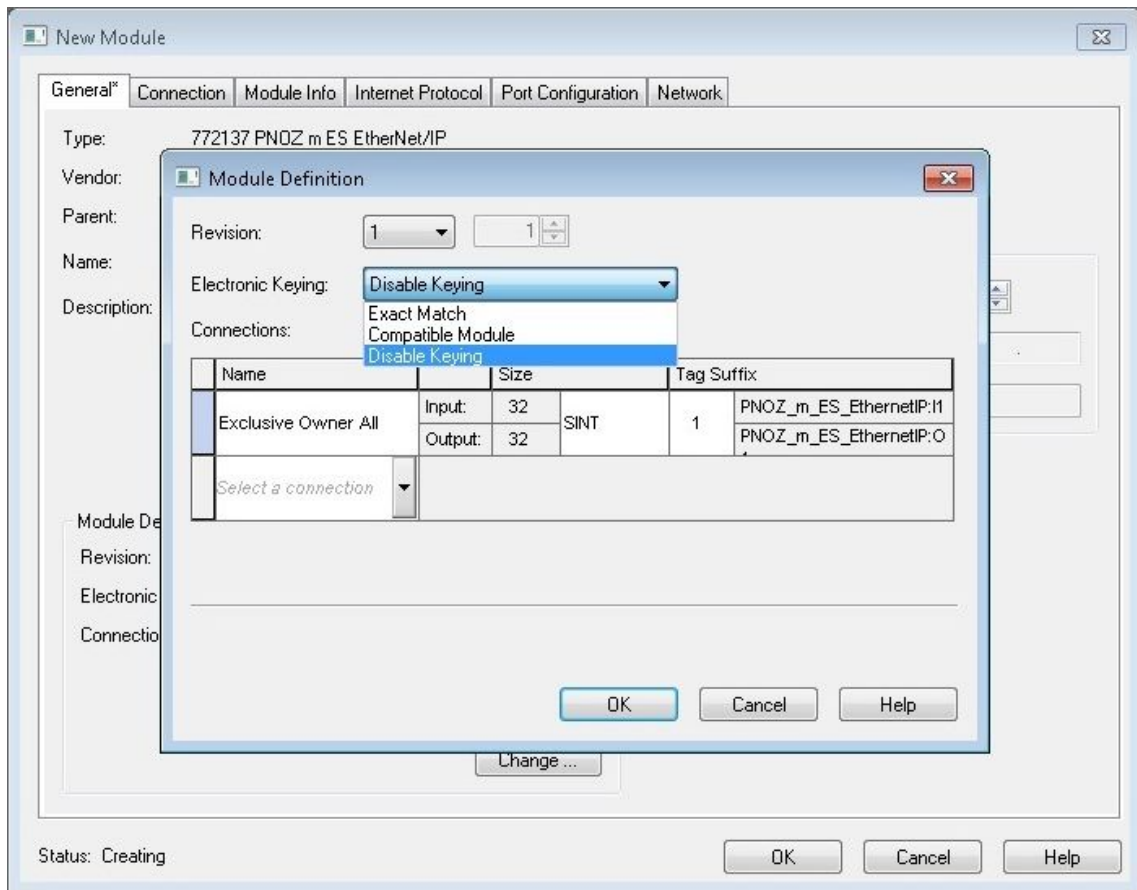


Figure 22: Studio 5000 – Create new PNOZ m ES Ethernet/IP Module (4)

- ▶ Enter a valid RPI

Name	Requested Packet Interval (RPI) (ms)	Input Type	Input Trigger
Exclusive Owner All	20.0	Unicast	Cyclic

☐ Inhibit Module

☐ Major Fault On Controller If Connection Fails While in Run Mode

Module Fault

Status: Creating

OK Cancel Help

Figure 23: Studio 5000 – Create new PNOZ m ES Ethernet/IP Module (4)



NOTICE

If the used version of RSLogix5000 configuration file (EDS) is not supported, use the Generic Ethernet Module and configure the properties manually.

- » Input: Assembly Instance 100 (32 Bytes) or 101 (17 Bytes)
- » Output: Assembly Instance 150 (32 Bytes) or 151 (17 Bytes)
- » Configuration: Assembly Instance 4 (0 Byte)

3.3.2 Download project to ControlLogix PLC

Check before downloading that the correct communication path to ControlLogix PLC is set.



Figure 24: Studio 5000 – Select recent communication path

► Start Download:

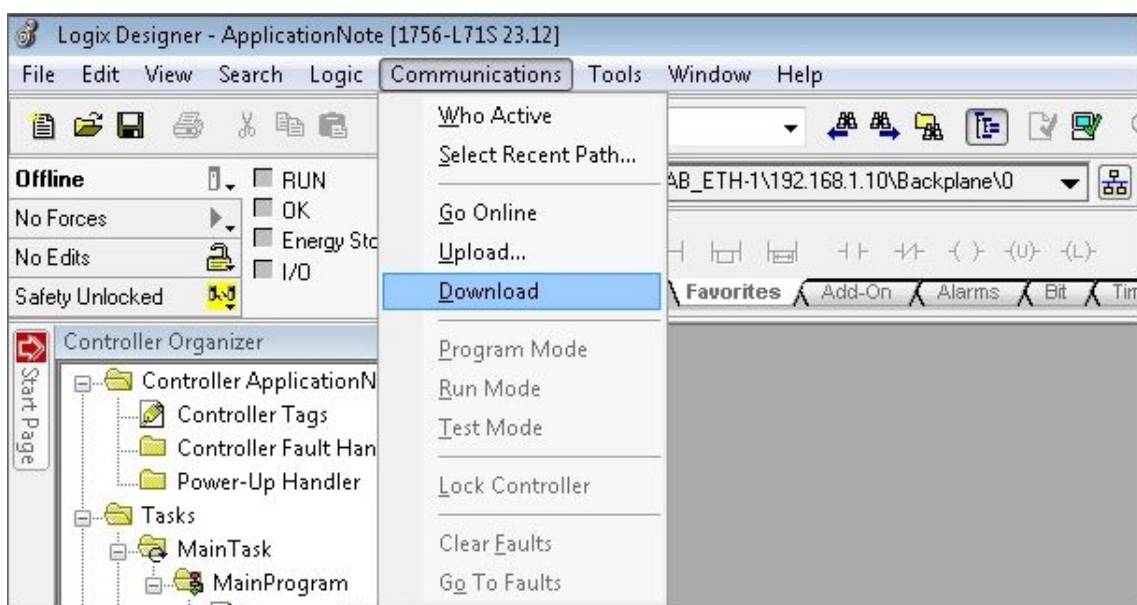


Figure 25: Studio 5000 –Start Download to ControlLogix PLC



NOTICE

If the > Key-Switch on ControlLogix Controller is in RUN position, move it before you continue with download to REM or PROG position.



The keyswitch is in the RUN position. Move it to REM or PROG in order to download.

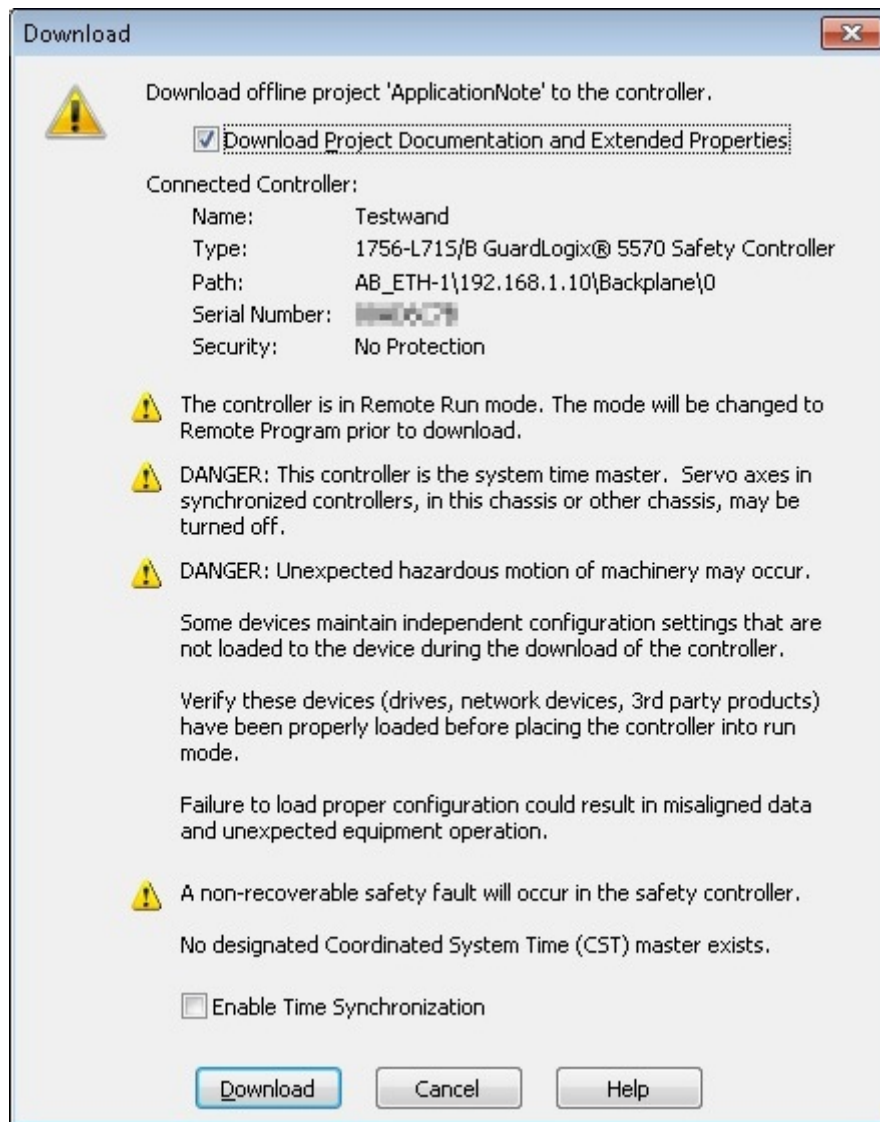


Figure 26: Studio 5000 – Continue download to ControlLogix PLC



NOTICE

After download move > Key-Switch on ControlLogix Controller back to REM or RUN position!

3.3.3 Controller Tags

To view the process data from PNOZ m ES Ethernet/IP Module open the Controller Tags in the tree

- ▶ Go Online
- ▶ Select "Monitor Tags"
- ▶ Select the PNOZmulti

3.3.4 Structure of the cyclic transferred data (Implicite Messaging)

Scanner Input Byte 00	Virtual Output 0..7	Exclusive Owner All, Assembly Instance Input 100	Exclusive Owner, Assembly Instance Input 101
Scanner Input Byte 01	Virtual Output 8..15		
Scanner Input Byte 02	Virtual Output 16..23		
Scanner Input Byte 03	Virtual Output 24..31		
Scanner Input Byte 04	Virtual Output 32..39		
Scanner Input Byte 05	Virtual Output 40..47		
Scanner Input Byte 06	Virtual Output 48..55		
Scanner Input Byte 07	Virtual Output 56..63		
Scanner Input Byte 08	Virtual Output 64..71		
Scanner Input Byte 09	Virtual Output 72..79		
Scanner Input Byte 10	Virtual Output 80..87		
Scanner Input Byte 11	Virtual Output 88..95		
Scanner Input Byte 12	Virtual Output 96..103		
Scanner Input Byte 13	Virtual Output 104..111		
Scanner Input Byte 14	Virtual Output 112..119		
Scanner Input Byte 15	Virtual Output 120..127		
Scanner Input Byte 16	LED status		
Scanner Input Byte 17	Table Number	Exclusive Owner All, Assembly Instance Input 100	Exclusive Owner, Assembly Instance Input 101
Scanner Input Byte 18	Segment Number		
Scanner Input Byte 19	Reserved		
Scanner Input Byte 20	Reserved		
Scanner Input Byte 21	Reserved		
Scanner Input Byte 22	Reserved		
Scanner Input Byte 23	Reserved		
Scanner Input Byte 24	Reserved		
Scanner Input Byte 25	Reserved		
Scanner Input Byte 26	Reserved		
Scanner Input Byte 27	Reserved		
Scanner Input Byte 28	Reserved		
Scanner Input Byte 29	Reserved		
Scanner Input Byte 30	Reserved		
Scanner Input Byte 31	Reserved		

Figure 27: Structure of the cyclic transferred data – Scanner Input Bytes

Scanner Output Byte 00	Virtual Input 0..7	Exclusive Owner All, Assembly Instance Output 150	Exclusive Owner, Assembly Instance Output 151
Scanner Output Byte 01	Virtual Input 8..15		
Scanner Output Byte 02	Virtual Input 16..23		
Scanner Output Byte 03	Virtual Input 24..31		
Scanner Output Byte 04	Virtual Input 32..39		
Scanner Output Byte 05	Virtual Input 40..47		
Scanner Output Byte 06	Virtual Input 48..55		
Scanner Output Byte 07	Virtual Input 56..63		
Scanner Output Byte 08	Virtual Input 64..71		
Scanner Output Byte 09	Virtual Input 72..79		
Scanner Output Byte 10	Virtual Input 80..87		
Scanner Output Byte 11	Virtual Input 88..95		
Scanner Output Byte 12	Virtual Input 96..103		
Scanner Output Byte 13	Virtual Input 104..111		
Scanner Output Byte 14	Virtual Input 112..119		
Scanner Output Byte 15	Virtual Input 120..127		
Scanner Output Byte 16	Reserved		
Scanner Output Byte 17	Table Number	Exclusive Owner All, Assembly Instance Output 150	Exclusive Owner, Assembly Instance Output 151
Scanner Output Byte 18	Segment Number		
Scanner Output Byte 19	Segment Data Byte 00		
Scanner Output Byte 20	Segment Data Byte 01		
Scanner Output Byte 21	Segment Data Byte 02		
Scanner Output Byte 22	Segment Data Byte 03		
Scanner Output Byte 23	Segment Data Byte 04		
Scanner Output Byte 24	Segment Data Byte 05		
Scanner Output Byte 25	Segment Data Byte 06		
Scanner Output Byte 26	Segment Data Byte 07		
Scanner Output Byte 27	Segment Data Byte 08		
Scanner Output Byte 28	Segment Data Byte 09		
Scanner Output Byte 29	Segment Data Byte 10		
Scanner Output Byte 30	Segment Data Byte 11		
Scanner Output Byte 31	Segment Data Byte 12		

Figure 28: Structure of the cyclic transferred data – Scanner Output Bytes



NOTICE

The content of the Segment Data Bytes you can find in the Document “PNOZmulti 2 Communication Interfaces”

3.3.5 Structure of the acyclic transferred data (Explicit Messaging)

The PNOZ m ES Ethernet/IP Module also supports Explicit Messaging. In the document “PNOZmulti 2 Communication Interfaces” you can find the Instance and Attribute Number.

3.4 Steps for PNOZ multi

3.4.1 PNOZ multi Configuration

- ▶ Create a new project
- ▶ Select Modules

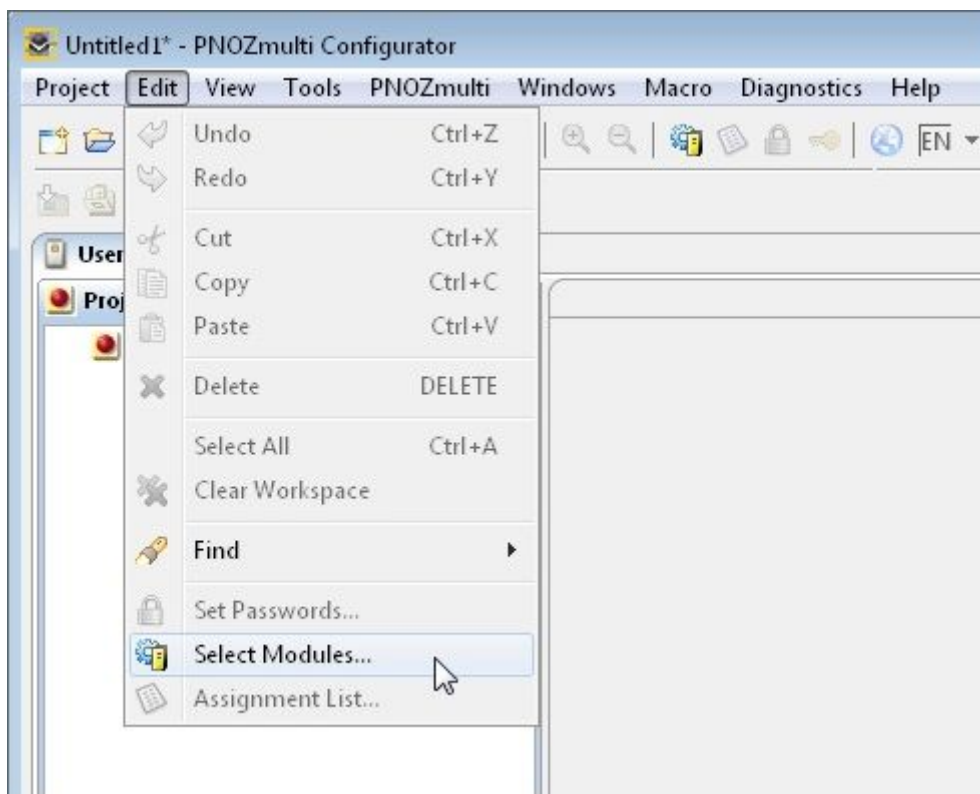


Figure 29: PNOZmulti Configurator – Select Modules

► Select the used Hardware

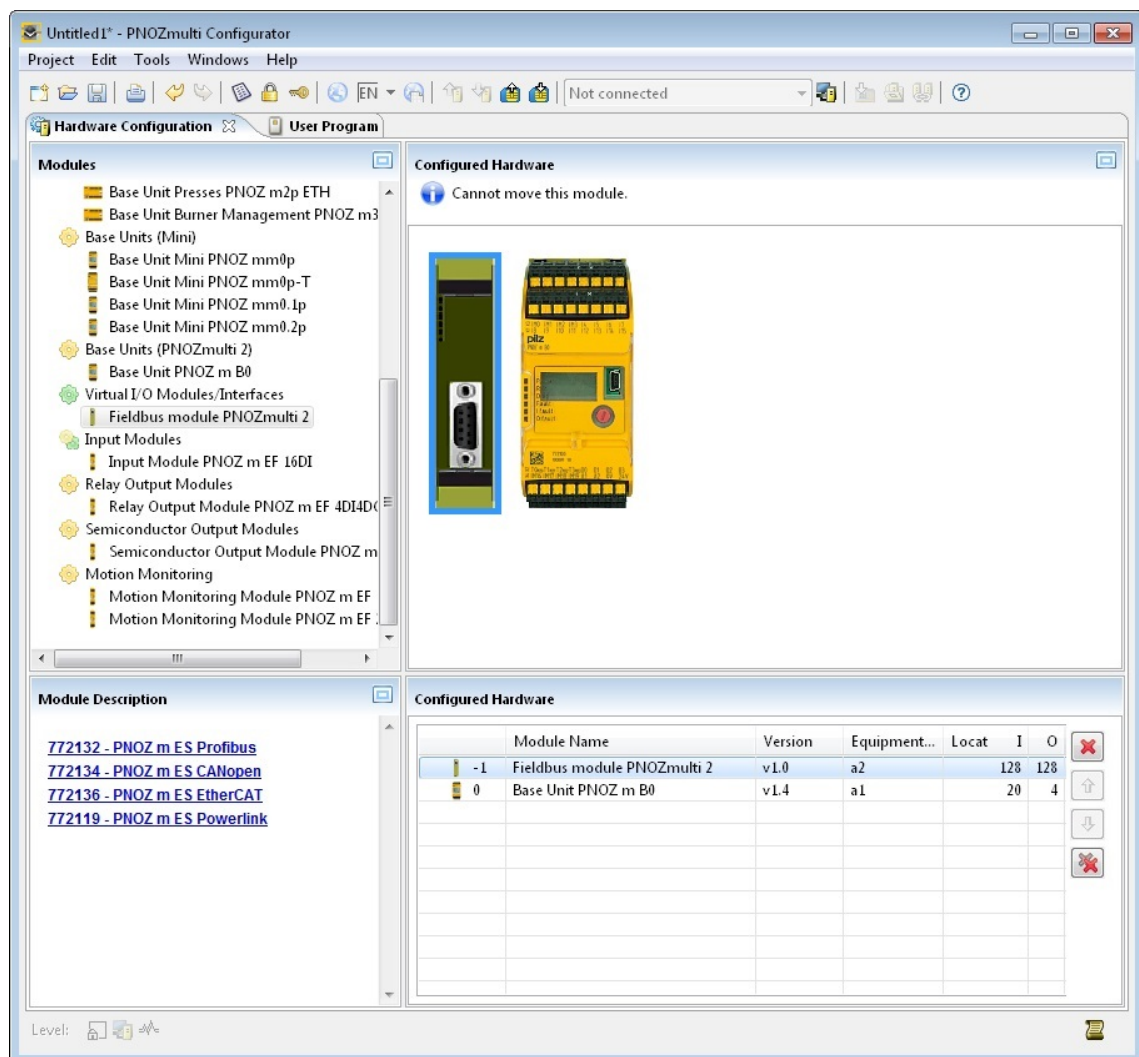


Figure 30: PNOZmulti Configurator – Select the used Hardware

**NOTICE**

To test the communication between the PNOZ multi and the Ethernet/IP Scanner you need at least one safety function in the PNOZ multi program.

- ▶ Insert a safety function, e.g. E-STOP

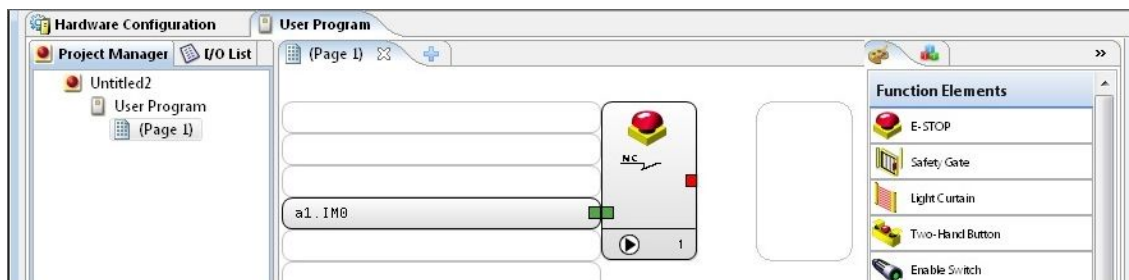


Figure 31: PNOZmulti Configurator – Insert E-Stop

- ▶ Insert an output and connect it with the E-STOP

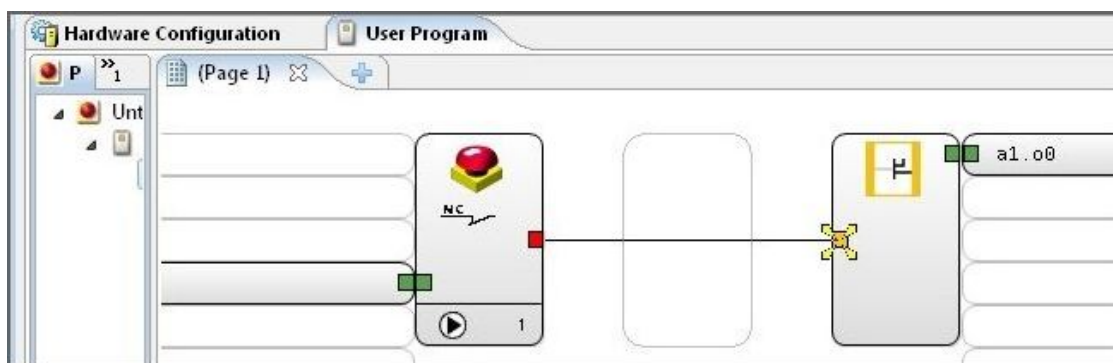


Figure 32: PNOZmulti Configurator – Insert Output

► Insert a virtual Output

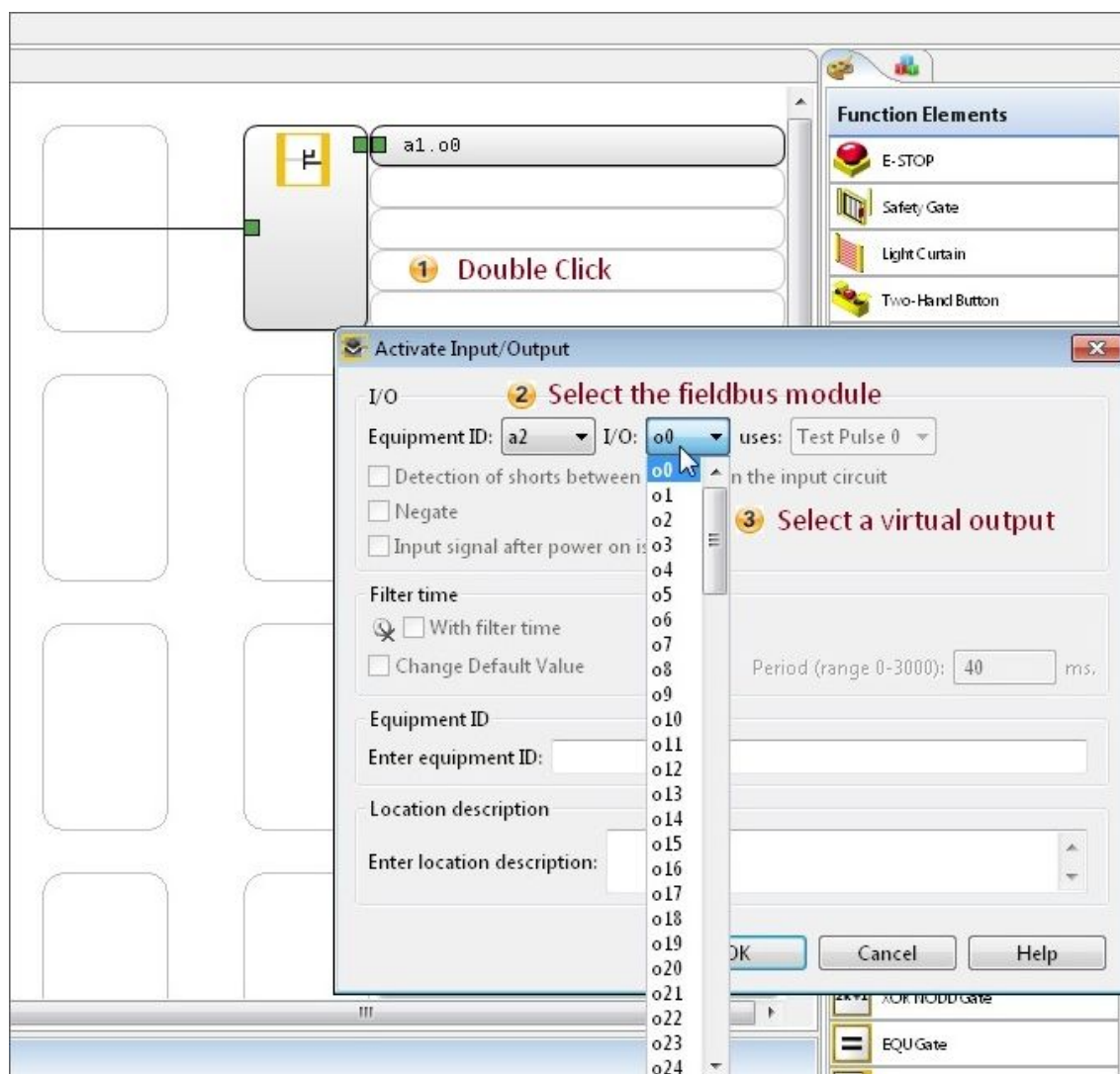


Figure 33: PNOZmulti Configurator – Insert a virtual Output

- ▶ Connect the virtual Output with the E-STOP to get the status of the E-STOP

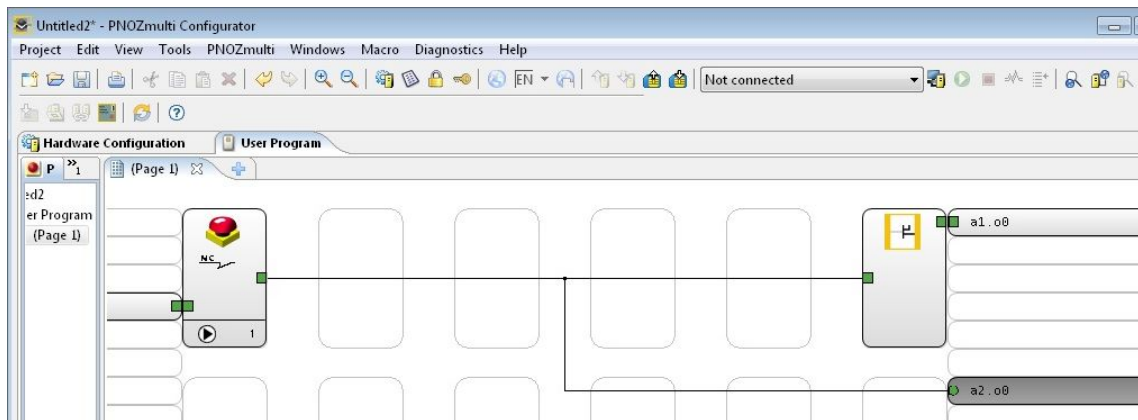


Figure 34: PNOZmulti Configurator – virtual Output is connected with E-Stop

3.4.2 PNOZ multi Download

- ▶ Select Interface

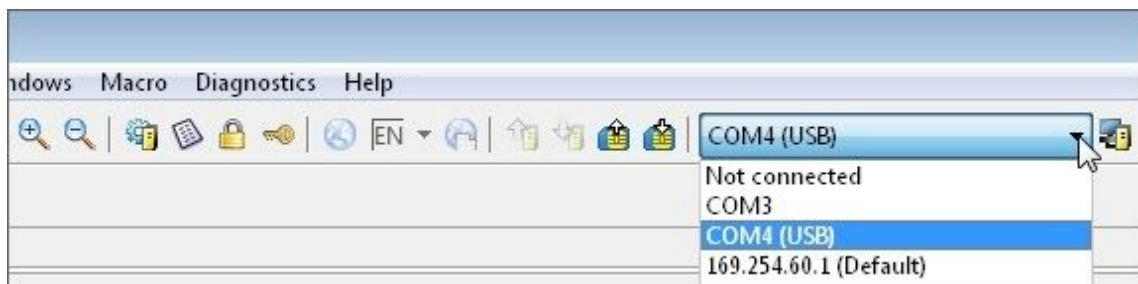


Figure 35: PNOZmulti Configurator – Select the Interface

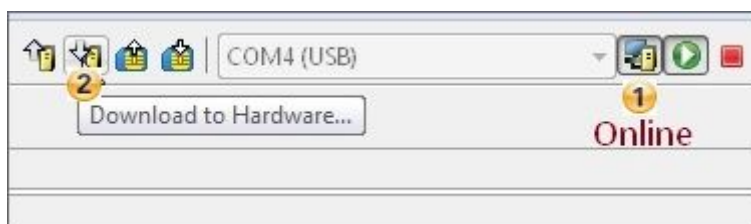


Figure 36: PNOZmulti Configurator – Download to PNOZmulti (1)

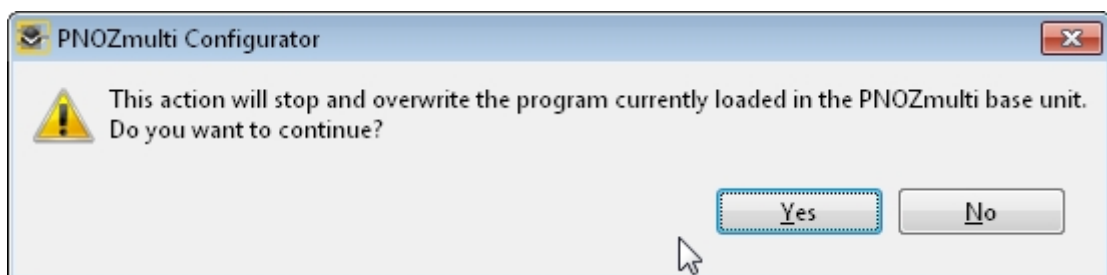


Figure 37: PNOZmulti Configurator – Download to PNOZmulti (2)

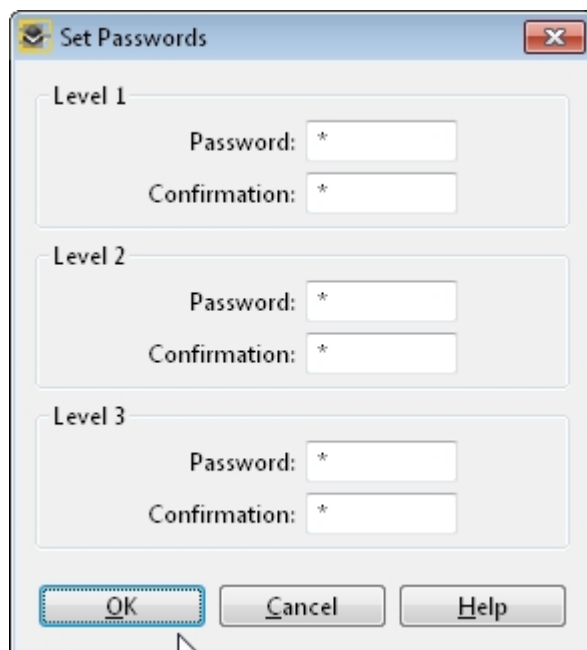


Figure 38: PNOZmulti Configurator – Download to PNOZmulti (3)

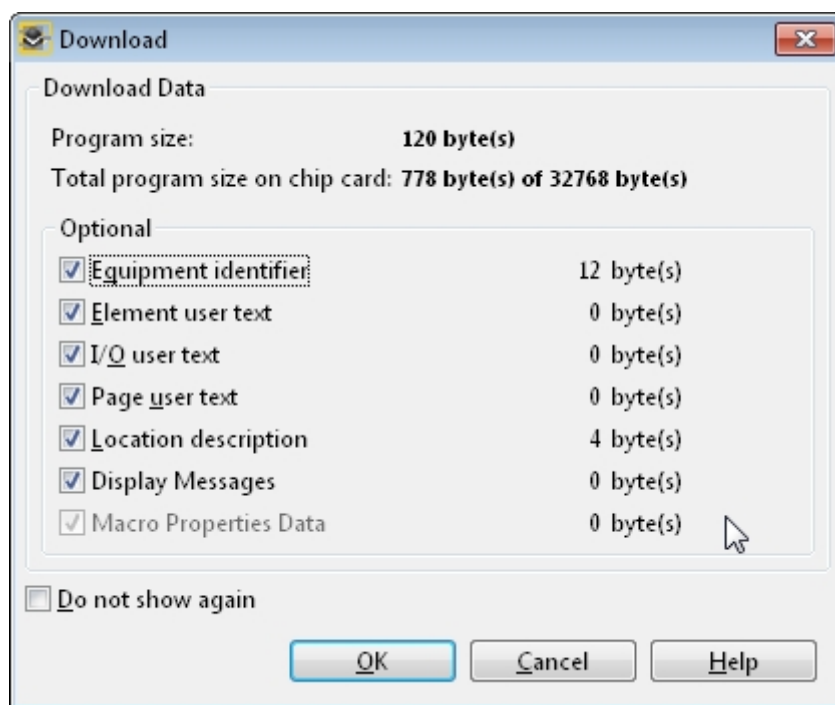


Figure 39: PNOZmulti Configurator – Download to PNOZmulti (4)

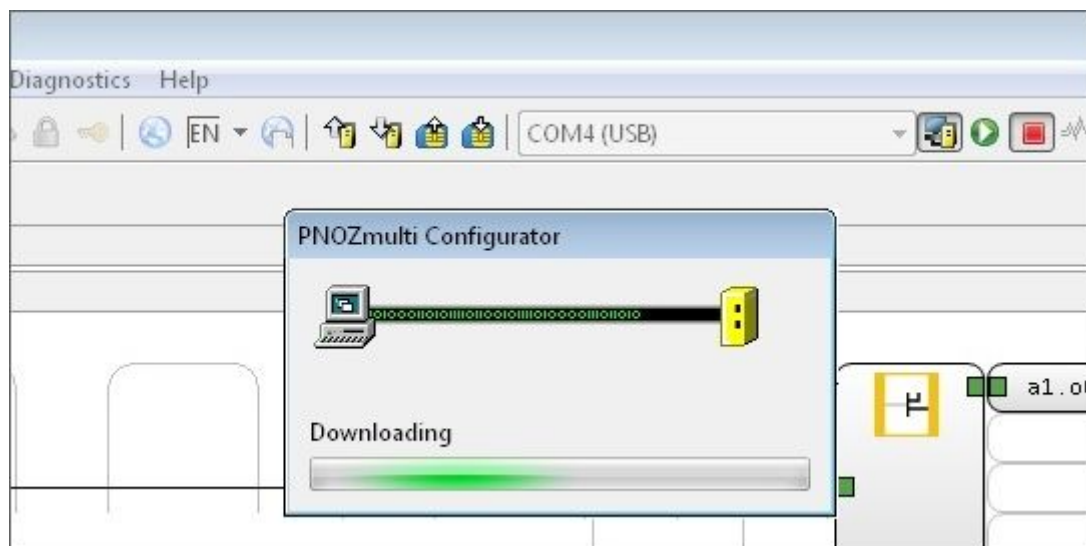


Figure 40: PNOZmulti Configurator – Download to PNOZmulti (5)

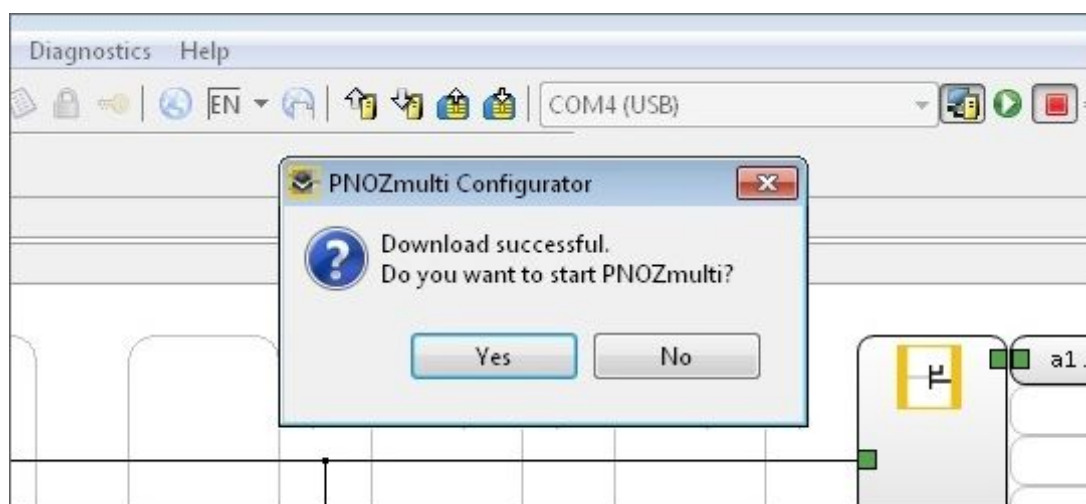


Figure 41: PNOZmulti Configurator – Download to PNOZmulti (6)

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