

PNOZmulti Modbus/TCP



PNOZmulti Modular Safety System

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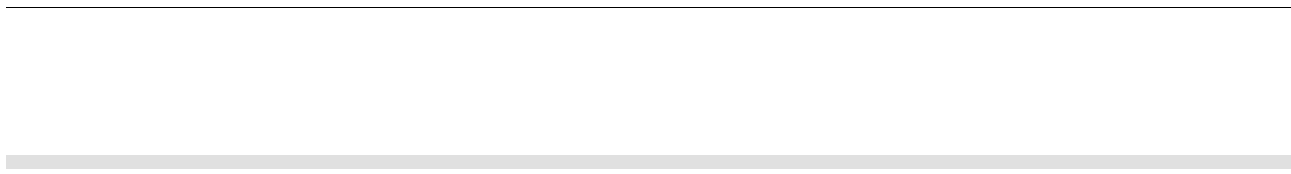
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SD means Secure Digital.

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1 Introduction

1.1 Validity of documentation

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product .

1.1.1 Retaining the documentation

This documentation is intended for instruction and should be retained for future reference.

1.2 Overview of documentation

1 Introduction

The introduction is designed to familiarise you with the contents, structure and specific order of this manual.

2 Overview

This chapter provides information on the product's most important features.

3 Safety

This chapter must be read as it contains important information on safety and intended use.

4 Function Description

This chapter describes the product's mode of operation.

5 Installation

This chapter explains how to install the product.

6 Commissioning

This chapter describes the product's commissioning and wiring.

7 Operation

This chapter describes how to operate the product and gives tips in the case of a fault.

8 Technical Details

This chapter contains the product's technical details and order reference.

1.3 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



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.



INFORMATION

This gives advice on applications and provides information on special features, as well as highlighting areas within the text that are of particular importance.

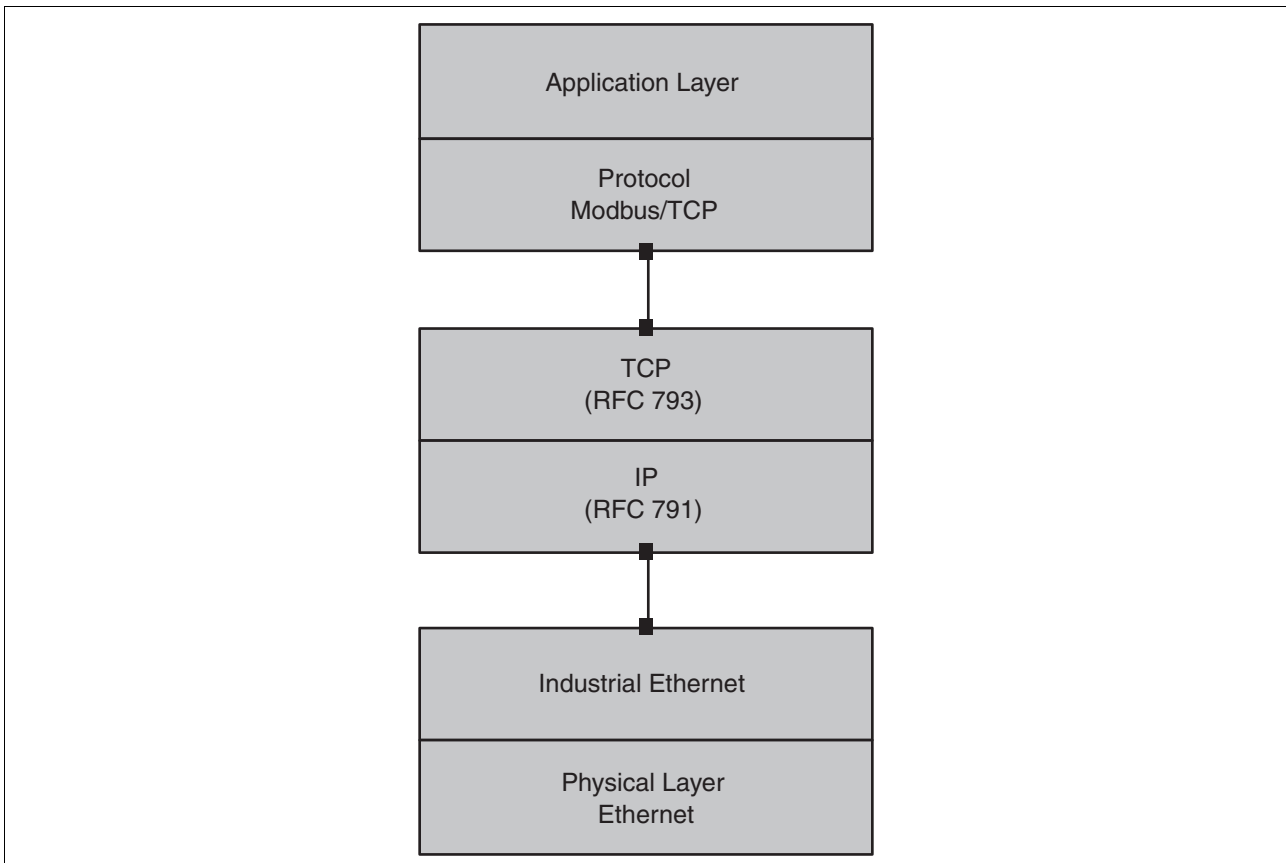
1.4 System requirements

- ▶ PNOZmulti Configurator: From Version 7.1.0
- ▶ Base unit PNOZ m0p ETH: From Version 1.0
- ▶ Base unit PNOZ m1p ETH: From Version 2.1
- ▶ Base unit PNOZ m2p ETH: From Version 1.0
- ▶ Base unit PNOZ m3p ETH: From Version 1.0
- ▶ Expansion module PNOZ mmc1p ETH from Version 1.0

Please contact Pilz if you have an older version.

2.1 Modbus/TCP - Basics

Modbus is an open fieldbus standard published by the User Group MODBUS-IDA (see www.Modbus-IDA.org).



Modbus/TCP is a protocol based on Industrial Ethernet (TCP/IP over Ethernet). It is a protocol with Client/Server communication. Data is transferred via a request/response mechanism using function codes (FC).

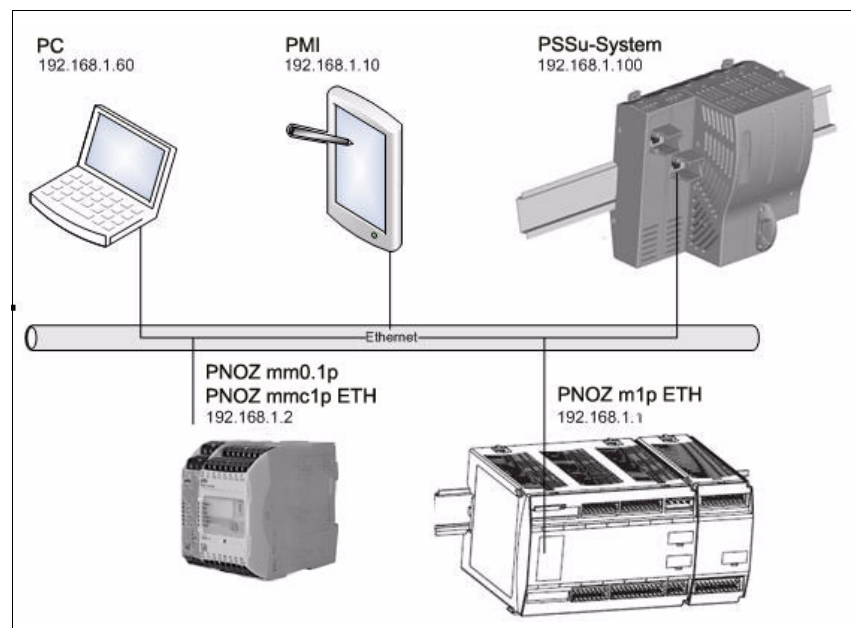
Modbus/TCP is connection-oriented, i.e. before usable data is transferred via Modbus/TCP, a connection must first be established between two Modbus/TCP interfaces. The initiator of the connection is called the Client. The communications partner with which the Client establishes the connection is called the Server. Whether a connection on a device assumes the role of Client or Server is defined when a connection is configured. As a result, the Server/Client role only applies for the used connection.

2.2 Modbus/TCP with PNOZmulti

All base units from the modular safety system PNOZmulti that have an Ethernet interface (PNOZ m1p ETH from V2.1) support Modbus/TCP. The same applies for the base units PNOZmulti Mini in conjunction with a communication module with Ethernet interface.

A PNOZmulti base unit can manage a max. of 8 Modbus/TCP connections. The PNOZmulti is always the Server in a connection. The Clients in the connections may be various devices, e.g. PC (PNOZmulti Configurator), control system, display unit. They can access the modular safety system PNOZmulti simultaneously.

The virtual I/Os plus all the information that is polled during fieldbus communication are contained in data areas. The data is accessed directly. It's no longer necessary to switch via table/segment.



The configurations required for Modbus/TCP are fully pre-configured in the PNOZmulti operating system. All that's necessary in the PNOZmulti Configurator is to activate the virtual inputs and outputs (see PNOZmulti Configurator's online help, under "Display and edit module selection").

On a modular control system PNOZmulti, port number "502" is fixed as the default for data exchange via a Modbus/TCP connection. It is not displayed in the PNOZmulti Configurator and cannot be modified.

3.1 Overview

A modular safety system PNOZmulti supports the following Modbus/TCP data areas:

| Data area | Modbus syntax | Example |
|--|---------------|--|
| Coils (Bit) 0x00000 ... 0x65535 [read/write] | 0x[xxxxx] | 0x00031 (virtual input i31) |
| Discrete Inputs (Bit) 1x00000 ... 1x65535 [read only] | 1x[xxxxx] | 1x08193 (virtual output o1) |
| Input Register (Word/16 Bits) 3x00000 ... 3x65535 [read only] | 3x[xxxxx] | 3x00002 (virtual inputs 32 ... 47) |
| Holding Register (Word/16 Bits) 4x00000 ... 4x65535 [read/write] | 4x[xxxxx] | 4x00805 (project name, 1st character) |



INFORMATION

Addressing for PNOZmulti systems starts at "0". On devices from other manufacturers, addressing can start at "1". Please refer to the operating manual provided by the relevant manufacturer.

3.2 Function codes

The following function codes (FC) are available for communication with the modular safety system PNOZmulti via Modbus/TCP:

| Function code | Function | |
|---------------|-------------------------------|---|
| FC 01 | Read Coils | The Client in a connection reads bit data from the Server in the connection, data length ≥ 1 Bit, content: input/output data (data received from 0x) |
| FC 02 | Read Discrete Input | The Client in a connection reads bit data from the Server in the connection, data length ≥ 1 Bit, content: input/output data (data received from 1x) |
| FC 03 | Read Holding Register | The Client in a connection reads word data from the Server in the connection, data length ≥ 1 Word, content: diagnostic word (data received from 4x) |
| FC 04 | Read Input Register | The Client in the connection reads word data from the Server in the connection, data length ≥ 1 Word, content: diagnostic word (data received from 3x) |
| FC 05 | Write Single Coil | The Client in the connection writes to one bit datum in the Server in the connection, data length = 1 Bit, content: input data (send data to 0x) |
| FC 06 | Write Single Register | The Client in the connection writes to one word datum in the Server in the connection, data length = 1 Word, content: input data (send data to 4x) |
| FC 15 | Write Multiple Coils | The Client in the connection writes to multiple bit data in the Server in the connection, data length ≥ 1 Bit, content: input data (send data to 0x) |
| FC 16 | Write Multiple Registers | The Client in a connection writes to multiple word data in the Server in the connection, data length = 1 Word, content: input data (send data to 4x) |
| FC 23 | Read/Write Multiple Registers | The Client in a connection reads and writes multiple word data within a telegram (receive data from 3x and send data to 4x) |

3.3 Data transfer limits

The following table contains information on the maximum data length per telegram that is supported:

| Data transfer | | Max. data length per telegram |
|----------------------------|---------------------------------------|---|
| Read data (Bit) | FC 01 (Read Coils) | 1 ... 2000 |
| | FC 02 (Read Discrete Inputs) | |
| Read data (Bit) | FC 05 (Write Single Coil) | 1 Bit |
| | FC 15 (Write Multiple Coils) | 1 ... 1968 |
| Read data (Word) | FC 03 (Read Holding Registers) | 1 ... 125 |
| | FC 04 (Read Input Register) | |
| Write data (Word) | FC 06 (Write Single Register) | 1 Word |
| | FC 16 (Write Multiple Registers) | 1 ... 123 Words |
| Read and write data (Word) | FC 23 (Read/Write Multiple Registers) | Read 1 ... 125 Words Write 1 ... 121 Words |



INFORMATION

There may be some restrictions in data length, depending on the device that is used. Please refer to the information stated in the operating manual of the device you are using.

3.4 Assignment of data areas

Data can be accessed via various Modbus/TCP data areas.

The tables below show the relationship between Modbus/TCP data areas and the content of the data areas.

3.4.1 Virtual inputs

The table below describes the Modbus/TCP data areas that contain the current state of the virtual inputs on the PNOZmulti. These are the virtual inputs that can be set by the user.

Relevant areas for the data are defined in each Modbus/TCP data area (Coils (0x), Discrete Inputs (1x), Input Register (3x), Holding Register (4x)). Read/write access will depend on the Modbus/TCP data area.

| Register (3x, 4x) | Coil/ Discrete Input (0x, 1x) | Content | High Byte | Low Byte |
|-------------------|-------------------------------|-------------------------------|-------------|-------------|
| 0 | 15... 0 | State of the inputs 0...15 | i15...i8 | i7...i0 |
| 1 | 31... 6 | State of the inputs 16...31 | i31...i24 | i23...i16 |
| 2 | 47...32 | State of the inputs 32...47 | i47...i40 | i39...i32 |
| 3 | 63...48 | State of the inputs 48...63 | i63...i56 | i55...i48 |
| 4 | 79... 64 | State of the inputs 64...79 | i79...i72 | i71...i64 |
| 5 | 95...80 | State of the inputs 80...95 | i95...i88 | i87...i80 |
| 6 | 111...96 | State of the inputs 96...111 | i111...i104 | i103...i96 |
| 7 | 127...112 | State of the inputs 112...127 | i127...i120 | i119...i112 |

3.4 Assignment of data areas

3.4.2 Control Register

A watchdog can be activated in Control Register 255.
 If no input bits are set by a Modbus/TCP subscriber within the preset time, the PNOZmulti will set the input bits to "0".

The table below describes the Modbus/TCP data areas for the watchdog.

A relevant area for the watchdog is defined in each Modbus/TCP data area (Coils (0x), Discrete Inputs (1x), Input Register (3x), Holding Register (4x)). Read/write access will depend on the Modbus/TCP data area.

| Register (3x, 4x) | Coil/ Discrete Input (0x, 1x) | Content | High Byte | Low Byte |
|-------------------|-------------------------------|------------------|-----------------|----------|
| 255 | 4095...4080 | Control Register | See table below | |

| High Byte | WD-Trig-ger | Error Mes- sage | Reserved | Reserved | Reserved | W-Timer Bit 2 | W-Timer Bit 1 | W-Timer Bit 0 |
|-----------|-------------|-----------------|----------|----------|----------|---------------|---------------|---------------|
| Low Byte | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved |

Bit 15 "Watchdog Trigger": The watchdog can be triggered by setting Bit 15 constantly to "1", or by a Client writing in the input area of the 128 inputs. The state of the bit when reading is undefined. A 1 or a 0 can be read.

Bit 14 "Error Message": If this bit is set, an error stack entry is generated when the watchdog is triggered.

Bit 10 ... 8 "WD Timer": If the set time for the watchdog is set, then Bit 15 must be set, or become set, at the same time.

| Watchdog Timer Bit 2 | Watchdog Timer Bit 1 | Watchdog Timer Bit 0 | Watchdog time |
|----------------------|----------------------|----------------------|-------------------|
| 0 | 0 | 0 | Timer deactivated |
| 0 | 0 | 1 | 100 ms |
| 0 | 1 | 0 | 200 ms |
| 0 | 1 | 1 | 500 ms |
| 1 | 0 | 0 | 1 s |
| 1 | 0 | 1 | 3 s |
| 1 | 1 | 0 | 5 s |
| 1 | 1 | 1 | 10 s |

3.4 Assignment of data areas



INFORMATION

To check whether the watchdog has been triggered, set a virtual input permanently to "1".

If this input is "0", then the watchdog has been triggered.

3.4.3 Virtual outputs

The table below describes the Modbus/TCP data areas that contain the state of the virtual outputs on the PNOZmulti.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|-----------------------------------|-------------|-------------|
| 512 | 8207...8192 | State of the outputs 0...15 | o15...o8 | o7...o0 |
| 513 | 8223...8208 | State of the outputs 16...31 | o31...o24 | o23...o16 |
| 514 | 8239...8224 | State of the outputs 32...47 | o47...o40 | o39...o32 |
| 515 | 8255...8240 | State of the outputs 48...63 | o63...o56 | o55...o48 |
| 516 | 8271...8256 | State of the outputs 64...79 | o79...o72 | o71...o64 |
| 517 | 8287...8272 | State of the outputs 80...95 | o95...o88 | o87...o80 |
| 518 | 8303...8288 | State of the outputs 96...111 | o111...o104 | o103...o96 |
| 519 | 8319...8304 | State of the outputs 112...127 | o127...o120 | o119...o112 |

3.4 Assignment of data areas

3.4.4 LEDs

The table below describes the Modbus/TCP data areas that contain the LED status.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|-------------------------------------|-----------|----------------|
| 520 | 8335...8320 | 8 Bit LED status; 8 Bit reserved | Reserved | PNOZmulti LEDs |
| 521...783 | | Reserved | | |

Bit 0 = 1: LED OFAULT illuminates or flashes

Bit 1 = 1: LED IFAULT illuminates or flashes

Bit 2 = 1: LED FAULT illuminates or flashes

Bit 3 = 1: LED DIAG illuminates or flashes

Bit 4 = 1: LED RUN illuminates

Bit 5: Reserved

Bit 6: Reserved

Bit 7: Reserved

3.4.5 Configuration

The table below describes the Modbus/TCP data areas that contain the device data from the base unit and the project data. The data was defined in the PNOZmulti Configurator.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|----------------|-----------|----------|
| 784 | 12559... 12544 | Product number | HH Byte | HL Byte |
| 785 | 12575... 12560 | Product number | LH Byte | LL Byte |
| 786 | 12591... 12576 | Device version | HH Byte | HL Byte |
| 787 | 12607... 12592 | Device version | LH Byte | LL Byte |
| 788 | 12623... 12608 | Serial number | HH Byte | HL Byte |
| 789 | 12639... 12624 | Serial number | LH Byte | LL Byte |

3.4 Assignment of data areas

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|---|-------------------------|-------------------------|
| 790 | 12655... 12640 | Reserved | | |
| 791 | 12671... 12656 | Project check sum | H Byte | L Byte |
| 792 | 12687... 12672 | Chip card check sum | H Byte | L Byte |
| 793 | 12703... 12688 | Project date | Day | Month |
| 794 | 12719... 12704 | Project date | Year (H Byte) | Year (L Byte) |
| 795 | 12735... 12720 | Operating hours | HL Byte | LH Byte |
| 796 | 12751... 12736 | Operating hours / Type of base unit | LL Byte | Type |
| 797 | 12767... 12752 | Reserved | | |
| 798 | 12783... 12768 | Configuration, fieldbus modules / RS232 / expansion module, right | Slot 1 | Fieldbus |
| 799 | 12799... 12784 | Configuration, expansion module, right | Slot 3 | Slot 2 |
| 800 | 12815... 12800 | Configuration, expansion module, right | Slot 5 | Slot 4 |
| 801 | 12831... 12816 | Configuration, expansion module, right | Slot 7 | Slot 6 |
| 802 | 12847... 12832 | Configuration, expansion module, right | Reserved | Slot 8 |
| 803 | 12863... 12848 | Reserved | | |
| 804 | 12879... 12864 | Reserved | | |
| 805 | 12895... 12880 | Project name | 1st character (H Byte) | 1st character (L Byte) |
| 806 | 12911... 12896 | Project name | 2nd character (H Byte) | 2nd character (L Byte) |
| 807 | 12927... 12912 | Project name | 3rd character (H Byte) | 3rd character (L Byte) |
| 808 | 12943... 12928 | Project name | 4th character (H Byte) | 4th character (L Byte) |
| 809 | 12959... 12944 | Project name | 5th character (H Byte) | 5th character (L Byte) |
| 810 | 12975... 12960 | Project name | 6th character (H Byte) | 6th character (L Byte) |
| 811 | 12991... 12976 | Project name | 7th character (H Byte) | 7th character (L Byte) |
| 812 | 13007... 12992 | Project name | 8th character (H Byte) | 8th character (L Byte) |
| 813 | 13023... 13008 | Project name | 9th character (H Byte) | 9th character (L Byte) |
| 814 | 13039... 13024 | Project name | 10th character (H Byte) | 10th character (L Byte) |
| 815 | 13055... 13040 | Project name | 11th character (H Byte) | 11th character (L Byte) |

3.4 Assignment of data areas

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|---------------------------------------|-------------------------|-------------------------|
| 816 | 13071... 13056 | Project name | 12th character (H Byte) | 12th character (L Byte) |
| 817 | 13087... 13072 | Project name | 13th character (H Byte) | 13th character (L Byte) |
| 818 | 13103... 13088 | Project name | 14th character (H Byte) | 14th character (L Byte) |
| 819 | 13119... 13104 | Project name | 15th character (H Byte) | 15th character (L Byte) |
| 820 | 13135... 13120 | Project name | 16th character (H Byte) | 16th character (L Byte) |
| 821 | 13151... 13136 | Project name | 0xFF | 0xFF |
| 822 | 13167... 13152 | Reserved | | |
| 823 | 13183... 13168 | Reserved | | |
| 824 | 13199... 13184 | Reserved | | |
| 825 | 13215... 13200 | Reserved | | |
| 826 | 13231... 13216 | Project date | Day | Month |
| 827 | 13247... 13232 | Project date | Year (H Byte) | Year (L Byte) |
| 828 | 13263... 13248 | Project date | Hour | Minute |
| 829 | 13279... 13264 | Project date | Time zone | Reserved |
| 830 | 13295... 13280 | Reserved | | |
| 831 | 13311... 13296 | Reserved | | |
| 832 | 13327... 13312 | Reserved | | |
| 833 | 13343... 13328 | Fieldbus type | Fieldbus type (H Byte) | Fieldbus type (L Byte) |
| 834 | 13359... 13344 | Fieldbus module software version | Version | Reserved |
| 835 | 13375... 13360 | Reserved | | |
| 836 | 13391... 13376 | Reserved | | |
| 837 | 13407... 13392 | Reserved | | |
| 838 | 13423... 13408 | Reserved | | |
| 839 | 13439... 13424 | Reserved | | |
| 840 | 13455... 13440 | Configuration, expansion module, left | Slot 2 | Slot 1 |
| 841 | 13471... 13456 | Configuration, expansion module, left | Slot 4 | Slot 3 |
| 842 | 13487... 13472 | Configuration, expansion module, left | Slot 6 | Slot 5 |
| 843 | 13503... 13488 | Reserved | | |
| 844 | 13519... 13504 | Reserved | | |
| 845 | 13535... 13520 | Reserved | | |
| 846 | 13551... 13536 | Reserved | | |

3.4 Assignment of data areas

3.4.6 State of the inputs from the base unit and expansion modules

The table below describes the Modbus/TCP data areas that contain the state of the inputs from the base unit and expansion modules.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|------------------------------------|--------------------|--------------------|
| 847 | 13567... 13552 | Base unit i0 - i15 | i15 ...i8 | i7 ...i0 |
| 848 | 13583... 13568 | Base unit i16 - 23 | Reserved | i23...i16 |
| 849 | 13599... 13584 | Reserved / expansion module, right | Right 1 (i7...i0) | Reserved |
| 850 | 13615... 13600 | Expansion module, right | Right 3 (i7...i0) | Right 2 (i7...i0) |
| 851 | 13631... 13616 | Expansion module, right | Right 5 (i7...i0) | Right 4 (i7...i0) |
| 852 | 13647... 13632 | Expansion module, right | Right 7 (i7...i0) | Right 6 (i7...i0) |
| 853 | 13663... 13648 | Expansion module, right / reserved | Reserved | Right 8 (i7...i0) |
| 854 | 13679... 13664 | Expansion module, left | Left 1 (i15...i8) | Left 1 (i7...i0) |
| 855 | 13695... 13680 | Expansion module, left | Left 1 (i31...i24) | Left 1 (i23...i16) |
| 856 | 13711... 13696 | Expansion module, left | Left 2 (i15...i8) | Left 2 (i7...i0) |
| 857 | 13727... 13712 | Expansion module, left | Left 2 (i31...i24) | Left 2 (i23...i16) |
| 858 | 13743... 13728 | Expansion module, left | Left 3 (i15...i8) | Left 3 (i7...i0) |
| 859 | 13759... 13744 | Expansion module, left | Left 3 (i31...i24) | Left 3 (i23...i16) |
| 860 | 13775... 13760 | Reserved | | |
| 861 | 13791... 13776 | Expansion module, left | Left 4 (i15...i8) | Left 4 (i7...i0) |
| 862 | 13807... 13792 | Expansion module, left | Left 4 (i31...i24) | Left 4 (i23...i16) |
| 863 | 13823... 13808 | Expansion module, left | Left 5 (i15...i8) | Left 5 (i7...i0) |
| 864 | 13839... 13824 | Expansion module, left | Left 5 (i31...i24) | Left 5 (i23...i16) |
| 865 | 13855... 13840 | Expansion module | Left 6 (i15...i8) | Left 6 (i7...i0) |
| 866 | 13871... 13856 | Expansion module, left | Left 6 (i31...i24) | Left 6 (i23...i16) |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|----------|-----------|----------|
| 867 | 13887... 13872 | Reserved | | |
| 868 | 13903... 13888 | 0 | 0 | 0 |

Register 854 to 866"Expansion module, left"

Please note: for analogue input modules, the content for "High Byte" and "Low Byte" is transposed.

3.4.7 State of the outputs from the base unit and expansion modules

The table below describes the Modbus/TCP data areas that contain the state of the outputs from the base unit and expansion modules.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|---|-------------------------|----------------------|
| 869 | 13919... 13904 | 0 / Base unit o0 - 03 | 4 Bit reserved..o3...o0 | 0 |
| 870 | 13935... 13920 | Base unit o4 - o5 / expansion module, right | Right 1 o7...o0 | 6 Bit reserved o5,o4 |
| 871 | 13951... 13936 | Expansion module | Right 3 o7...o0 | Right 2 o7...o0 |
| 872 | 13967... 13952 | Expansion module, right | Right 5 o7...o0 | Right 4 o7...o0 |
| 873 | 13983... 13968 | Expansion module, right | Right 7 o7...o0 | Right 6 o7...o0 |
| 874 | 13999... 13984 | Expansion module, right / res | Reserved | Right 8 o7...o0 |
| 875 | 14015... 14000 | 0 | 0 | 0 |
| 876 | 14031... 14016 | 0 | 0 | 0 |
| 877 | 14047... 14032 | 0 / Expansion module, right | Right 1 o15...o8 | 0 |
| 878 | 14063... 14048 | Expansion module, right | Right 3 o15...o8 | Right 2 o15...o8 |
| 879 | 14079... 14064 | Expansion module, right | Right 5 o15...o8 | Right 4 o15...o8 |
| 880 | 14095... 14080 | Expansion module, right | Right 7 o15...o8 | Right 6 o15...o8 |
| 881 | 14111... 14096 | Expansion module, right / res | Reserved | Right 8 o15...o8 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|------------------------|--------------------|--------------------|
| 882 | 14127... 14112 | Expansion module, left | Left 1 (o15...o8) | Left 1 (o7...o0) |
| 883 | 14143... 14128 | Expansion module, left | Left 1 (o31...o24) | Left 1 (o23...o16) |
| 884 | 14159... 14144 | Expansion module, left | Left 2 (o15...o8) | Left 2 (o7...o0) |
| 885 | 14175... 14160 | Expansion module, left | Left 2 (o31...o24) | Left 2 (o23...o16) |
| 886 | 14191... 14176 | Expansion module, left | Left 3 (o15...o8) | Left 3 (o7...o0) |
| 887 | 14207... 14192 | Expansion module, left | Left 3 (o31...o24) | Left 3 (o23...o16) |
| 888 | 14223... 14208 | 0 | | |
| 889 | 14239... 14224 | Expansion module, left | Left 4 (o15...o8) | Left 4 (o7...o0) |
| 890 | 14255... 14240 | Expansion module, left | Left 4 (o31...o24) | Left 4 (o23...o16) |
| 891 | 14271... 14256 | Expansion module, left | Left 5 (o15...o8) | Left 5 (o7...o0) |
| 892 | 14287... 14272 | Expansion module, left | Left 5 (o31...o24) | Left 5 (o23...o16) |
| 893 | 14303... 14288 | Expansion module, left | Left 6 (o15...o8) | Left 6 (o7...o0) |
| 894 | 14319... 14304 | Expansion module, left | Left 6 (o31...o24) | Left 6 (o23...o16) |
| 895 | 14335... 14320 | 0 | | |

3.4.8 LED status

The table below describes the Modbus/TCP data areas that contain the LED status.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|---------------------------------------|--------------|---------------|
| 896 | 14351... 14336 | LEDs RUN / DIAG | Diag | Run |
| 897 | 14367... 14352 | LEDs FAULT/IFAULT | I Fault | Fault |
| 898 | 14383... 14368 | LEDs OFAULT / Expansion module, right | Right 1 | O Fault |
| 899 | 14399... 14384 | LEDs expansion module, right | Right 3 | Right 2 |
| 900 | 14415... 14400 | LEDs | Right 5 | Right 4 |
| 901 | 14431... 14416 | LEDs | Right 7 | Right 6 |
| 902 | 14447... 14432 | LEDs / res | Reserved | Right 8 |
| 903 | 14463... 14448 | LED base unit i0 - i15 | LED i15...i8 | LED i7...i0 |
| 904 | 14479... 14464 | LED base unit i16-i19 / 0 | 0 | LED i19...i16 |
| 905 | 14495... 14480 | 0 / LEDs expansion module, right | LED right 1 | 0 |
| 906 | 14511... 14496 | LEDs expansion module, right | LED right 3 | LED right 2 |

3.4 Assignment of data areas

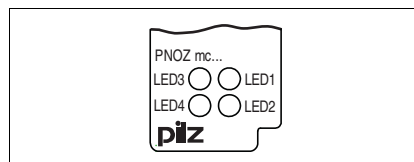
| Register (3x) | Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------|------------------------------|-------------|-------------|
| 907 | 14527... 14512 | LEDs expansion module, right | LED right 5 | LED right 4 |
| 908 | 14543... 14528 | LEDs expansion module, right | LED right 7 | LED right 6 |
| 909 | 14559... 14544 | LED right 8 / res | Reserved | LED right 8 |
| 910 | 14575... 14560 | LEDs fieldbus status | LED 2 | LED 1 |
| 911 | 14591... 14576 | LEDs fieldbus status | LED 4 | LED 3 |
| 912 | 14607... 14592 | 0 | | |
| 913 | 14623... 14608 | 0 | | |
| 914 | 14639... 14624 | 0 | | |
| 915 | 14655... 14640 | 0 | | |
| 916 | 14671... 14656 | 0 | | |
| 917 | 14687... 14672 | LEDs speed monitor 1 | Axis 2 | Axis 1 |
| 918 | 14703... 14688 | LEDs speed monitor 2 | Axis 2 | Axis 1 |
| 919 | 14719... 14704 | LEDs speed monitor 3 | Axis 2 | Axis 1 |
| 920 | 14735... 14720 | LEDs speed monitor 4 | Axis 2 | Axis 1 |
| 921 | 14751... 14736 | 0 | | |
| 922 | 14767... 14752 | 0 | | |
| 923 | 14783... 14768 | 0 | | |
| 924 | 14799... 14784 | LEDs expansion module, left | Left 2 | Left 1 |
| 925 | 14815... 14800 | LEDs expansion module, left | Left 4 | Left 3 |
| 926 | 14831... 14816 | LEDs expansion module, left | Left 6 | Left 5 |
| 927 | 14847... 14832 | 0 | | |
| 928 | 14863... 14848 | 0 | | |
| 929 | 14879... 14864 | 0 | | |
| 930 | 14895... 14880 | 0 | | |

Register 896 "LEDs" and Register 924 to 926 "LEDs expansion module, left"

- 0x00 = LED off
- 0xFF = LED on
- 0x30 = LED flashes

Register 910 to 911 "LEDs fieldbus"

Position of LED1 ... LED4:



3.4 Assignment of data areas

0x00 = LED off
 0xFF = LED green
 0x30 = LED red

The LED functions are described in the relevant operating manual.

Register 917 to 920 "LEDs speed monitor 1 ... 4"

State of the LEDs on the speed monitors

PNOZ ms1p, PNOZ ms2p:

I10, I11, I20, I21, X12, X22

PNOZ ms3p:

X12, X22

PNOZ ms4p:

X12

| | | | | | | | | |
|--------|---|---|-----|-----|-----|-----|---|-----|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Axis 1 | 0 | 0 | I11 | I11 | I10 | I10 | 0 | X12 |
| Axis 2 | 0 | 0 | I21 | I21 | I20 | I20 | 0 | X22 |

LEDs for proximity switch: I10, I11, I20, I21:

If the LED is lit, the corresponding Bit will contain "1". The proximity switch is energised.

LEDs for incremental encoder: X12, X22:

If the LED is lit, the corresponding Bit will contain "1"; The incremental encoder is connected correctly.

The LED functions are described in the operating manuals for the speed monitors.

3.4.9 Diagnostic word, element types

The table below describes the Modbus/TCP data areas that contain information on the elements in the PNOZmulti Configurator and the diagnostic word.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|---|-----------|----------|
| 931 | 14911... 14896 | Number of elements that can store a state | 0 | Number |
| 932 | 14927... 14912 | Reserved | | |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|----------------------------------|-------------|------------|
| 933 | 14943... 14928 | Reserved | | |
| 934 | 14959... 14944 | Reserved | | |
| 935 | 14975... 14960 | Reserved | | |
| 936 | 14991... 14976 | Reserved | | |
| 937 | 15007... 14992 | Reserved | | |
| 938 | 15023... 15008 | Element enable 1-16 | 16...9 | 8...1 |
| 939 | 15039... 15024 | Element enable 17-32 | 32...25 | 24...16 |
| 940 | 15055... 15040 | Element enable 33-48 | 48...41 | 40...33 |
| 941 | 15071... 15056 | Element enable 49-64 | 64...57 | 56...49 |
| 942 | 15087... 15072 | Element enable 65-80 | 80...73 | 72...65 |
| 943 | 15103... 15088 | Element enable 81-96 | 96...89 | 88...81 |
| 944 | 15119... 15104 | Element enable 96-100 / reserved | Reserved | 100...96 |
| 945 | 15135... 15120 | Reserved | | |
| 946 | 15151... 15136 | Reserved | | |
| 947 | 15167... 15152 | Reserved | | |
| 948 | 15183... 15168 | Reserved | | |
| 949 | 15199... 15184 | Reserved | | |
| 950 | 15215... 15200 | Reserved | | |
| 951 | 15231... 15216 | Reserved | | |
| 952 | 15247... 15232 | Diagnostic word 1 | Bit 15... 8 | Bit 7... 0 |
| 953 | 15263... 15248 | Diagnostic word 2 | Bit 15... 8 | Bit 7... 0 |
| 954 | 15279... 15264 | Diagnostic word 3 | Bit 15... 8 | Bit 7... 0 |
| 955 | 15295... 15280 | Diagnostic word 4 | Bit 15... 8 | Bit 7... 0 |
| 956 | 15311... 15296 | Diagnostic word 5 | Bit 15... 8 | Bit 7... 0 |
| 957 | 15327... 15312 | Diagnostic word 6 | Bit 15... 8 | Bit 7... 0 |
| 958 | 15343... 15328 | Diagnostic word 7 | Bit 15... 8 | Bit 7... 0 |
| 959 | 15359... 15344 | Diagnostic word 8 | Bit 15... 8 | Bit 7... 0 |
| 960 | 15375... 15360 | Diagnostic word 9 | Bit 15... 8 | Bit 7... 0 |
| 961 | 15391... 15376 | Diagnostic word 10 | Bit 15... 8 | Bit 7... 0 |
| 962 | 15407... 15392 | Diagnostic word 11 | Bit 15... 8 | Bit 7... 0 |
| 963 | 15423... 15408 | Diagnostic word 12 | Bit 15... 8 | Bit 7... 0 |
| 964 | 15439... 15424 | Diagnostic word 13 | Bit 15... 8 | Bit 7... 0 |
| 965 | 15455... 15440 | Diagnostic word 14 | Bit 15... 8 | Bit 7... 0 |
| 966 | 15471... 15456 | Diagnostic word 15 | Bit 15... 8 | Bit 7... 0 |
| 967 | 15487... 15472 | Diagnostic word 16 | Bit 15... 8 | Bit 7... 0 |
| 968 | 15503... 15488 | Diagnostic word 17 | Bit 15... 8 | Bit 7... 0 |
| 969 | 15519... 15504 | Diagnostic word 18 | Bit 15... 8 | Bit 7... 0 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|--------------------|-------------|------------|
| 970 | 15535... 15520 | Diagnostic word 19 | Bit 15... 8 | Bit 7... 0 |
| 971 | 15551... 15536 | Diagnostic word 20 | Bit 15... 8 | Bit 7... 0 |
| 972 | 15567... 15552 | Diagnostic word 21 | Bit 15... 8 | Bit 7... 0 |
| 973 | 15583... 15568 | Diagnostic word 22 | Bit 15... 8 | Bit 7... 0 |
| 974 | 15599... 15584 | Diagnostic word 23 | Bit 15... 8 | Bit 7... 0 |
| 975 | 15615... 15600 | Diagnostic word 24 | Bit 15... 8 | Bit 7... 0 |
| 976 | 15631... 15616 | Diagnostic word 25 | Bit 15... 8 | Bit 7... 0 |
| 977 | 15647... 15632 | Diagnostic word 26 | Bit 15... 8 | Bit 7... 0 |
| 978 | 15663... 15648 | Diagnostic word 27 | Bit 15... 8 | Bit 7... 0 |
| 979 | 15679... 15664 | Diagnostic word 28 | Bit 15... 8 | Bit 7... 0 |
| 980 | 15695... 15680 | Diagnostic word 29 | Bit 15... 8 | Bit 7... 0 |
| 981 | 15711... 15696 | Diagnostic word 30 | Bit 15... 8 | Bit 7... 0 |
| 982 | 15727... 15712 | Diagnostic word 31 | Bit 15... 8 | Bit 7... 0 |
| 983 | 15743... 15728 | Diagnostic word 32 | Bit 15... 8 | Bit 7... 0 |
| 984 | 15759... 15744 | Diagnostic word 33 | Bit 15... 8 | Bit 7... 0 |
| 985 | 15775... 15760 | Diagnostic word 34 | Bit 15... 8 | Bit 7... 0 |
| 986 | 15791... 15776 | Diagnostic word 35 | Bit 15... 8 | Bit 7... 0 |
| 987 | 15807... 15792 | Diagnostic word 36 | Bit 15... 8 | Bit 7... 0 |
| 988 | 15823... 15808 | Diagnostic word 37 | Bit 15... 8 | Bit 7... 0 |
| 989 | 15839... 15824 | Diagnostic word 38 | Bit 15... 8 | Bit 7... 0 |
| 990 | 15855... 15840 | Diagnostic word 39 | Bit 15... 8 | Bit 7... 0 |
| 991 | 15871... 15856 | Diagnostic word 40 | Bit 15... 8 | Bit 7... 0 |
| 992 | 15887... 15872 | Diagnostic word 41 | Bit 15... 8 | Bit 7... 0 |
| 993 | 15903... 15888 | Diagnostic word 42 | Bit 15... 8 | Bit 7... 0 |
| 994 | 15919... 15904 | Diagnostic word 43 | Bit 15... 8 | Bit 7... 0 |
| 995 | 15935... 15920 | Diagnostic word 44 | Bit 15... 8 | Bit 7... 0 |
| 996 | 15951... 15936 | Diagnostic word 45 | Bit 15... 8 | Bit 7... 0 |
| 997 | 15967... 15952 | Diagnostic word 46 | Bit 15... 8 | Bit 7... 0 |
| 998 | 15983... 15968 | Diagnostic word 47 | Bit 15... 8 | Bit 7... 0 |
| 999 | 15999... 15984 | Diagnostic word 48 | Bit 15... 8 | Bit 7... 0 |
| 1000 | 16015... 16000 | Diagnostic word 49 | Bit 15... 8 | Bit 7... 0 |
| 1001 | 16031... 16016 | Diagnostic word 50 | Bit 15... 8 | Bit 7... 0 |
| 1002 | 16047... 16032 | Diagnostic word 51 | Bit 15... 8 | Bit 7... 0 |
| 1003 | 16063... 16048 | Diagnostic word 52 | Bit 15... 8 | Bit 7... 0 |
| 1004 | 16079... 16064 | Diagnostic word 53 | Bit 15... 8 | Bit 7... 0 |
| 1005 | 16095... 16080 | Diagnostic word 54 | Bit 15... 8 | Bit 7... 0 |
| 1006 | 16111... 16096 | Diagnostic word 55 | Bit 15... 8 | Bit 7... 0 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|--------------------|-------------|------------|
| 1007 | 16127... 16112 | Diagnostic word 56 | Bit 15... 8 | Bit 7... 0 |
| 1008 | 16143... 16128 | Diagnostic word 57 | Bit 15... 8 | Bit 7... 0 |
| 1009 | 16159... 16144 | Diagnostic word 58 | Bit 15... 8 | Bit 7... 0 |
| 1010 | 16175... 16160 | Diagnostic word 59 | Bit 15... 8 | Bit 7... 0 |
| 1011 | 16191... 16176 | Diagnostic word 60 | Bit 15... 8 | Bit 7... 0 |
| 1012 | 16207... 16192 | Diagnostic word 61 | Bit 15... 8 | Bit 7... 0 |
| 1013 | 16223... 16208 | Diagnostic word 62 | Bit 15... 8 | Bit 7... 0 |
| 1014 | 16239... 16224 | Diagnostic word 63 | Bit 15... 8 | Bit 7... 0 |
| 1015 | 16255... 16240 | Diagnostic word 64 | Bit 15... 8 | Bit 7... 0 |
| 1016 | 16271... 16256 | Diagnostic word 65 | Bit 15... 8 | Bit 7... 0 |
| 1017 | 16287... 16272 | Diagnostic word 66 | Bit 15... 8 | Bit 7... 0 |
| 1018 | 16303... 16288 | Diagnostic word 67 | Bit 15... 8 | Bit 7... 0 |
| 1019 | 16319... 16304 | Diagnostic word 68 | Bit 15... 8 | Bit 7... 0 |
| 1020 | 16335... 16320 | Diagnostic word 69 | Bit 15... 8 | Bit 7... 0 |
| 1021 | 16351... 16336 | Diagnostic word 70 | Bit 15... 8 | Bit 7... 0 |
| 1022 | 16367... 16352 | Diagnostic word 71 | Bit 15... 8 | Bit 7... 0 |
| 1023 | 16383... 16368 | Diagnostic word 72 | Bit 15... 8 | Bit 7... 0 |
| 1024 | 16399... 16384 | Diagnostic word 73 | Bit 15... 8 | Bit 7... 0 |
| 1025 | 16415... 16400 | Diagnostic word 74 | Bit 15... 8 | Bit 7... 0 |
| 1026 | 16431... 16416 | Diagnostic word 75 | Bit 15... 8 | Bit 7... 0 |
| 1027 | 16447... 16432 | Diagnostic word 76 | Bit 15... 8 | Bit 7... 0 |
| 1028 | 16463... 16448 | Diagnostic word 77 | Bit 15... 8 | Bit 7... 0 |
| 1029 | 16479... 16464 | Diagnostic word 78 | Bit 15... 8 | Bit 7... 0 |
| 1030 | 16495... 16480 | Diagnostic word 79 | Bit 15... 8 | Bit 7... 0 |
| 1031 | 16511... 16496 | Diagnostic word 80 | Bit 15... 8 | Bit 7... 0 |
| 1032 | 16527... 16512 | Diagnostic word 81 | Bit 15... 8 | Bit 7... 0 |
| 1033 | 16543... 16528 | Diagnostic word 82 | Bit 15... 8 | Bit 7... 0 |
| 1034 | 16559... 16544 | Diagnostic word 83 | Bit 15... 8 | Bit 7... 0 |
| 1035 | 16575... 16560 | Diagnostic word 84 | Bit 15... 8 | Bit 7... 0 |
| 1036 | 16591... 16576 | Diagnostic word 85 | Bit 15... 8 | Bit 7... 0 |
| 1037 | 16607... 16592 | Diagnostic word 86 | Bit 15... 8 | Bit 7... 0 |
| 1038 | 16623... 16608 | Diagnostic word 87 | Bit 15... 8 | Bit 7... 0 |
| 1039 | 16639... 16624 | Diagnostic word 88 | Bit 15... 8 | Bit 7... 0 |
| 1040 | 16655... 16640 | Diagnostic word 89 | Bit 15... 8 | Bit 7... 0 |
| 1041 | 16671... 16656 | Diagnostic word 90 | Bit 15... 8 | Bit 7... 0 |
| 1042 | 16687... 16672 | Diagnostic word 91 | Bit 15... 8 | Bit 7... 0 |
| 1043 | 16703... 16688 | Diagnostic word 92 | Bit 15... 8 | Bit 7... 0 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|---------------------|-----------------|-----------------|
| 1044 | 16719... 16704 | Diagnostic word 93 | Bit 15... 8 | Bit 7... 0 |
| 1045 | 16735... 16720 | Diagnostic word 94 | Bit 15... 8 | Bit 7... 0 |
| 1046 | 16751... 16736 | Diagnostic word 95 | Bit 15... 8 | Bit 7... 0 |
| 1047 | 16767... 16752 | Diagnostic word 96 | Bit 15... 8 | Bit 7... 0 |
| 1048 | 16783... 16768 | Diagnostic word 97 | Bit 15... 8 | Bit 7... 0 |
| 1049 | 16799... 16784 | Diagnostic word 98 | Bit 15... 8 | Bit 7... 0 |
| 1050 | 16815... 16800 | Diagnostic word 99 | Bit 15... 8 | Bit 7... 0 |
| 1051 | 16831... 16816 | Diagnostic word 100 | Bit 15... 8 | Bit 7... 0 |
| 1052 | 16847... 16832 | Reserved | | |
| 1053 | 16863... 16848 | Reserved | | |
| 1054 | 16879... 16864 | Reserved | | |
| 1055 | 16895... 16880 | Reserved | | |
| 1056 | 16911... 16896 | Reserved | | |
| 1057 | 16927... 16912 | Reserved | | |
| 1058 | 16943... 16928 | Reserved | | |
| 1059 | 16959... 16944 | Reserved | | |
| 1060 | 16975... 16960 | Reserved | | |
| 1061 | 16991... 16976 | Reserved | | |
| 1062 | 17007... 16992 | Reserved | | |
| 1063 | 17023... 17008 | Reserved | | |
| 1064 | 17039... 17024 | Reserved | | |
| 1065 | 17055... 17040 | Reserved | | |
| 1066 | 17071... 17056 | Reserved | | |
| 1067 | 17087... 17072 | Reserved | | |
| 1068 | 17103... 17088 | Reserved | | |
| 1069 | 17119... 17104 | Reserved | | |
| 1070 | 17135... 17120 | Reserved | | |
| 1071 | 17151... 17136 | Element type | Element ID = 2 | Element ID = 1 |
| 1072 | 17167... 17152 | Element type | Element ID = 4 | Element ID = 3 |
| 1073 | 17183... 17168 | Element type | Element ID = 6 | Element ID = 5 |
| 1074 | 17199... 17184 | Element type | Element ID = 8 | Element ID = 7 |
| 1075 | 17215... 17200 | Element type | Element ID = 10 | Element ID = 9 |
| 1076 | 17231... 17216 | Element type | Element ID = 12 | Element ID = 11 |
| 1077 | 17247... 17232 | Element type | 0 | Element ID = 13 |
| 1078 | 17263... 17248 | Element type | Element ID = 15 | Element ID = 14 |
| 1079 | 17279... 17264 | Element type | Element ID = 17 | Element ID = 16 |
| 1080 | 17295... 17280 | Element type | Element ID = 19 | Element ID = 18 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|--------------|-----------------|-----------------|
| 1081 | 17311... 17296 | Element type | Element ID = 21 | Element ID = 20 |
| 1082 | 17327... 17312 | Element type | Element ID = 23 | Element ID = 22 |
| 1083 | 17343... 17328 | Element type | Element ID = 25 | Element ID = 24 |
| 1084 | 17359... 17344 | Element type | 0 | Element ID = 26 |
| 1085 | 17375... 17360 | Element type | Element ID = 15 | Element ID = 27 |
| 1086 | 17391... 17376 | Element type | Element ID = 17 | Element ID = 29 |
| 1087 | 17407... 17392 | Element type | Element ID = 19 | Element ID = 31 |
| 1088 | 17423... 17408 | Element type | Element ID = 21 | Element ID = 33 |
| 1089 | 17439... 17424 | Element type | Element ID = 23 | Element ID = 35 |
| 1090 | 17455... 17440 | Element type | Element ID = 25 | Element ID = 37 |
| 1091 | 17471... 17456 | Element type | 0 | Element ID = 39 |
| 1092 | 17487... 17472 | Element type | Element ID = 41 | Element ID = 40 |
| 1093 | 17503... 17488 | Element type | Element ID = 43 | Element ID = 42 |
| 1094 | 17519... 17504 | Element type | Element ID = 45 | Element ID = 44 |
| 1095 | 17535... 17520 | Element type | Element ID = 47 | Element ID = 46 |
| 1096 | 17551... 17536 | Element type | Element ID = 49 | Element ID = 48 |
| 1097 | 17567... 17552 | Element type | Element ID = 51 | Element ID = 50 |
| 1098 | 17583... 17568 | Element type | 0 | Element ID = 52 |
| 1099 | 17599... 17584 | Element type | Element ID = 54 | Element ID = 53 |
| 1100 | 17615... 17600 | Element type | Element ID = 56 | Element ID = 55 |
| 1101 | 17631... 17616 | Element type | Element ID = 58 | Element ID = 57 |
| 1102 | 17647... 17632 | Element type | Element ID = 60 | Element ID = 59 |
| 1103 | 17663... 17648 | Element type | Element ID = 62 | Element ID = 61 |
| 1104 | 17679... 17664 | Element type | Element ID = 64 | Element ID = 63 |
| 1105 | 17695... 17680 | Element type | 0 | Element ID = 65 |
| 1106 | 17711... 17696 | Element type | Element ID = 67 | Element ID = 66 |
| 1107 | 17727... 17712 | Element type | Element ID = 69 | Element ID = 68 |
| 1108 | 17743... 17728 | Element type | Element ID = 71 | Element ID = 70 |
| 1109 | 17759... 17744 | Element type | Element ID = 73 | Element ID = 72 |
| 1110 | 17775... 17760 | Element type | Element ID = 75 | Element ID = 74 |
| 1111 | 17791... 17776 | Element type | Element ID = 77 | Element ID = 76 |
| 1112 | 17807... 17792 | Element type | 0 | Element ID = 78 |
| 1113 | 17823... 17808 | Element type | Element ID = 80 | Element ID = 79 |
| 1114 | 17839... 17824 | Element type | Element ID = 82 | Element ID = 81 |
| 1115 | 17855... 17840 | Element type | Element ID = 84 | Element ID = 83 |
| 1116 | 17871... 17856 | Element type | Element ID = 86 | Element ID = 85 |
| 1117 | 17887... 17872 | Element type | Element ID = 88 | Element ID = 87 |

3.4 Assignment of data areas

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|--------------|-----------------|------------------|
| 1118 | 17903... 17888 | Element type | Element ID = 90 | Element ID = 89 |
| 1119 | 17919... 17904 | Element type | 0 | Element ID = 91 |
| 1120 | 17935... 17920 | Element type | Element ID = 93 | Element ID = 92 |
| 1121 | 17951... 17936 | Element type | Element ID = 95 | Element ID = 94 |
| 1122 | 17967... 17952 | Element type | Element ID = 97 | Element ID = 96 |
| 1123 | 17983... 17968 | Element type | Element ID = 99 | Element ID = 98 |
| 1124 | 17999... 17984 | Element type | Reserved | Element ID = 100 |
| 1125 | 18015... 18000 | Element type | Reserved | Reserved |
| 1126 | 18031... 18016 | Element type | Reserved | Reserved |

Register 938 to 944 "Element enable 1 ... 100"

Each element is assigned an ID in the PNOZmulti Configurator. If the element's output = 0 (no enable), the corresponding bit is set.

| | | | | | | | | |
|---------|----|----|----|----|-----|----|----|----|
| Byte 0 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Byte 1 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |
| Byte 2 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |
| ... | | | | | | | | |
| Byte 10 | 88 | 87 | 86 | 85 | 84 | 83 | 82 | 81 |
| Byte 11 | 96 | 95 | 94 | 93 | 92 | 91 | 90 | 89 |
| Byte 12 | - | - | - | - | 100 | 99 | 98 | 97 |

Register 1071 to 1126 "Element type"

The available element types are listed below.

| Element type (Byte) | Element |
|---------------------|--|
| | Function elements |
| 01 | Switch type 1: N/C contact |
| 02 | Switch type 1: N/C contact, monitored reset |
| 03 | Switch type 1: N/C contact, manual reset |
| 04 | Switch type 1: N/C contact, start-up test |
| 05 | Switch type 1: N/C contact, start-up test, monitored reset |
| 06 | Switch type 1: N/C contact, start-up test, manual reset |

3.4 Assignment of data areas

| Element type (Byte) | Element |
|---------------------|--|
| 07 | Switch type 2: N/C contact, N/O contact |
| 08 | Switch type 2: N/C contact, N/O contact, monitored reset |
| 09 | Switch type 2: N/C contact, N/O contact, manual reset |
| 0A | Switch type 2: N/C contact, N/O contact, start-up test |
| 0B | Switch type 2: N/C contact, N/O contact, start-up test, monitored reset |
| 0C | Switch type 2: N/C contact, N/O contact, start-up test, manual reset |
| 0D | Switch type 3: N/C contact, N/C contact |
| 0E | Switch type 3: N/C contact, N/C contact, monitored reset |
| 0F | Switch type 3: N/C contact, N/C contact, manual reset |
| 10 | Switch type 3: N/C contact, N/C contact, start-up test |
| 11 | Switch type 3: N/C contact, N/C contact, start-up test, monitored reset |
| 12 | Switch type 3: N/C contact, N/C contact, start-up test, manual reset |
| 13 | Switch type 4: N/C contact, N/C contact, N/O contact |
| 14 | Switch type 4: N/C contact, N/C contact, N/O contact, monitored reset |
| 15 | Switch type 4: N/C contact, N/C contact, N/O contact, manual reset |
| 16 | Switch type 4: N/C contact, N/C contact, N/O contact, start-up test |
| 17 | Switch type 4: N/C contact, N/C contact, N/O contact, start-up test, monitored reset |
| 18 | Switch type 4: N/C contact, N/C contact, N/O contact, start-up test, manual reset |
| 19 | Switch type 5: N/C contact, N/C contact, N/C contact |
| 1A | Switch type 5: N/C contact, N/C contact, N/C contact, monitored reset |
| 1B | Switch type 5: N/C contact, N/C contact, N/C contact, manual reset |
| 1C | Switch type 6: Two-hand, N/C contact, N/O contact |
| 1D | Switch type 7: Two-hand, N/O contact |
| 1E | Operating mode selector switch 1 from 2 |
| 1F | Operating mode selector switch 1 from 3 |
| 20 | Operating mode selector switch 1 from 4 |
| 21 | Operating mode selector switch 1 from 5 |
| 22 | Safety mat, with automatic reset |
| 23 | Safety mat, with start-up test |
| 24 | Safety mat, with reset button |
| 25 | Cascading input |
| 26 | Switch type 5, N/C contact, N/C contact, N/C contact, start-up test |

3.4 Assignment of data areas

3.4.10 Current state of the virtual inputs

The table below describes the Modbus/TCP data areas that contain the current state of the virtual inputs. These are the virtual inputs that can be set by various subscribers (e.g. fieldbus).

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|-----------------------------------|-------------|-------------|
| 1127 | 18047... 18032 | Inputs, feedback status 0...15 | i15...i8 | i7...i0 |
| 1128 | 18063... 18048 | Inputs, feedback status 16...31 | i31...i24 | i23...i16 |
| 1129 | 18079... 18064 | Inputs, feedback status 32...47 | i47...i40 | i39...i32 |
| 1130 | 18095... 18080 | Inputs, feedback status 48...63 | i63...i56 | i55...i48 |
| 1131 | 18111... 18096 | Inputs, feedback status 64...79 | i79...i72 | i71...i64 |
| 1132 | 18127... 18112 | Inputs, feedback status 80...95 | i95...i88 | i87...i80 |
| 1133 | 18143... 18128 | Inputs, feedback status 96...111 | i111...i104 | i103...i96 |
| 1134 | 18159... 18144 | Inputs, feedback status 112...127 | i127...i120 | i119...i112 |
| 1135 | 18175... 18160 | Reserved | | |
| 1136 | 18191... 18176 | Reserved | | |
| 1137 | 18207... 18192 | Reserved | | |
| 1138 | 18223... 18208 | Reserved | | |
| 1139 | 18239... 18224 | Reserved | | |
| 1140- 2047 | | Reserved | | |

3.4 Assignment of data areas

3.4.11 State of process data

The table below describes the Modbus/TCP data areas that contain the status info register. The general state of the data is reproduced in the status info register.

Relevant areas for the data are defined in the Modbus/TCP data areas Discrete Inputs (1x) and Input Register (3x). Read access is available to these data areas.

| Register (3x) | Coil/ Discrete Input (1x) | Content | High Byte | Low Byte |
|---------------|---------------------------|--------------------|-----------|----------|
| 2048 | 32783... 32768 | Status information | See below | |

| | | | | | | | | |
|------------------|----------|----------|-------------|----------|----------|----------|----------|------------------|
| High Byte | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved |
| Low Byte | Reserved | Reserved | WD Time-out | Reserved | Reserved | Reserved | Reserved | Global Error Bit |

Bit 5 "WD Timeout": The set watchdog for the input bits has been triggered and the inputs set to "0".

Bit 0 "Error Bit": The content of the data areas is not current or the set watchdog for the input bits has been triggered.

3.5 Updating the data areas

Data is updated with varying priority.

The table below shows the typical update cycles for the various data.

| Content | Typ. update cycle |
|--|----------------------------|
| Virtual inputs/outputs | 20 ms |
| Configuration | Once during initialisation |
| State of the inputs/outputs from the base unit and expansion modules | 320 ms |
| LED status | 1000 ms |
| Number of elements that can store a state | Once during initialisation |
| Element enable | 320 ms |
| Diagnostic words | 1000 ms |
| Element types | Once during initialisation |
| Current state of the virtual inputs | 1000 ms |



INFORMATION

The update time may increase if there are additional TCP/IP connections (e.g. PNOZmulti Configurator, PMI, control system) on the PG port (Port 9000).

3.6 Bit addressing in a Register

Addressing the virtual inputs (coils) on the PNOZmulti

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Register 0 | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Register 1 | Bit 31 | Bit 30 | Bit 29 | Bit 28 | Bit 27 | Bit 26 | Bit 25 | Bit 24 | Bit 23 | Bit 22 | Bit 21 | Bit 20 | Bit 19 | Bit 18 | Bit 17 | Bit 16 |
| Register 2 | Bit 47 | Bit 46 | Bit 45 | Bit 44 | Bit 43 | Bit 42 | Bit 41 | Bit 40 | Bit 39 | Bit 38 | Bit 37 | Bit 36 | Bit 35 | Bit 34 | Bit 33 | Bit 32 |
| Register 3 | Bit 63 | Bit 62 | Bit 61 | Bit 60 | Bit 59 | Bit 58 | Bit 57 | Bit 56 | Bit 55 | Bit 54 | Bit 53 | Bit 52 | Bit 51 | Bit 50 | Bit 49 | Bit 48 |
| Register 4 | Bit 79 | Bit 78 | Bit 77 | Bit 76 | Bit 75 | Bit 74 | Bit 73 | Bit 72 | Bit 71 | Bit 70 | Bit 69 | Bit 68 | Bit 67 | Bit 66 | Bit 65 | Bit 64 |
| Register 5 | Bit 95 | Bit 94 | Bit 93 | Bit 92 | Bit 91 | Bit 90 | Bit 89 | Bit 88 | Bit 87 | Bit 86 | Bit 85 | Bit 84 | Bit 83 | Bit 82 | Bit 81 | Bit 80 |
| Register 6 | Bit 111 | Bit 110 | Bit 109 | Bit 108 | Bit 107 | Bit 106 | Bit 105 | Bit 104 | Bit 103 | Bit 102 | Bit 101 | Bit 100 | Bit 99 | Bit 98 | Bit 97 | Bit 96 |
| Register 7 | Bit 127 | Bit 126 | Bit 125 | Bit 124 | Bit 123 | Bit 122 | Bit 121 | Bit 120 | Bit 119 | Bit 118 | Bit 117 | Bit 116 | Bit 115 | Bit 114 | Bit 113 | Bit 112 |

Addressing the virtual outputs (discrete inputs) on the PNOZmulti

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Register 512 | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Register 513 | Bit 31 | Bit 30 | Bit 29 | Bit 28 | Bit 27 | Bit 26 | Bit 25 | Bit 24 | Bit 23 | Bit 22 | Bit 21 | Bit 20 | Bit 19 | Bit 18 | Bit 17 | Bit 16 |
| Register 514 | Bit 47 | Bit 46 | Bit 45 | Bit 44 | Bit 43 | Bit 42 | Bit 41 | Bit 40 | Bit 39 | Bit 38 | Bit 37 | Bit 36 | Bit 35 | Bit 34 | Bit 33 | Bit 32 |
| Register 515 | Bit 63 | Bit 62 | Bit 61 | Bit 60 | Bit 59 | Bit 58 | Bit 57 | Bit 56 | Bit 55 | Bit 54 | Bit 53 | Bit 52 | Bit 51 | Bit 50 | Bit 49 | Bit 48 |
| Register 516 | Bit 79 | Bit 78 | Bit 77 | Bit 76 | Bit 75 | Bit 74 | Bit 73 | Bit 72 | Bit 71 | Bit 70 | Bit 69 | Bit 68 | Bit 67 | Bit 66 | Bit 65 | Bit 64 |
| Register 517 | Bit 95 | Bit 94 | Bit 93 | Bit 92 | Bit 91 | Bit 90 | Bit 89 | Bit 88 | Bit 87 | Bit 86 | Bit 85 | Bit 84 | Bit 83 | Bit 82 | Bit 81 | Bit 80 |
| Register 518 | Bit 111 | Bit 110 | Bit 109 | Bit 108 | Bit 107 | Bit 106 | Bit 105 | Bit 104 | Bit 103 | Bit 102 | Bit 101 | Bit 100 | Bit 99 | Bit 98 | Bit 97 | Bit 96 |
| Register 519 | Bit 127 | Bit 126 | Bit 125 | Bit 124 | Bit 123 | Bit 122 | Bit 121 | Bit 120 | Bit 119 | Bit 118 | Bit 117 | Bit 116 | Bit 115 | Bit 114 | Bit 113 | Bit 112 |

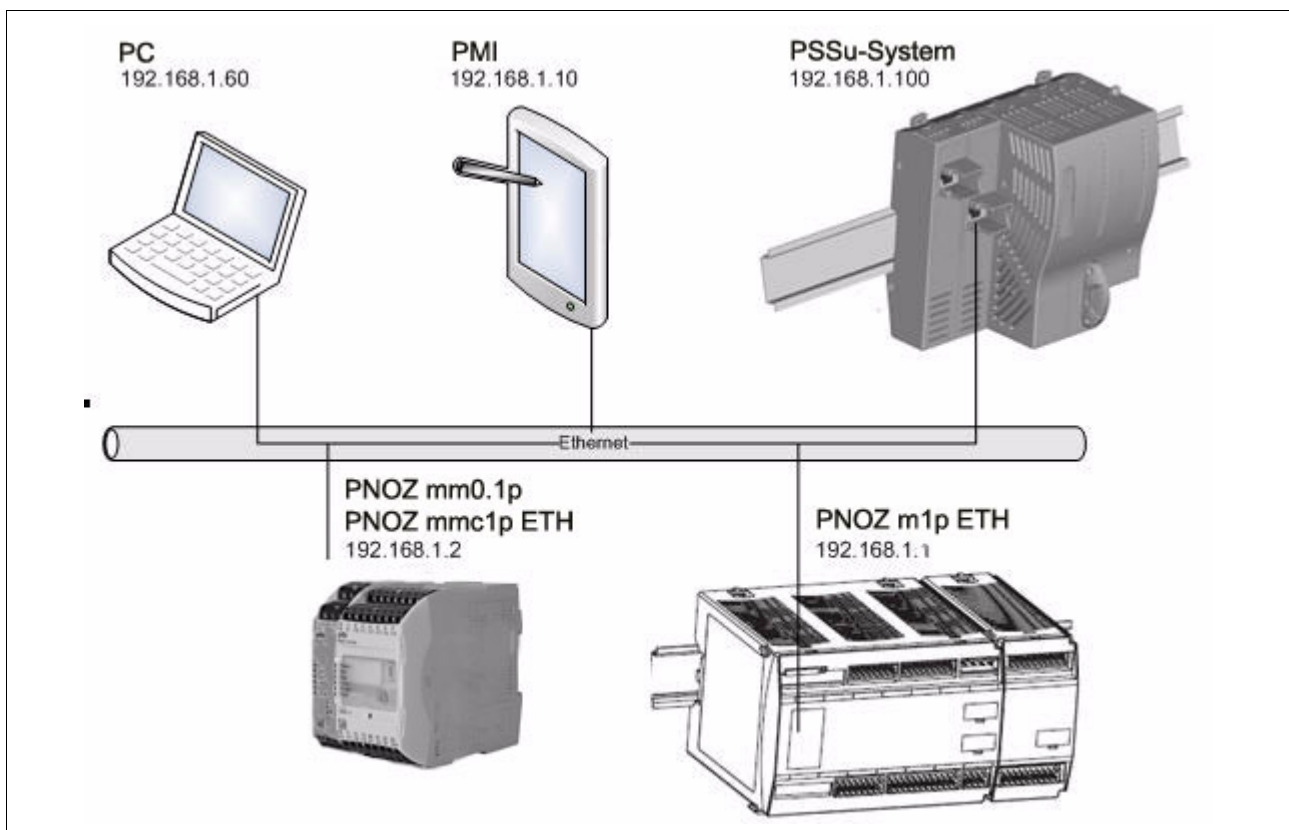
3 Modbus/TCP - Data areas

4.1 Modbus subscriber

In this example, the following subscribers communicate via Modbus/TCP or Ethernet:

- ▶ Devices with server role:
 - PNOZmulti base unit PNOZ m1p ETH
 - PNOZmulti Mini base unit PNOZ mm0.1p with the expansion module PNOZ mmc1p ETH
- ▶ Devices with client role:
 - PSSu system in the automation system PSS 4000
 - Operator terminal PMI
- ▶ PC as programming device for PNOZmulti, PSSu system and PMI

The PSSu system and the operator terminal PMI access both modular safety systems PNOZmulti (server roles) simultaneously.



4.2 Data exchange via Modbus/TCP

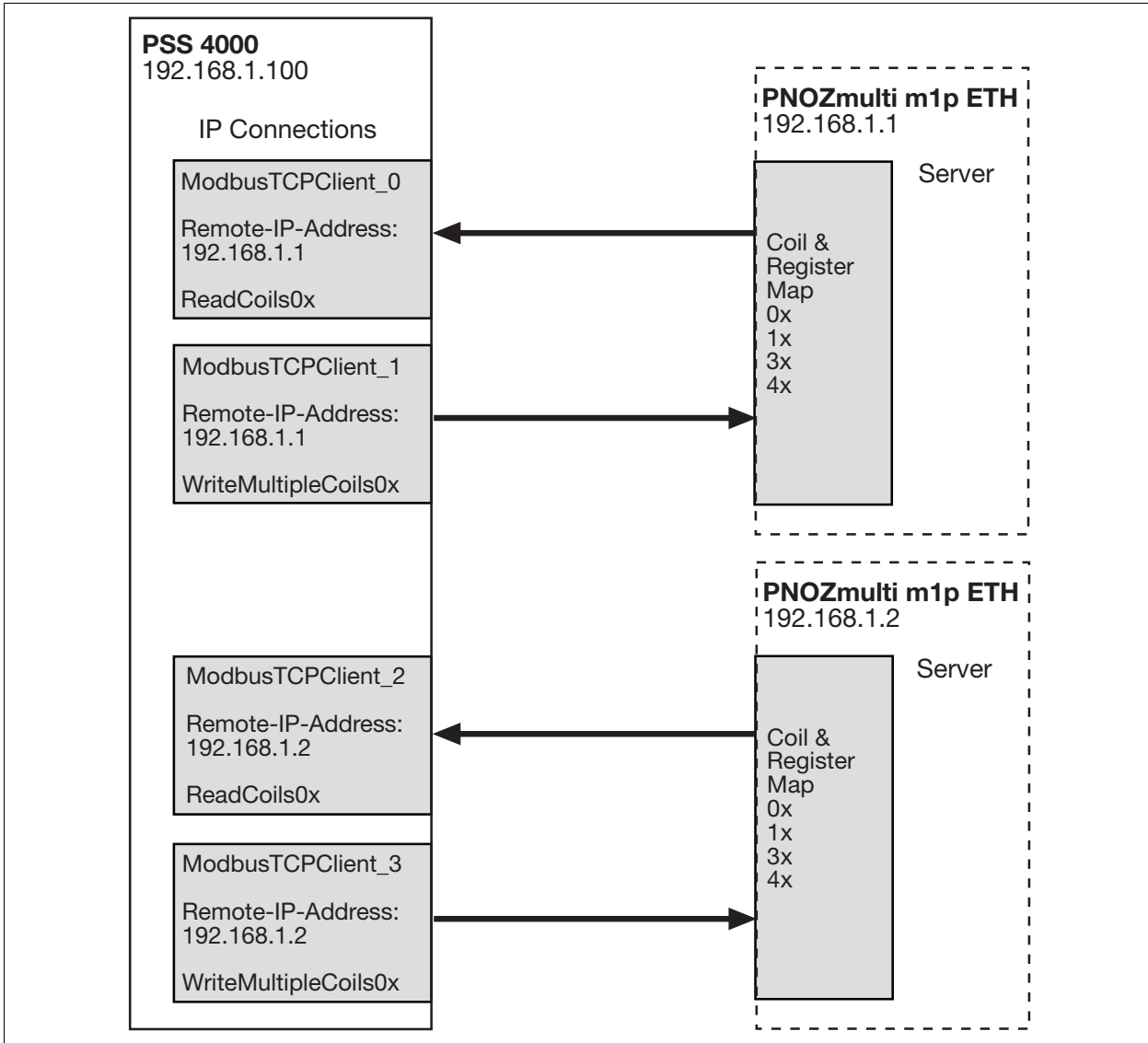
An example of data exchange is shown below. The modular safety system PNOZmulti is always the server in a connection and the PSSu system from the automation system PSS 4000 is always the client in a connection.

It is always the connection's client that initiates data transfer. The direction of the data flow (send/receive) and access to Modbus/TCP data areas (coils, discrete inputs, input registers, holding register) is defined by the function code.

When sending, the connection's client sends data to a data area belonging to the connection's server. This is also known as "Writing data".

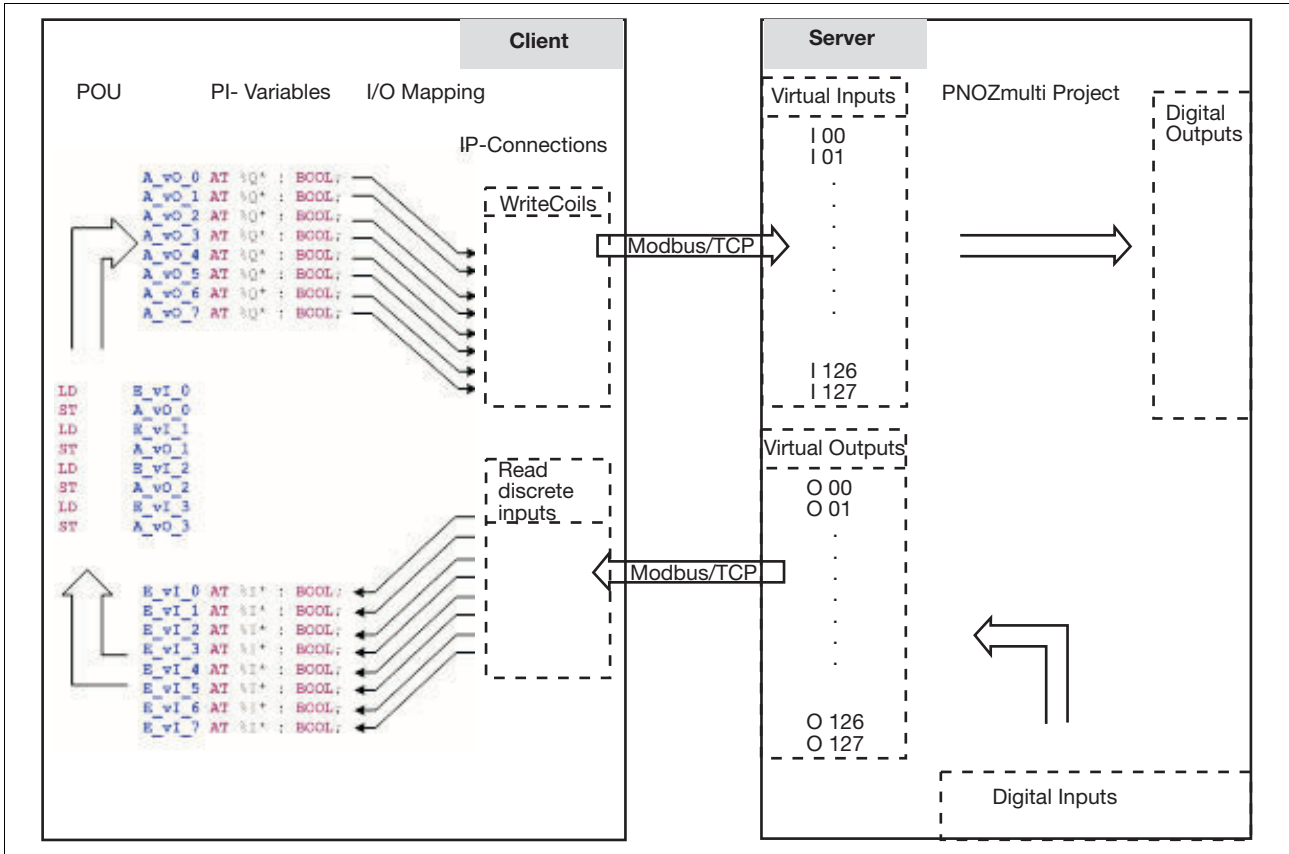
When receiving, the connection's client requests and receives data located in a data area belonging to the connection's server. This is also known as "Reading data".

4.2 Data exchange via Modbus/TCP



In this program, inputs on the PNOZmulti are copied to virtual outputs. The PSSu system reads the data from the PNOZmulti, processes it and then writes it back to the virtual inputs on the PNOZmulti. There the state of the virtual inputs is written to signal outputs.

4.2 Data exchange via Modbus/TCP



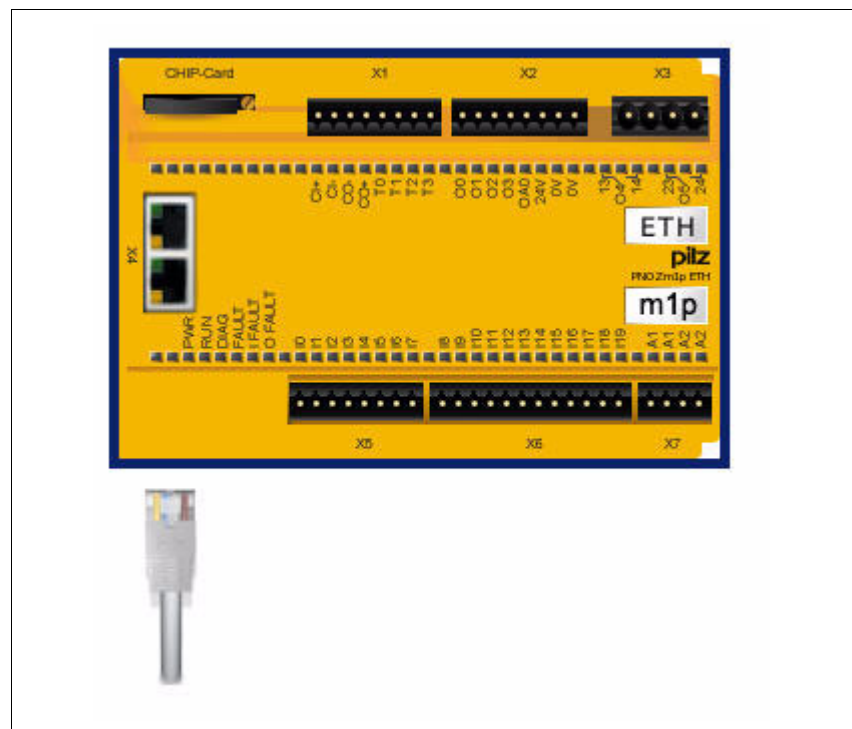
4.3 Device configuration

4.3.1 Modular safety system PNOZmulti

Insert the required modules in the PNOZmulti Configurator, in the "Hardware Configuration" window.

Base unit PNOZm1p ETH:

1. Insert base unit PNOZ m1p ETH
2. Insert inputs/outputs that are downloaded via the integrated interface



4.3 Device configuration

Base unit PNOZ mm0.1p

1. Base unit PNOZ mm0.1p
2. Configure communication module PNOZ mmc1p ETH
3. Insert inputs/outputs that are downloaded via the integrated interface



4.3.2 PSSu system in the automation system PSS 4000

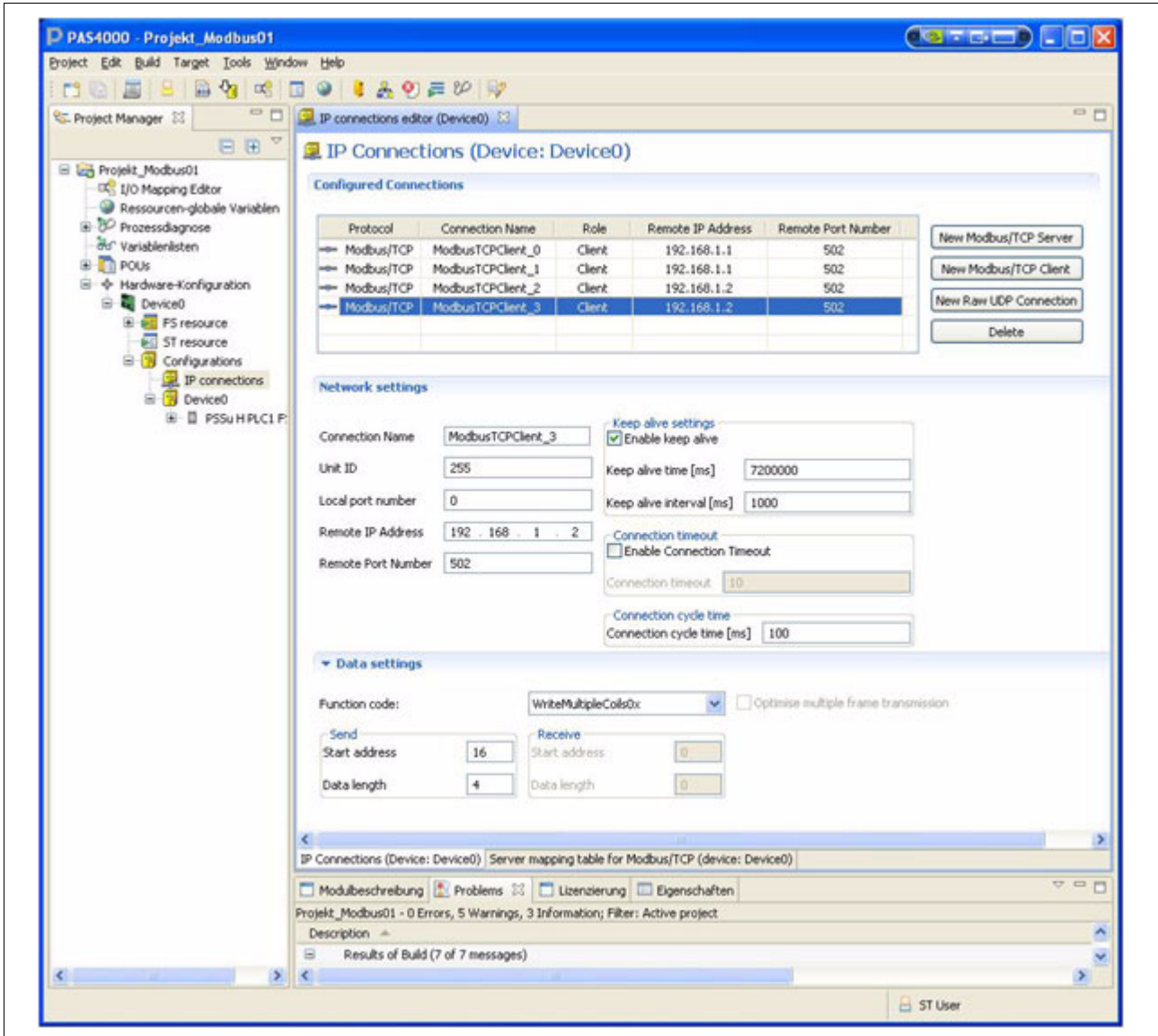
The configuration is made in PAS4000.

Create IP connection

Create the IP connection in the IP Connections Editor

1. Enter remote IP address
 - ⇒ Enter the IP addresses of the PNOZmulti Ethernet connections.
2. Enter remote port number
 - ⇒ Enter the port number "502".
 - The number may not be modified.
3. Select function code
 - ⇒ From the list, select "WriteMultipleCols0x"
4. Define the start address and the length of the data block
 - ⇒ Enter the start address and the data length in the "Send" field

4.3 Device configuration

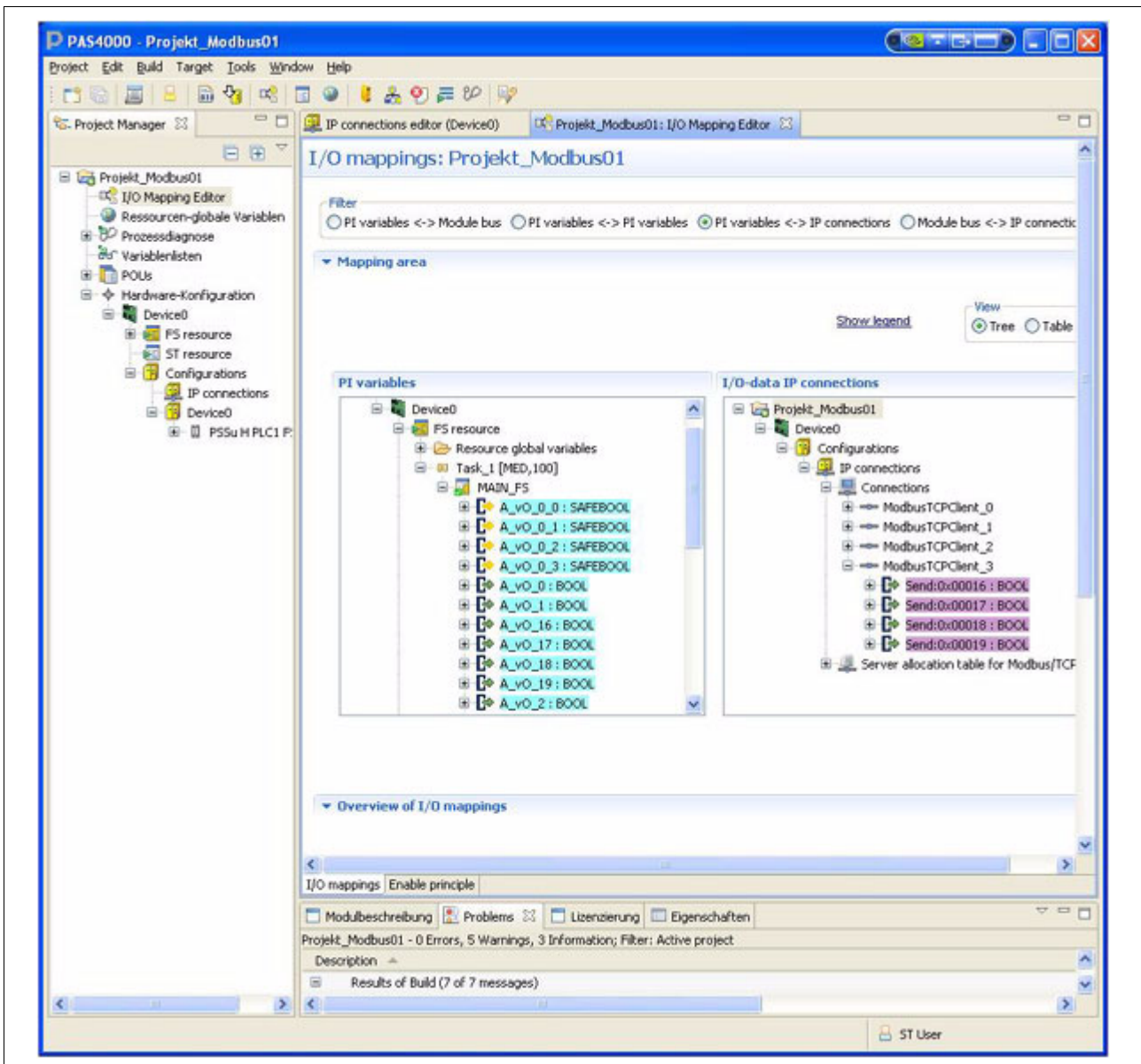


4.3 Device configuration

Perform I/O mapping

The PI variables are mapped to the data in the Modbus/TCP connection. Map the PI variables in the I/O Mapping Editor as follows:

1. Set filter
 - ⇒ Select the option "PI variables < - > IP connections"
2. Map PI variables



4.3 Device configuration

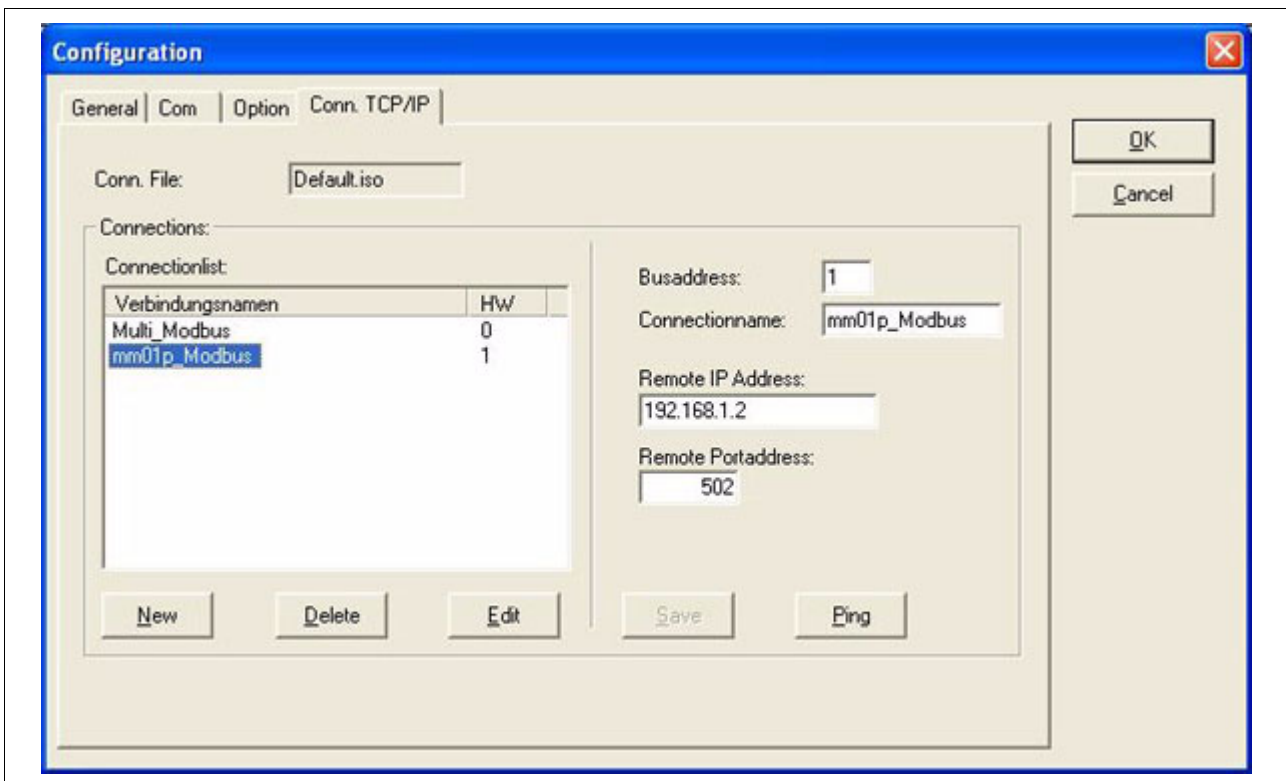
4.3.3 Operator terminal PMI

The configuration is made in the PMImicro Configurator

Select Modbus/TCP driver, create IP connection

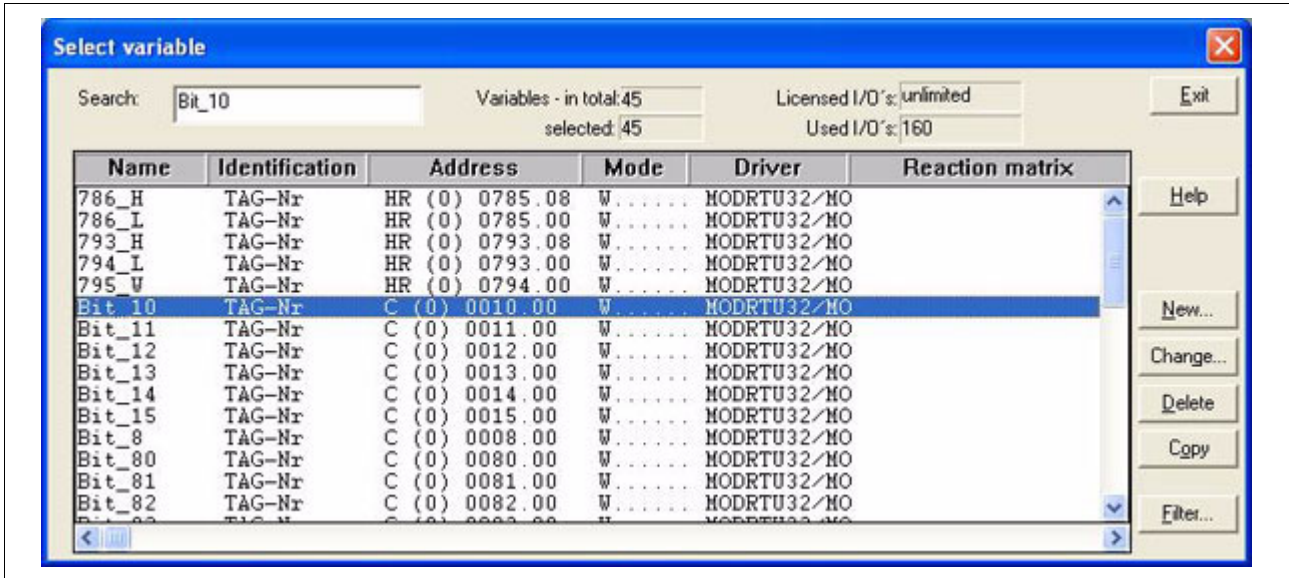
Select the Modbus/TCP driver in the Configuration window and set the IP connection:

1. Enter remote IP address
 - ⇒ Enter the IP addresses of the PNOZmulti.
2. Enter remote port number
 - ⇒ Enter the port number "502".
 - The number may not be modified.

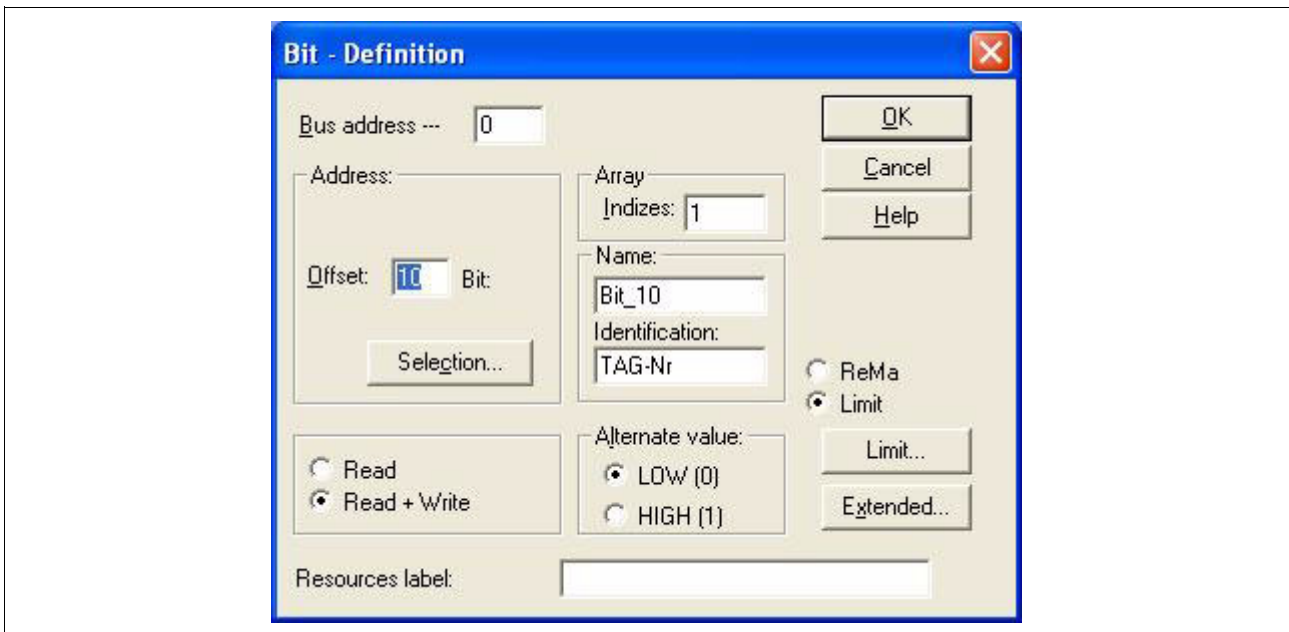


A variable is defined in the variable list for each display or operator element.

4.3 Device configuration



The offset refers to the data block provided by the PNOZmulti.





DAT - I - 010/05



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