MURR ELEKTRONIK

*stay connected*

# Manual
# Cube20 ProfiNET

# Publisher's Note

Product Manual for Cube20 BN-PNIO DI8 (Article Number: 56006)

Version 1.0

Version 07_10 DE

Article Number 56006

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# Service and Support

**Website:**

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**In addition, our Customer Service Center (CSC) will be glad to assist you:**

The CSC supports customers over the entire course of the project, during planning and the conception of customer applications, configuration, installation, and startup. We also offer competent consulting or – in more complex cases – we even provide direct onsite support.

The CSC has a range of support tools. It performs measurements for fieldbus systems, such as PROFIBUS DP, DeviceNet, CANopen, and AS interface, as well as energy, heat, and EMC measurements.

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# About the User Manual and its Structure

**Bus Manual:**
General explanations and functions for each bus.

On this subject, please click on the links to the next page.

**System Manuals:**
Describe the system in general and give an overview about the products, accessories and documentation.

| Art. No. | Designation |
|---|---|
| 56030 | Cube 20 System |
| 56970 | Cube 67 System |
| 56974 | Cube 67+ System |

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**Product Manuals:**
Describe product-specific features.

| Art. No. | Designation |
|---|---|
| 56001 | Cube20 BN-P DI8 |
| 56005 | Cube20 BN-E DI8 |
| 56006 | Cube20 BN-PNIO DIO8 |
| 56035 | Cube20 Erweiterungen |

www.murrelektronik.com

**Here are links to the bus user manuals:**

**>>> PROFINET (www.profinet.com)**

# Table of Contents

# Important Information

### Symbols and Icons

This manual contains information and instructions you must comply with in order to maintain safety and avoid personal injury or damage to property. They are identified as follows:

**Notes indicate important information.**

**Warnings contain information that, if ignored, may cause damage to equipment or other assets or, if you fail to comply with safety precautions, may constitute a danger to the user's health and life.**

➔ ***Refer to our catalog or visit our inline shop at www.murrelektronik.com***.

**Intended Purpose**

Before starting the devices, read this manual carefully. Keep it in a location that is accessible to all users at all times.

The products that are described in this manual were developed, manufactured, tested, and documented in compliance with the relevant safety standards. In normal cases, these products do not constitute any danger to persons or objects, provided the handling specifications and safety instructions described in this manual are observed. They meet the specifications of the European EMC Directive (2004/108/EC).

**DANGER!**

**The devices are not safety devices conforming to the relevant standards.**

**Do not use the OFF state of the outputs to implement safety-related requirements of the system/machine.**

The products are designed for industrial use. An industrial environment is defined as one in which loads are not connected directly to the public low-voltage power grid. Additional measures must be taken if the products are used in private, business, or trade environments.

The safe, troublefree functioning of the products requires proper transportation, storage, mounting, and careful operation. Operation of the devices for their intended purposes is only guaranteed when the enclosures are fully mounted. If aggressive media are used, check their material resistance depending on the application.

Current safety and accident prevention laws valid for a specific application must be observed for the configuration, installation, setup, maintenance, and testing of the devices. The power supply must comply with SELV or PELV. Power sources in accordance with EN 61558-2-6 (transformer) or EN 60950-1 (switched-mode power supply) meet these requirements.

Only use cables that meet the requirements and regulations for safety, electromagnetic compatibility, and, if necessary, telecommunications terminal equipment specifications.

**Information on the cables and accessories that are suitable for use with this product are contained in the Appendix to this manual.**

### Qualified Personnel

Only qualified, trained electricians knowledgeable in the safety standards of automation systems may configure, install, set up, maintain, and test the devices. The requirements concerning qualified personnel are dependent on the requirements profiles described in ZVEI and VDMA. For this reason, electricians must know the contents of the manual "Weiterbildung in der Automatisierung" (Further Training in Automation Systems) issued by ZVEI and VDMA and published by Maschinenbau-Verlag, Post Box 710864, 60498 Frankfurt, Germany) before installing and maintaining the devices. They are therefore electricians who are capable of assessing the work executed and any possible dangers arising from this due to their professional training, knowledge, experience, and their knowledge of the pertinent standards; or who have a level of knowledge equivalent to professional training due to their many years of activity in a comparable field.

Only Murrelektronik technical personnel are allowed to execute work on the hardware and software of our devices, if they are devices not described in this manual.

**WARNING!**

**Unqualified tampering with the hardware or software, or failure to observe the warnings cited in this manual may result in severe personal injury or damage to property.**

# 1 Description of the Cube20 BN-PNIO DI8 Art. No. 56006

The Cube20 System is an I/O system for use IP20 zones for the decentralized capture and control of digital and analog process parameters. It consists of a fieldbus-specific bus node and fieldbus-independent I/O modules that are linked to the bus node via an internal system connection. Please note the galvanic isolation between the input for the system power supply and the input for the sensor and actuator power supplies.

To maximize electromagnetic compatibility, we recommend implementing galvanic isolation.

**Make sure you isolate the power supplies from different voltage sources for the system electronics (UB), sensors (UI), and actuators (UA). Otherwise, we cannot guarantee proper functionality.**

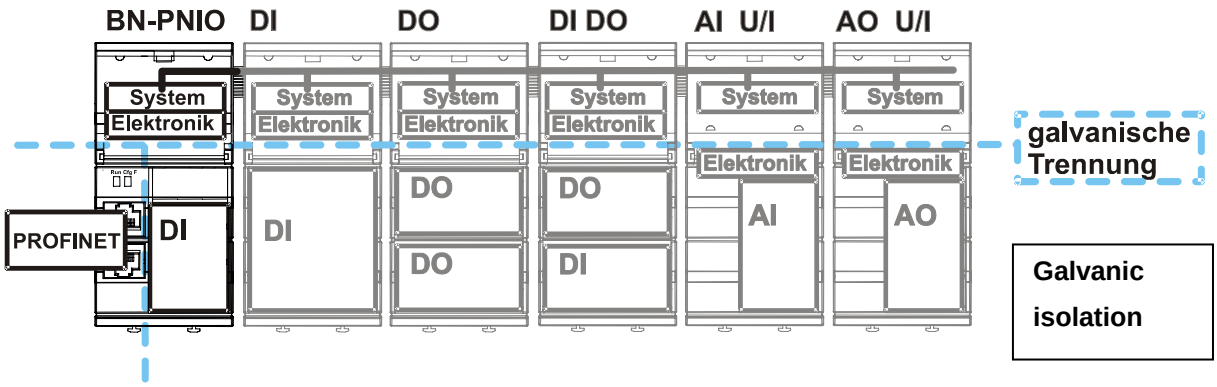



*Fig. 1: Typical system setup with galvanic isolation*

Figure 1 shows a typical system setup of the Cube20 with digital inputs and outputs (DI / DO) and analog inputs and outputs (AI / AO).

This section explains that PROFINET, the I/O power supply, and the system electronics power supplies are galvanically isolated from each other. The internal electronics of the digital I/O modules are powered from the system cable, i.e. by the bus node. The internal electronics of the analog I/O modules are powered from the I/O power supply.

**Information on the analog I/O modules:**

**Always connect the I/O power supply to guarantee communication for all analog modules via the internal system connection.**

**Features of the Cube20 BN-PNIO:**

- Machine Options Management (see 3.3.1)
- Status request (see 3.3.3)
- Reset by acyclic access (see 3.3)
- IM 0 (see 3.3.2)
- IM 1 (see 3.2.3)
- IM 2 (see 3.2.4)

# 2 Installation

## 2.1 Terminal Overview of the Cube20 BN- PNIO DI8 Art. No. 56006

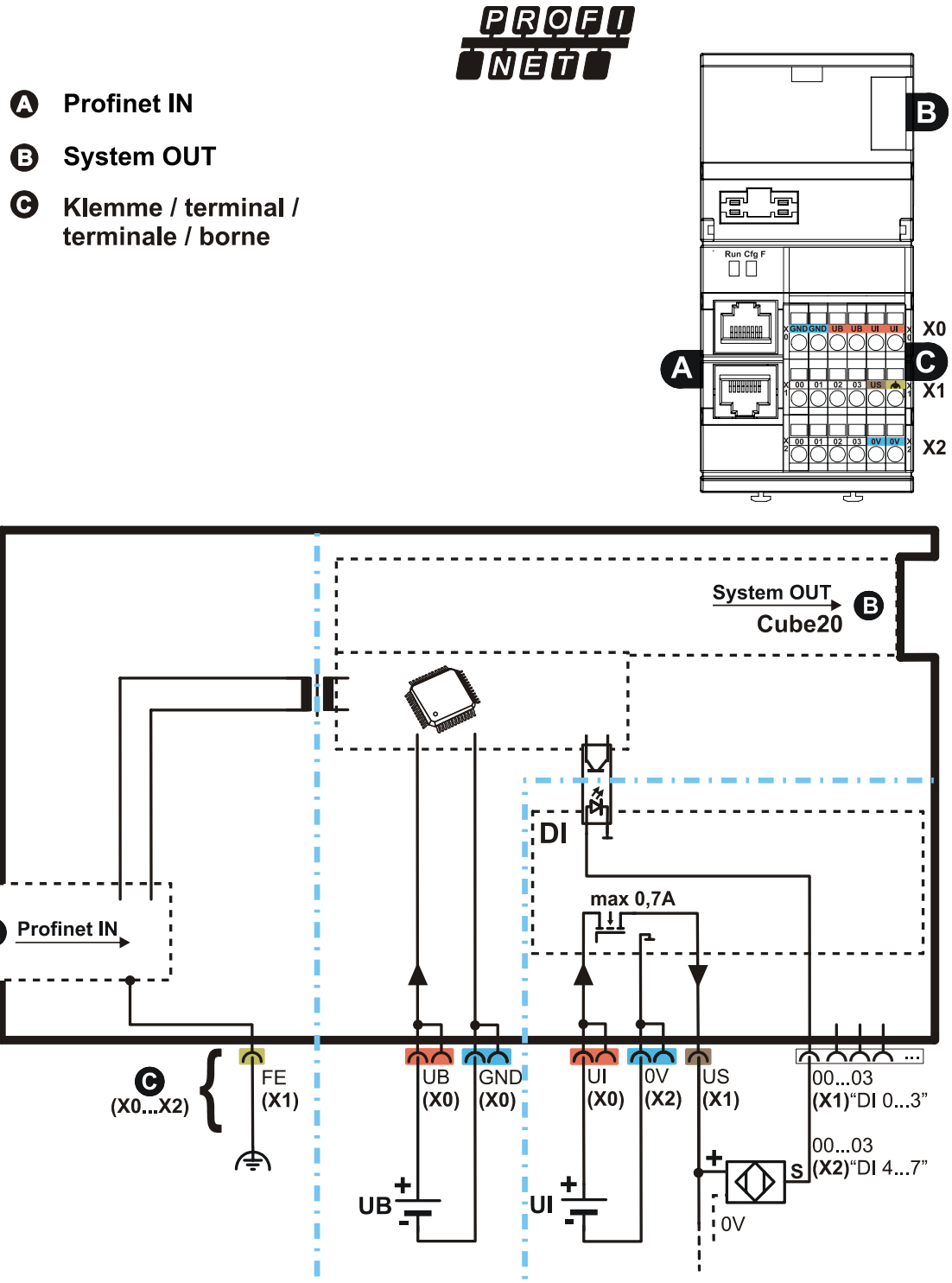



*Fig. 2: Terminal overview of the Cube20 BN-PNIO DI8 Art. No. 56006*

➔ ***For extensions, we recommend our voltage terminal block Art. No. 56109***.

***For more details, please refer to the voltage terminal blocks in the Product Manual.***

***Refer to our catalog or visit our inline shop at www.murrelektronik.com***

# 3 Characteristics of the Cube20 BN-PNIO

The section below lists the functions of the Cube20 BN-PNIO. They can be enabled or disabled by setting/not setting the parameters described.

## 3.1 Cube20 BN-PNIO DI8 Art. No. 56006

### 3.1.1 Parameters

**Number of parameter bytes: 4**

**Bit assignment of parameter Byte 0**

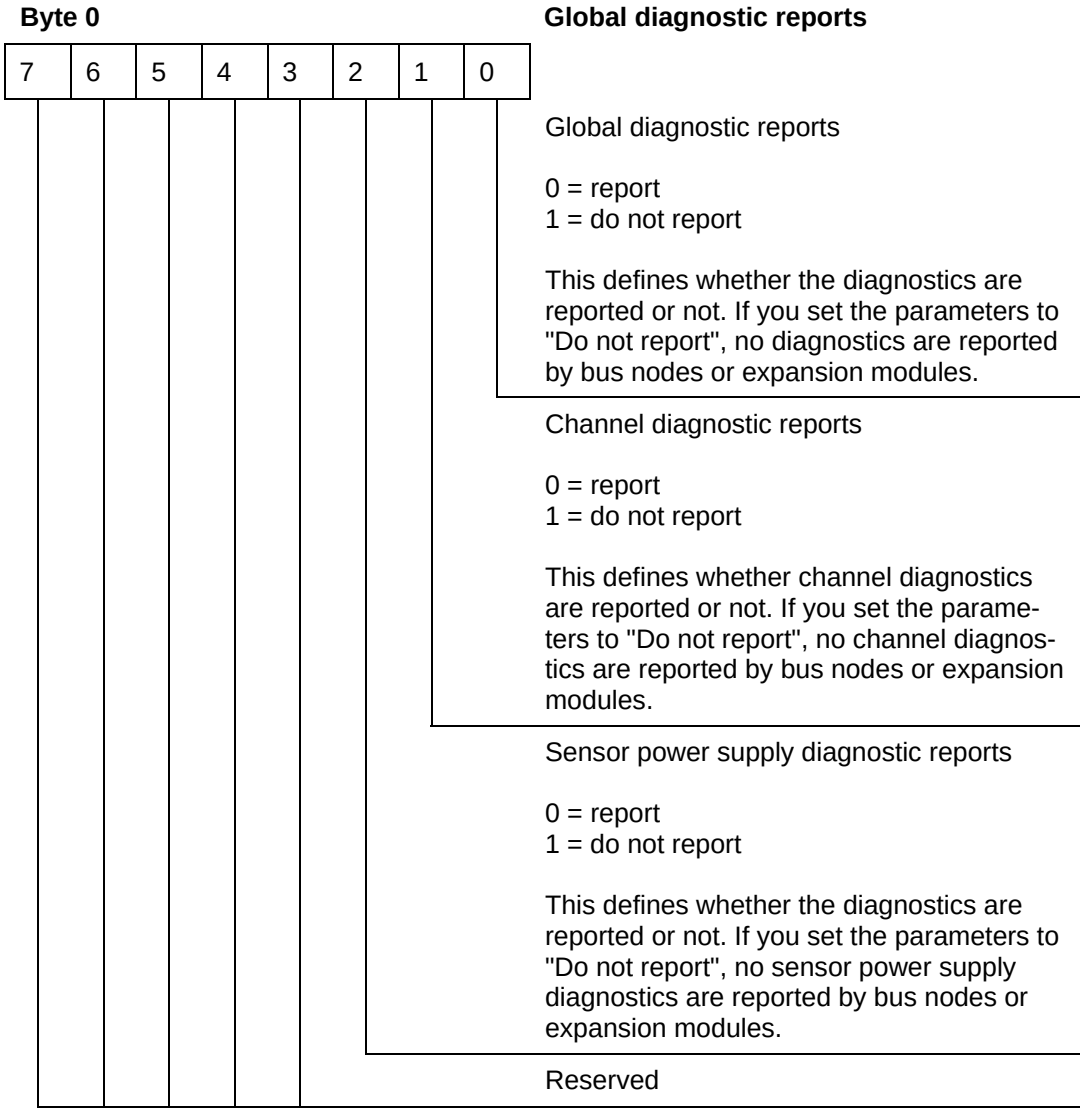



*Fig. 3: Parameter Byte 0 of Cube20 PNIO-DP DI8 Art. No. 56006*

**Bit assignment of parameter Byte 1**

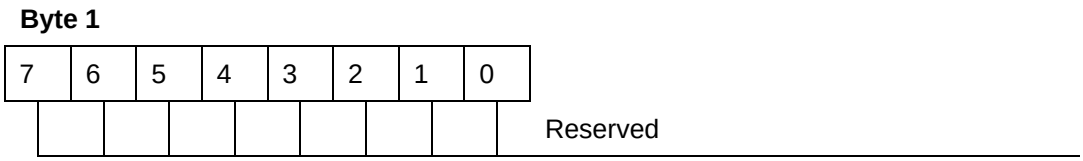



*Fig. 4: Parameter Byte 1 of Cube20 PNIO-DP DI8 Art. No. 56006*

**Bit assignment of parameter Byte 2**

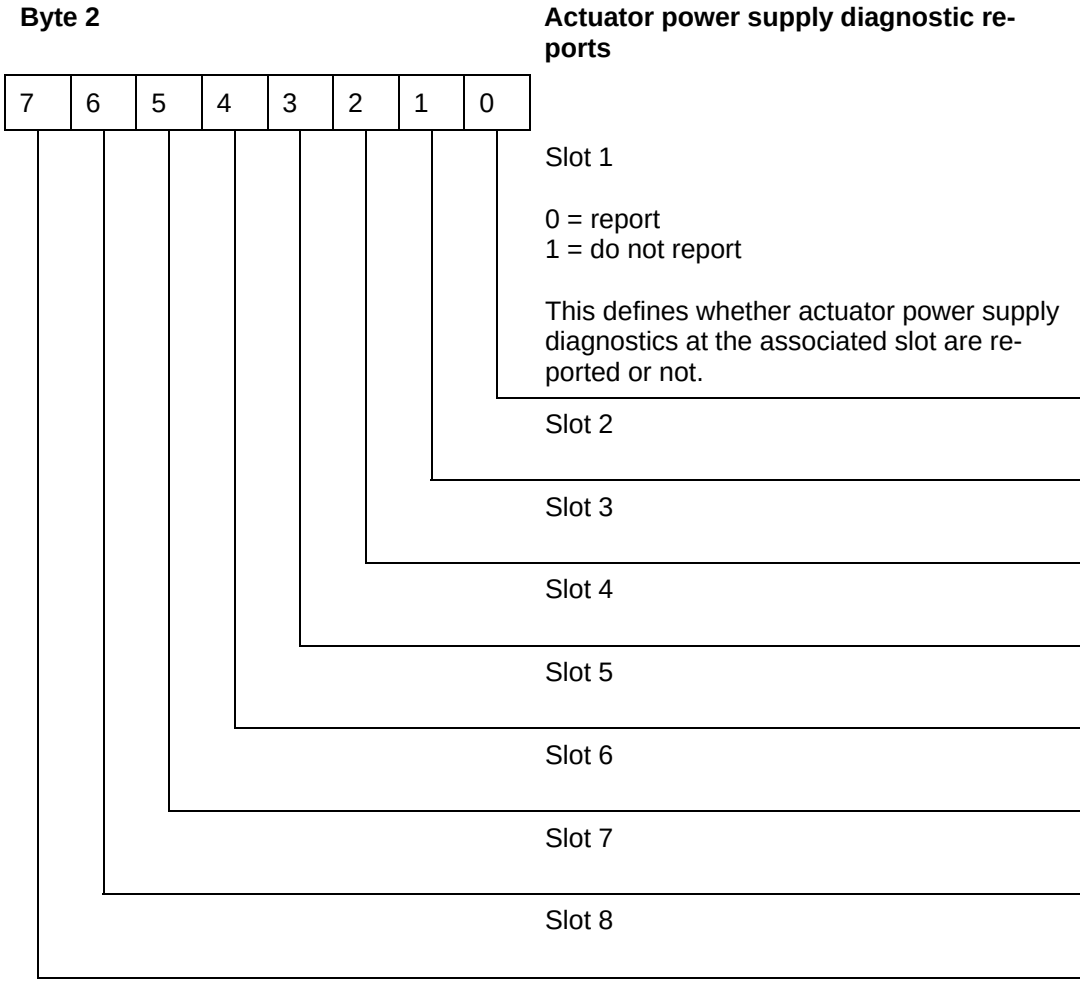



*Fig. 5: Parameter Byte 2 of Cube20 PNIO-DP DI8 Art. No. 56006*

**Bit assignment of parameter Byte 3**

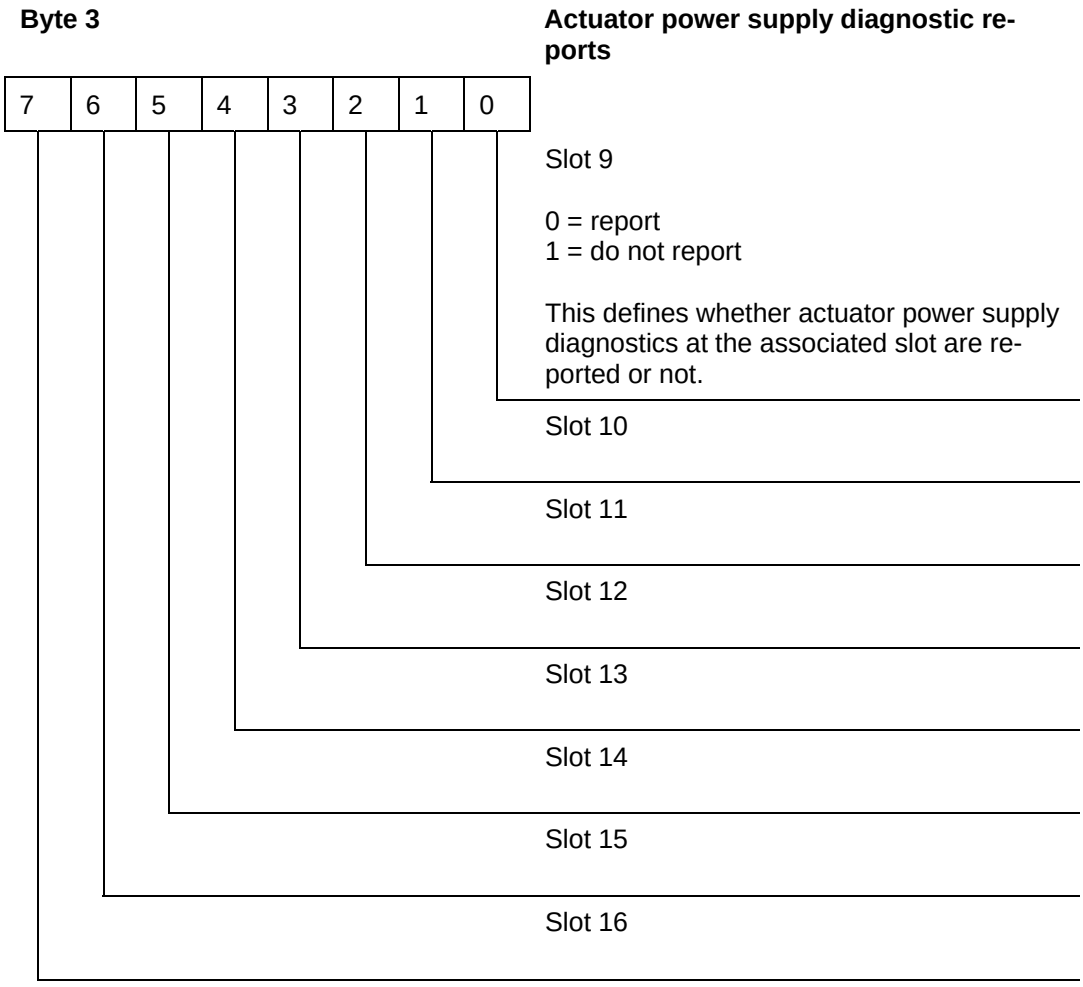



*Fig. 6: Parameter Byte 3 of Cube20 PNIO-DP DI8 Art. No. 56006*

**Refer to the appropriate product manual for how to parameterize Cube20 I/O modules. You will find an overview in the chapter "Manual Overview and Layout" on page III.**

## 3.2 Identification and Maintenance

### 3.2.1 General Information

This section provides you with an overview of the scope of I&M (Identification & Maintenance) functions supported. The tables do not list any values and may change during the course of development (IM0), or may be written by later end-users (IM1).

Detailed lists and descriptions of parameters are contained in IEC 61158-6-10.

I&M data can be requested by acyclic access from the bus node. Addresses are slot-dependent. I&M data are addressable by their slot on the bus node or individual I/O modules.

I&M data are reserved for the bus node. For I/O modules without their own separate I&M data, the bus node must reply to requests with "Feature not supported". I/O modules with I&M data (e.g. IO link) have their requests forwarded and manage their I&M data themselves.

### 3.2.2 I&M 0 Module Description

| **I&M0 (required)** | **0xAFF0** | |
|---|---|---|
| **Parameters** | **Description** | **Value** |
| VendorID | Manufacturer ID of PNO | 0x012F |
| OrderID | Bus node order number | 56006 |
| IM_Serial_Number | 16-digit visual string (manufacturer-specific) | MAC ID |
| IM_Hardware_Revision | Hardware version (16-bit) | |
| IM_SW_Revision_Functional_Enhancement | Software version for major changes (8-bit) | |
| IM_SW_Revision_Bug_Fix | Software version for bug fixes (8-bit) | |
| IM_SW_Revision_Internal_Change | Software version for internal changes (8-bit) | |
| IM_Revision_Counter | I&M revision counter | 0x0001 |
| IM_Profile_ID | I&M profile ID (16-bit) | 0x0000 |
| IM_Profile_Specific_Type | I&M profile specification type(16-bit) | 0x0000 |
| IM_VERSION | I&M version ID | 0x0101 |
| IM_SUPPORTED | Describes which I&M functions are supported | 0x0002 |

*Tab. 1: I&M 0*

### 3.2.3 I&M 1 – Functions and Installation Locations

| I&M1 | 0xAFF1 | |
|---|---|---|
| **Parameters** | **Description** | **Value** |
| IM_Tag_Function | 32-digit visible string – module function | |
| IM_Tag_Location | 22-digit visible string – installation location | |

*Tab. 2: I&M 1*

### 3.2.4 I&M 2 – Installation Date

| I&M1 | 0xAFF1 | |
|---|---|---|
| **Parameters** | **Description** | **Value** |
| IM_Installation_Date | 16-digit visible string – module installation date | |
| IM_Reserved | 38 digits | |

*Tab. 3: I&M 2*

## 3.3 Acyclic Access Options

### 3.3.1 Index 10 Machine Options Management

Slots 0 to 17 can be enabled or disabled in 8 bytes, provided "Machine Options Management" is parameterized.

**Byte 0 Enable/disable Slots 1 to 8:**

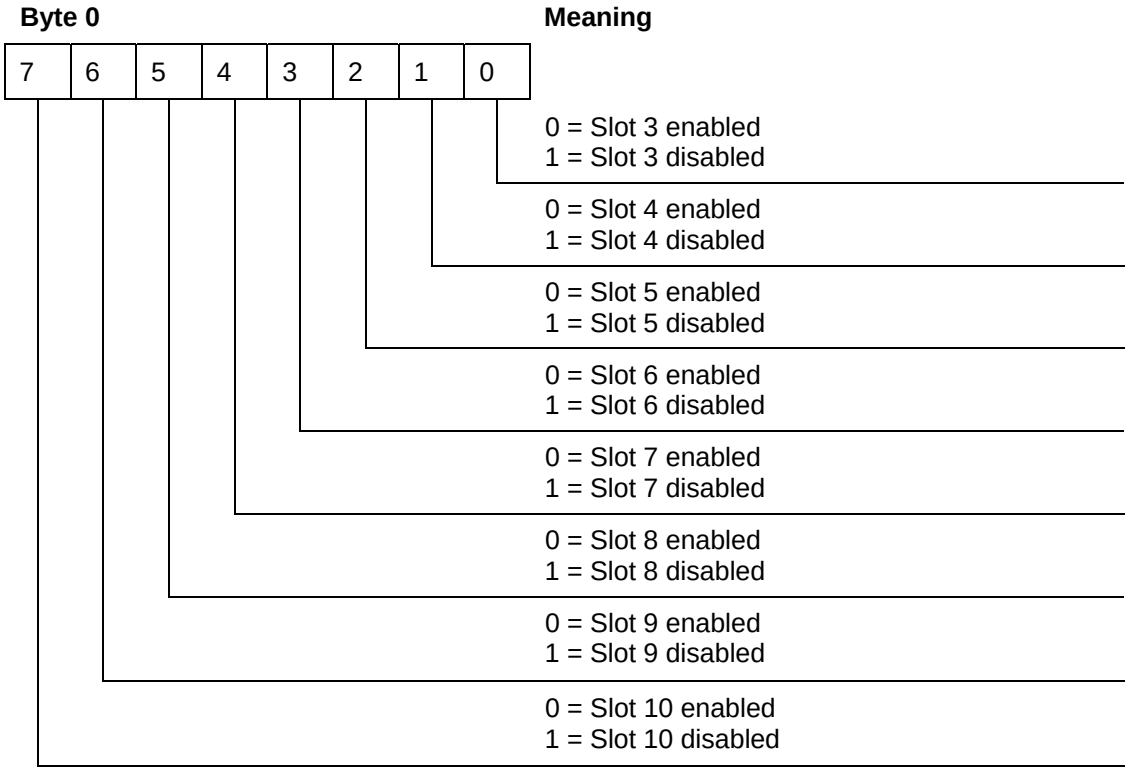



*Fig. 7: Assignment of Byte 0*

**Corresponds to:**

**Byte 1: Enable/disable Slot 11 to 17; Slot 18 not available**

Write or read accesses without "Machine Options Management" receive the negative reply "Access Denied".

Read accesses with "Machine Options Management" receive a positive reply.

If the configuration is invalid, Index 10 write accesses always receive a positive reply. If the configuration is valid after an Index 10 write access, every following Index 10 write access receives a negative reply with "Access Denied".

If no valid configuration is set in "Machine Options Management", the system does not exchange any relevant data with the controller.

## 3.3.2 Index 12 BusControl

**Byte 0: „BusControl“:**

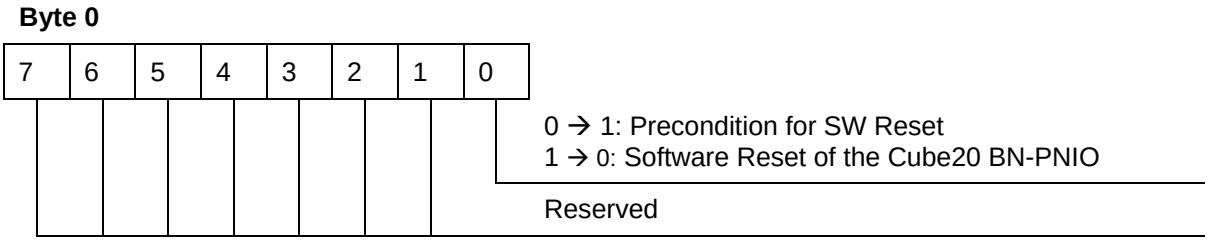



*Fig. 8: Index 12 BusControl byte DPV1*

The bus node can be reset from the PLC using the BusControl access. This may reset a possibly present UA short-circuit or other fault without switching the power supply of the Cube67+ BN-P on or off manually.

### 3.3.3 Index 13 Status Request of the Cube20 BN-PNIO

**Byte 0: Konfigurationsüberprüfung:**

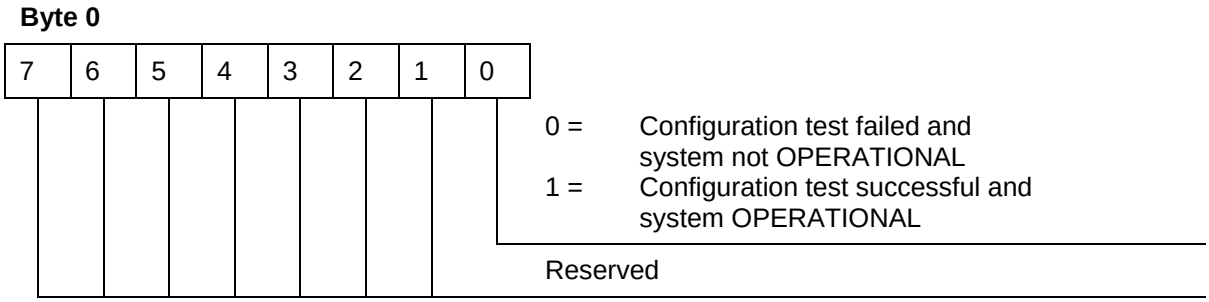



*Fig. 9: Belegung Konfigurationsüberprüfung*

Read access must be set with Index 13 to know whether a valid configuration was set in "Machine Options Management". Here, 1 is returned if the configuration is valid and the system is OPERATIONAL, otherwise 0.

If the bus node is parameterized with "Standard Configuration", the reply contains the present system state from **Fehler! Verweisquelle konnte nicht gefunden werden.**.

Write accesses receive the negative reply "Access Denied".

## 3.4 I/O Data of Cube20 PNIO-DP DI8 Art. No. 56006

**Bit Assignment of Input Data PAE I/O Data**

| **Byte 0** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Bit** | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| **Terminal** | X2 03 | X2 02 | X2 01 | X2 00 | X1 03 | X1 02 | X1 01 | X1 00 |

*Tab. 4: Input data of Cube20 BN-PNIO DP DI8 Art. No. 56006*

# 4 Startup of Cube20 BN-PNIO

## 4.1 GSDML File

The GSDML file in XML format is required to operate the devices described in this manual.
**GSDML-Vx.x-Murrelektronik- Cube20_BN_PNIO -JJJJMMTT.xml**

Import the GSDML file to the appropriate configuration tool before starting up the device.

➔ ***The GSDML file is downloadable from the Murrelektronik website on the "Service >> Technical Data" page: www.murrelektronik.com***

## 4.2 Configuration with S7 Hardware Manager

This chapter describes how to configure and parameterize a Cube20 BN-PNIO using the example of the HW Config (hardware configuration software of the Simatic S7 Manager from Siemens).

### 4.2.1 General Information

Configuring a ProfiNet device is necessary to define the I/O data quantity and reserve the addresses in the controller.

First, add the head module to the virtual bus, just as in a construction kit. Head modules always have zero data length and their function acts as module identification and parameterization. They are in direct connection with the Article Number of each Cube20 BN-PNIO.

Each head module is followed in Slot 1 by a BN–PNIO DI8 as bus node together with its inputs.

Cube20 or Cube67 modules can then be installed in a row. A separate address can be assigned to each of the useful data modules in the PLC process image.

## 4.2.2 Parameterization of Modular Station

Double-click on any module to open a list box containing the parameter settings for this module.

Select the settings you require.

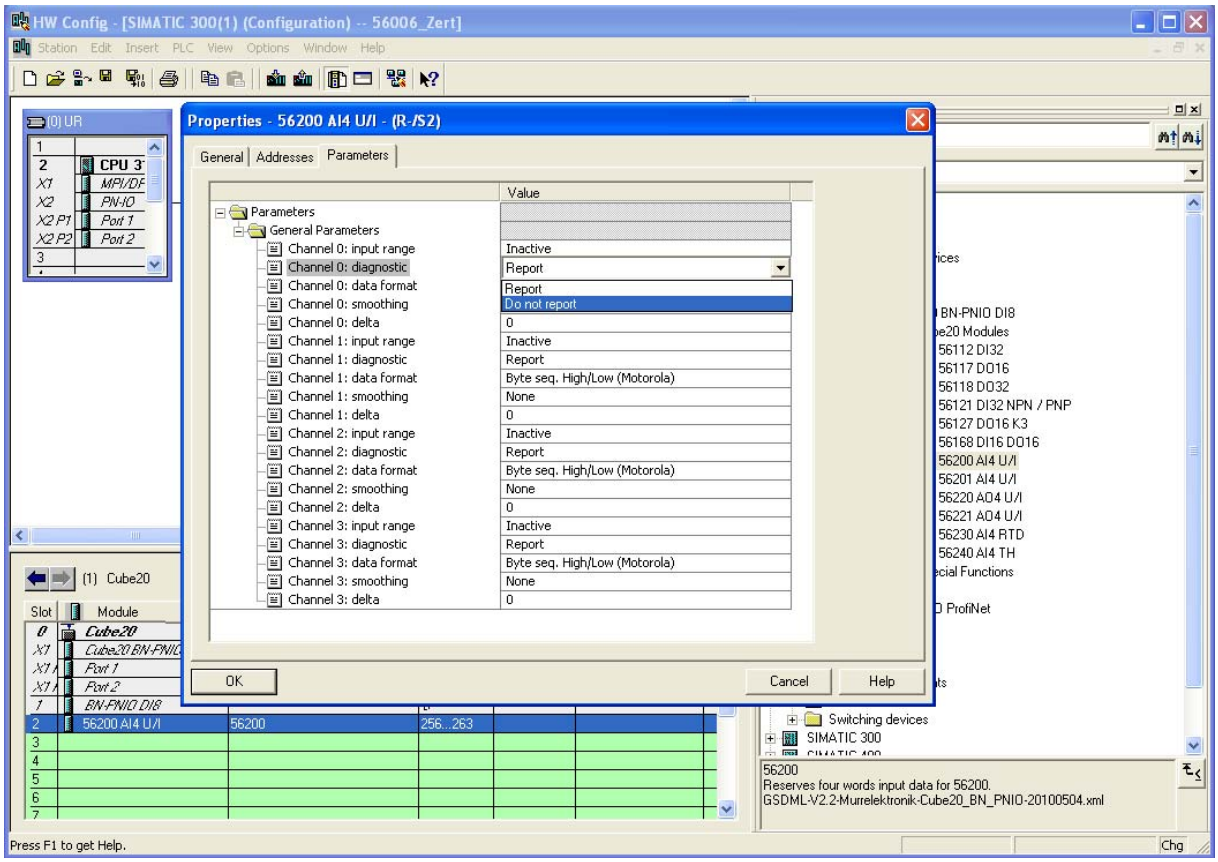



*Fig. 10: Settings of Cube20 field devices in the Simatic Manager*

## 4.2.3 Setting the Topology

ProfiNet offers a number of functions, diagnostic, and maintenance options based on the existing topology or utilizing knowledge of the topology. All Cube20 BN-PNIO devices support the topology setting and automatic topology recognition by the Engineering Tool.

This is followed by setting the topology for the Cube20 BN-PNIO.

Setup via connected adjacent devices is performed using Slots X1 P1 and X1 P2, which represent physical interfaces.

A list of possible ports of other devices in the project is contained in the Topology tab under the "Partner Port" option.

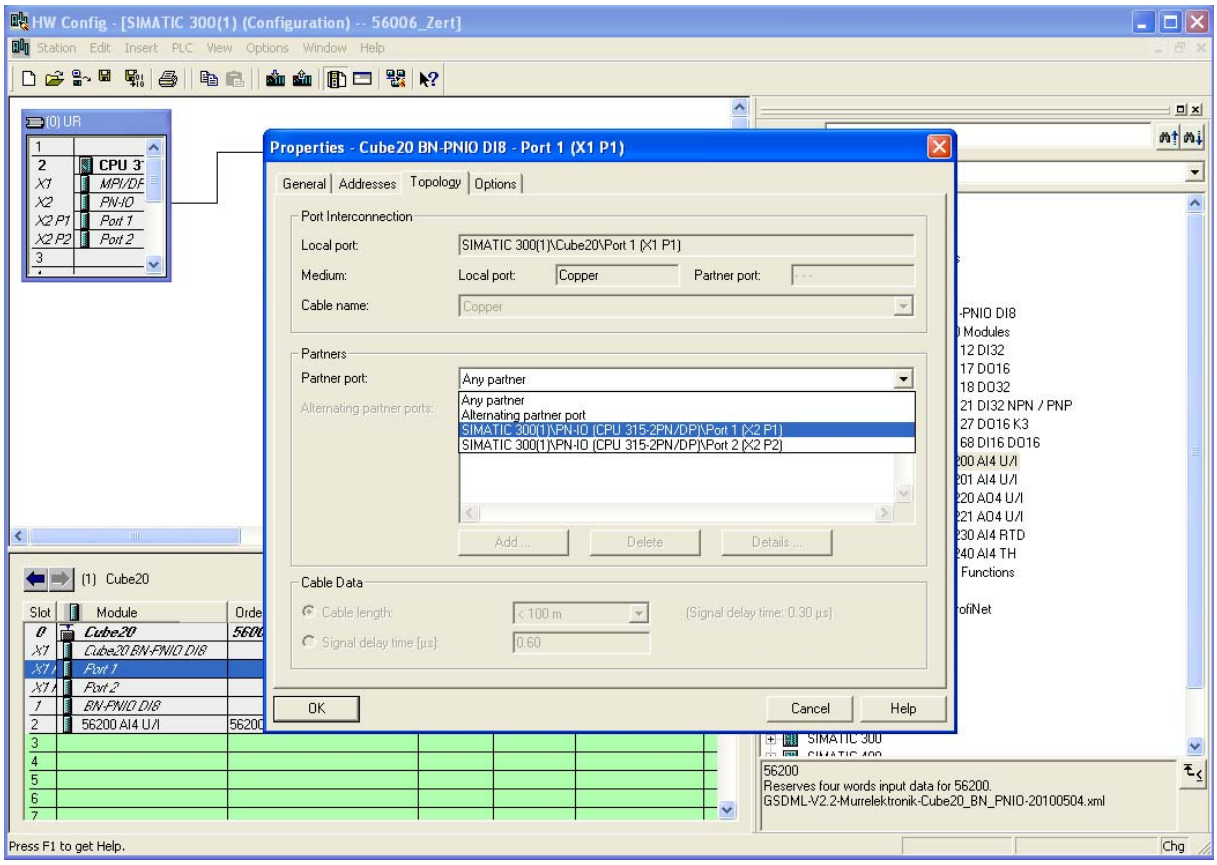
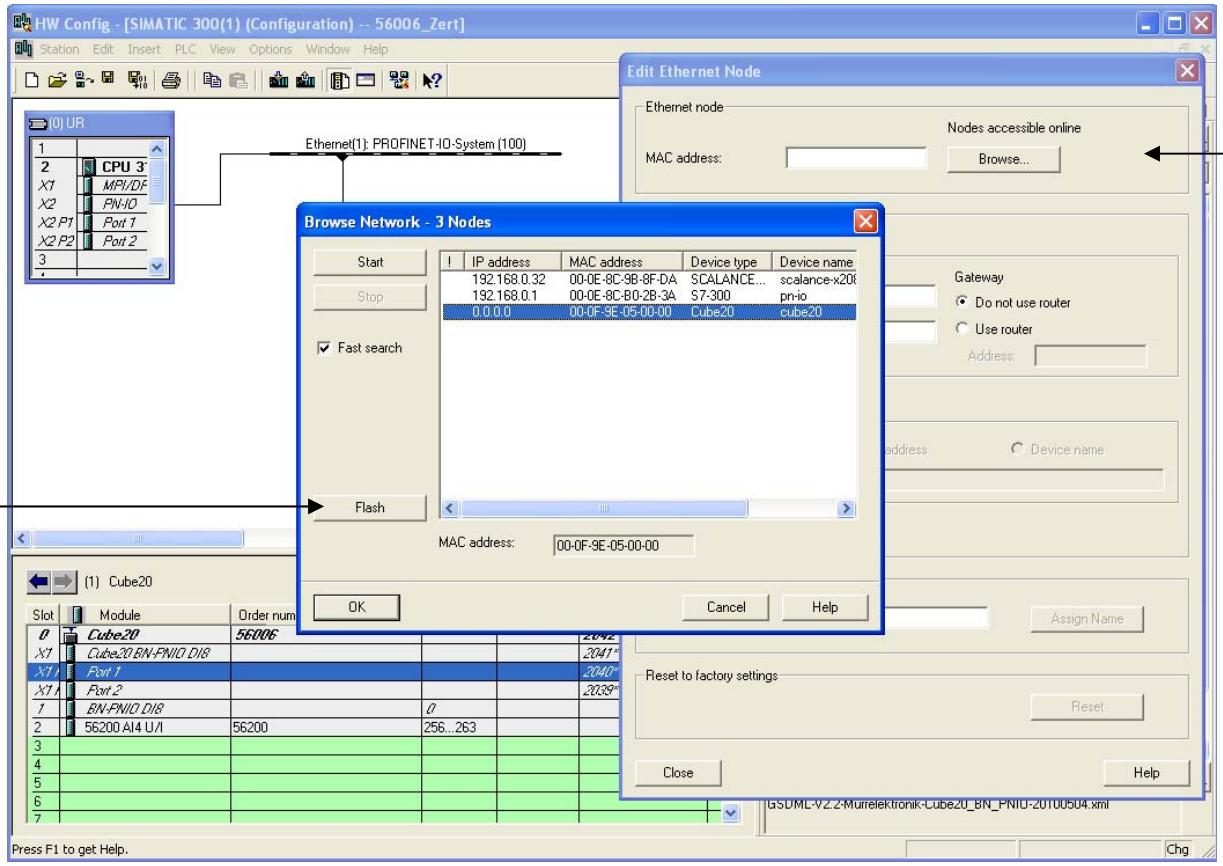



*Fig. 11: List of possible partner ports*

## 4.2.4 Identifying Devices in the Network

PNIO devices are identified by their MAC addresses and the appropriate device type. If you want to put several devices of the same type into operation, make sure you provide each with a definite unique identification.




Use your configuration tool to scan and select all the devices in the network. Use the path below to search the network for reachable users in the HW configuration: **Target system → Ethernet → Edit Ethernet Users → Search**

Identification takes place using the blink test. This test makes the LINK LED of the selected Cube20 BN-PNIO device blink at a rate of 2 Hz. Mark an available device and select the **Blink** option.

*Fig. 12: Identifying devices in the network*

**Factory Settings of the Cube20 BN-PNIO**

- MAC address 00-0F-9E-xx-xx-xx

- IP address 0.0.0.0

- Device type Cube20 PROFINET

- Device name:

The device name according to the factory settings is unassigned.

## 4.2.5 Issuing Device Names and IP Addresses

After you identify a device with a unique identification, assign a device name to it. The IP address is issued automatically by the PNIO controller via DCP.

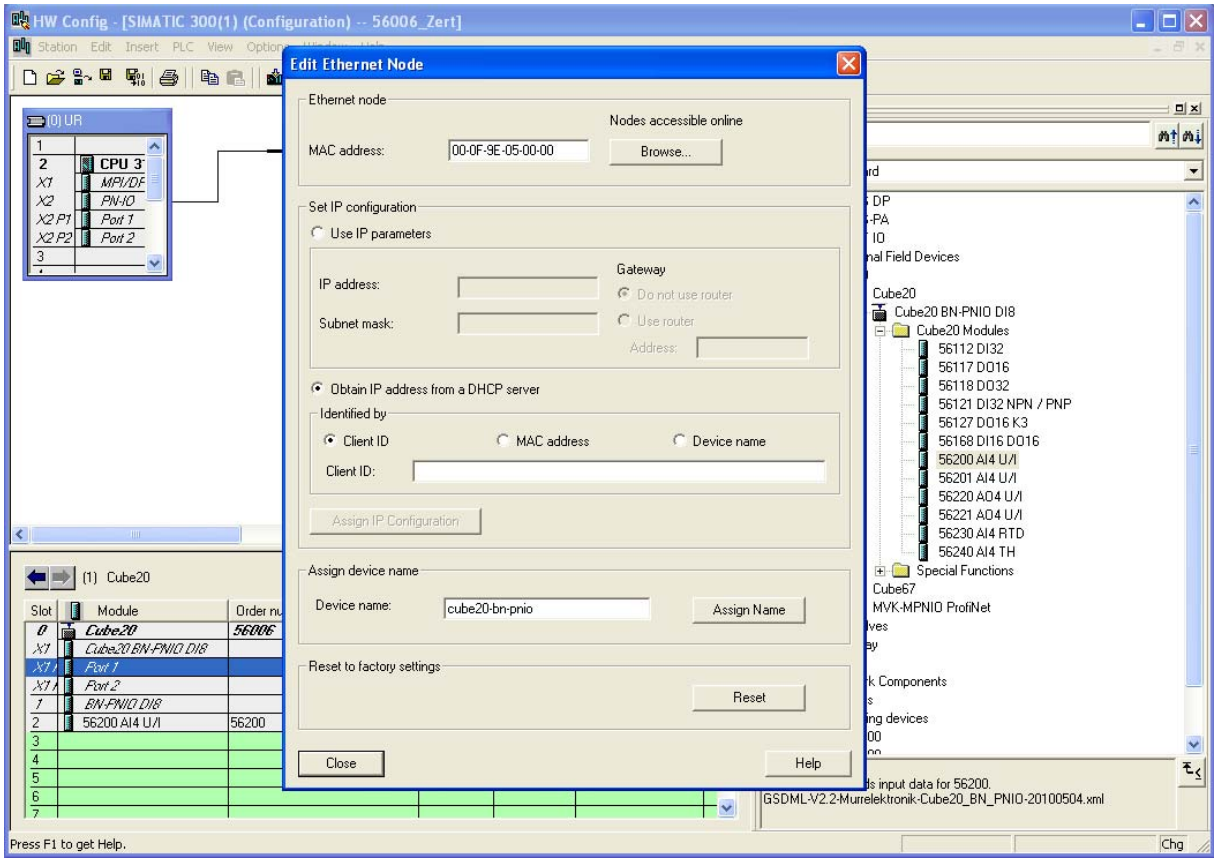



*Fig. 13: Issuing device names and IP addresses*

The Simatic S7 Manager then shows you the data detected from the Cube20 BN-PNIO.

**Further procedures:**

- Enter a name for the device.
- Click on "***Assign Name***".
- If you do not want to fetch the address from a DHCP Server, set the required IP address and subnet mask.
- Click on "***Assign IP Configuration***"
- Or select the suboption to fetch the IP address from a DHCP Server.
-

**With ProfiNet I/O, it is absolutely necessary to assign a unique name to each device. Address and name resolution is only controlled by the name that is stored permanently in the device.**

**Reset to Factory Settings**

The "Reset to Factory Settings" function clears the previous settings and restores the defaults.

IP address: 0.0.0.0

Device name:

# 5 Diagnostics

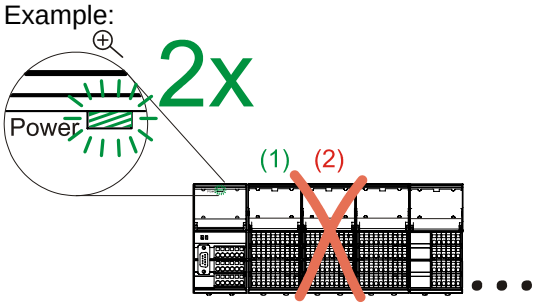
## 5.1 LED Indicators

### 5.1.1 Meaning of "Power" LED States

**The "Power" LED indicates the state of the Cube20 system voltage and internal communication.**


*Fig. 14: Power LED on Cube20 modules*

**Response of Power LED on Cube20 BN Modules**

| Color | | Meaning for Power LED | Remedial Action |
|---|---|---|---|
| | green | System voltage (>12V) applied | |
| | flashes green | System link interrupted in the Cube20 System.<br>Number of flash pulses corresponds to position of defective expansion module (e.g.: 1 to 15), with several modules, the nearest. | Exchange the affected module and power rest at terminal UB<br>or<br>perform Index 12 of Cube20 BN module via acyclic access |
| | | Example:<br>  | |
| | off | No system voltage (>12V) | Raise system voltage |

*Tab. 5: Response of Power LED on Cube20 BN Modules*

**The I/O data of unreachable modules is reset to zero. The input data of reachable modules is not updated. The output data is also reset to zero.**

**CAUTION**

**Devices from the Cube20 series are not safety devices conforming to the relevant standards. Do not use the OFF state of the outputs to implement safety-related requirements of the application.**

### 5.1.2 Meaning of "Bus Run" LED States

**The "Bus Run" LED indicates the state of PROFINET communication on the Cube20 PNIO DI8 Art. No. 56006.**


*Fig. 15: Run LED on the Cube20 PNIO DI8 Art. No. 56006*

| LED Display | Response | State |
|---|---|---|
| ■ | lights up continuously (green) | Data transfer: |
| ▨ | flashing (green) | No data exchange |
| □ | off | - Voltage too low (<12 V) at Terminal UB |

*Tab. 6: Run LED on the Cube20 PNIO DI8 Art. No. 56006*

### 5.1.3 Meaning of "Cfg F" LED States

**The "Cfg F" LED indicates the state of a correct/incorrect configuration on the Cube20 PNIO DI8 Art. No. 56006.**


*Fig. 16: Cfg F LED on the Cube20 PNIO DI8 Art. No. 56006*

| LED Display | Response | State |
|---|---|---|
| | lights up continuously (green) | Configuration OK |
| | off | No configuration |
| | flashing (red) | Module flashed over PROFINET |
| | lights up continuously (red) | Real configuration does not match the projected configuration |

*Tab. 7: Cfg F LED on the Cube20 PNIO DI8 Art. No. 56006*

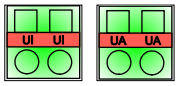
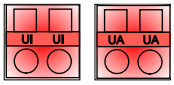
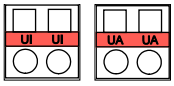
## 5.1.4 Power Supply Displays at Terminals

### Module Power Supply

**No LED display at Terminal "UB". The system voltage state is indicated by the Power LED.**


**See section: Meaning of "Power" LED States**

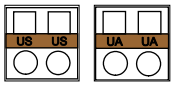
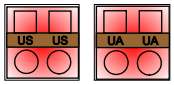
- The LEDs under**"UI"** indicate the status of the sensor power supply voltage.
- The LEDs under**"UB"** indicate the status of the module operating voltage.

| LED display UI and UA | Response | State |
|---|---|---|
|   | green | Power supply OK (>= 18 V) |
|   | red | Undervoltage (< 18 V) |
|   | off | Voltage <= 12.5V |

*Tab. 8: LED module power supply*

### Peripheral Power Supply

- The LEDs under **"US"** indicate the status of the sensor power supply voltage.
- The LEDs under **"UA"** indicate the status of the actuator power supply voltage.

| LED Display US and UA | Response | State |
|---|---|---|
|   | off | Power supply OK |
|   | red | Overload or short-circuit of sensor or actuator power supply |

*Tab. 9: LED periphery power supply*

**The "US" LED is not designed individually for each terminal.**

## 5.1.5 Signal-Logic Display and LED Behavior

### Digital Input Modules

Each input and output is assigned a separate status display It is labeled **"00 to 03"** or **"00 to 07"**. The label indicates the channel number and bit position. It is arranged under the associated terminal and assigns the status of the peripheral components.

### Relationship of signal-logic display and LED behavior at the input

| LED Display | | Logic Value | Voltage at Input | Signal |
|---|---|---|---|---|
|   | off | 0 | 0 V | Input with NO contact function |
|   | yellow | 1 | 24 V | |

*Tab. 10: LED at input of digital modules*

## 5.2 Diagnostics with PROFINET

### 5.2.1 Diagnostic Concept

The diagnostic concept with PROFINET is divided into two steps.

**Logging on the diagnostics:**

Step 1: PROFINET saves all diagnostic information in the module.

Step 2: PROFINET sends an alarm telegram to the controller to report that diagnostic information is available. You can request this information as required.

**Logging out the diagnostics:**

Step 1: PROFINET clears the information in the module.

Step 2: PROFINET reports this to the controller.

### 5.2.2 Predefined Diagnostics

PROFINET receives predefined error codes that are used in alarm reports to inform the user which error has occurred.

Below is an extract from IEC 61158-6-10.

| Code [HEX] | Meaning | Assigned text |
|---|---|---|
| 0x0000 | Reserved | Unknown error |
| 0x0001 | Short circuit | Sensor short-circuit |
| 0x0002 | Undervoltage | Sensor power supply undervoltage |
| 0x0003 | Overvoltage | |
| 0x0004 | Overload | |
| 0x0005 | Overtemperature | |
| 0x0006 | Line break | Line break |
| 0x0007 | Upper limit value exceeded | Upper limit exceeded |
| 0x0008 | Lower limit value exceeded | Lower limit exceeded |
| 0x0009 | ERROR | Fault |

| Code [HEX] | Meaning | Assigned text |
|---|---|---|
| 0x000A | Simulation active | |
| 0x000B | Unknown error | |
| 0x000C | Unknown error | |
| 0x000D | Unknown error | |
| 0x000E | Unknown error | |
| 0x000F | Parameter missing | |
| 0x0010 | Parameterization fault | |
| 0x0011 | Power supply fault | Actuator undervoltage |
| 0x0012 | Fuse blown / open | |
| 0x0013 | Communication fault | |
| 0x0014 | Ground fault | |
| 0x0015 | Reference point lost | Reference channel fault |
| 0x0016 | Process event lost / sampling error | |
| 0x0017 | Threshold warning | Actuator warning |
| 0x0018 | Output disabled | Deactivate actuator |
| 0x0019 | Safety event | |
| 0x001A | External fault | Desina diagnostic |
| 0x001B | Manufacturer specific | Actuator power supply not available |
| 0x001C | Manufacturer specific | Sensor power supply not available |
| 0x001D | Manufacturer specific | External actuator power supply not available |
| 0x001E | Manufacturer specific | External actuator power supply undervoltage |
| 0x001F | Temporary fault | |
| 0x0609 | Manufacturer specific | Machine Options Management not loaded |
| 0x0610 | Manufacturer specific | Configuration error |

*Tab. 11: Predefined error codes in PROFINET*

### 5.2.3 Diagnostics of Cube20 BN-PNIO and I/O Modules

| Module | Diagnostic | Error Code | Report to |
|---|---|---|---|
| Digital modules | Sensor short-circuit | 0x0001 | Module / channel |
| | Undervoltage (US/UI/UA) | 0x0002 | Module |
| | No voltage (UA) | 0x0011 | Module |
| | DESINA (only Cube67 modules) | 0x001A | Module / channel |
| | Actuator short-circuit | 0x0018 | Module / channel |
| | Actuator warning (only Cube67 modules) | 0x0017 | Module / channel |
| Analog modules | Line break | 0x0006 | Module / channel |
| | Measuring range undershot | 0x0008 | Module / channel |
| | Measuring range overshot | 0x0007 | Module / channel |

*Tab. 12: Allocation between predefined and Murrelektronik-typical diagnostics*

### 5.2.4 Diagnostic Message Parameters

This section describes the parameters used for diagnostic logon and logout.

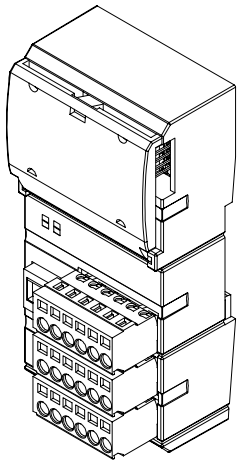
| | | | |
|---|---|---|---|
| **Slot** | Receives information regarding the slot where the diagnostic is reported. The software must know what module is configured at which slot. | | |
| **ChannelNumber** | The exact channel number can be sent here for channel diagnostics and is then displaced like this. Channel number 0x8000 is reserved for module diagnostics, e.g. undervoltage. | | |
| **ChannelProperties** | This parameter describes the I/O functions of the affected channel/module with the diagnostic. The values for this are contained in IEC 61158-6-10. | | |
| **ChannelErrorType** | This is where the error codes from Table 265.2.2 are saved. | | |
| **AlarmState** | 0 | - | outgoing diagnostic |
| | 1 | - | incoming diagnostic |

## 5.3 Troubleshooting

| **Diagnostic Message** | | **Possible Cause** | **Action** |
|---|---|---|---|
| Chan-nel | Short-circuit (sensor supply) | Overload or short-circuit of sensor power supply to 0V. | Change cable to sensor or check sensor for short-circuit. |
| | Line break | Defective line. Only for ana-log inputs and outputs. | Check connection to sensor or sensor itself. |
| | Upper limit overshot | Analog input measuring range overshot. | Check connection to sensor or sensor itself. |
| | Lower limit under-shot | Analog input measuring range undershot. | Check connection to sensor or sensor itself. |
| | Deactivate actuator | Overload or short-circuit of output signal to 0V. | Check wiring or actuator. |

*Tab. 13: Troubleshooting*

# 6 Technical Data of 20 BN-PNIO DI8 Art. No. 56006



PROFINET IO Device IP20 with 8 digital inputs

[Terminal X1] → 4 inputs

[Terminal X2] → 4 inputs

**EMC**

**EN 61131-2 Product standard**

| | |
|---|---|
| EN 61000-4-2 ESD | Contact ± 4 kV, air ± 8 kV |
| EN 61000-4-3 RF-Field & GSM | 10 V/m |
| EN 61000-4-4 Burst | ± 2 kV DC inputs, ± 1 kV signal lines |
| EN 61000-4-5 Surge | Asym./symm. ± 500 V |
| | Asym. ± 1 kV |
| EN 61000-4-6 HF-asymmetric | 10 V |
| EN 61000-4-8 Magnetic field 50 Hz | 30 A/m |
| EN 55011 Emission | QP 40 dBµV/m (30 ... 230 MHz) |
| | QP 47 dBµV/m (230 ... 1000 MHz) Class A |

**Ambient Conditions**

| | |
|---|---|
| Operating temperature | 0°C... +55°C |
| Storage temperature | -20°C to +85°C |
| Enclosure type according to EN 60529 | IP 20 |

**Mechanical Ambient Conditions**

| | |
|---|---|
| Oscillation according to EN 60068 Part 2-6 | 5 g |
| Shock according to EN 60068 Part 2-27 | 15 g / 11 ms |

**Miscellaneous**

| | |
|---|---|
| Dimensions (LxWxH) in mm | 117 x 56 x 47 mm |
| Mounting dimension (L xW)in mm | 117 x 56 mm |
| Weight | 170 g |

**Bus Data**

| | |
|---|---|
| Transfer protocol | PROFINET I/O according to IEC 61158 |
| Transfer rate | 100 MBit/s |
| Addressing | automatically |

### System connection

| | |
|---|---|
| Transfer protocol | Internal system |
| Addressing | Automatic |

### Connection Possibilities

| | |
|---|---|
| Internal system connection Out | 10-pin male connector |
| Sensor and actuator supply | Cage clamp 2.5 mm² |
| Bus connection | RJ45 |
| Sensor | 2x4 terminal block connectors |

### Power Supply

| | |
|---|---|
| Operating voltage range logic $U_B$ | 18 ... 30.2 V DC |
| Current consumption (only, $U_B$ ) | 100 mA |
| Sensor supply $U_I$ | 18 ... 30.2 V DC |
| Reverse voltage protection module electronics | Yes |
| Reverse voltage protection sensor power supply | yes |
| Reverse voltage protection actuator power supply | yes |
| Overvoltage protection | yes (suppressor diode ) |

### Inputs

| | |
|---|---|
| Delay time for signal change | 2 ms |
| Input characteristics | EN 61131-2, Type 2 |
| Galvanic separation | 500 V |

### Sensor power supply

| | |
|---|---|
| Max. current | 0.7 A |
| Short circuit protection for sensors with automatic restart | Yes |
| Reverse polarity protection | Yes |

**This is a class A product. The product may cause broadcast interferences in a residential environment. In this case, the applicant may have to take appropriate measures.**

# 7 Accessories

A list of Cube20 accessories is contained in the Cube20 System Manual.

**** Refer to our catalog or visit our online shop at www.murrelektronik.com***

# Glossary

| | |
|---|---|
| AI | Analog Input. |
| Deactivate actuator | Short-circuit or overload at an output results in output switchoff. |
| AO | Analog Output. |
| BN-PNIO | Bus Node-PROFINET. |
| Bus Run LED | LED to signal bus status. |
| Bus segment | Due to the electrical specification of the RS-485 interface, the number of users on the RS485 network is restricted to 32 users. If more than 32 Profibus users are connected, the network must be divided into segments by means of repeaters. |
| Byte | Equivalent to 8 bits. |
| Cfg F-LED | LED to signal a correct/incorrect configuration. |
| DESINA | DEcentralized and Standardized INstAllation technology |
| DI | Digital Input |
| DIN | Deutsches Institut für Normung (German Standards Institute) |
| DIN TH35 | Standardized DIN mounting rail (35x15 mm, 35x7.5 mm). |
| DO | Digital Output |
| DP | Decentral Periphery. Profibus protocol for the high-speed cyclic data exchange. |
| I/O | Input/Output |
| EC Directive 2004/108/EC | EMC Directive. |
| EMC | Electromagnetic Compatibility. |
| EN | European Standard |
| ESD | Electrostatic Discharge |
| FE | Function ground/earth. |
| GSDML | The Generic Station Description Markup Language file is the device master file in XML format containing the technical features of a PROFINET product. This file is required to configure a PROFINET system and is provided by the device manufacturer. |

| | |
|---|---|
| I | Current. |
| I/O | Input/Output |
| I/O link | Standardized communication system to link intelligent sensors and actuators to an automation system. |
| ID number | A 16-bit number that identifies a Profibus product uniquely. It represents a reference for the DDB file. Several devices may also have the same ID number, provided they are describable in a common DDB file. This number is issues by the Profibus Nutzerorganisation e.V. (German Profibus User Organization). |
| IEC | International Electrotechnical Commission |
| IEC 61158 | Profibus DP and FMS standard valid worldwide. Successor of international standard EN 50170 Volume 2. |
| IP20 | Ingress Protection, protection degree to DIN EN 60529<br>1st digit = protection against contact and foreign bodies<br>2nd digit = protection against water<br><br>2: Protection against the ingress of solid foreign bodies above a diameter of 12.5 mm, protection against access by finger<br>0: No protection against inclusion |
| ISO | International Standard Organization |
| LED | Light Emitting Diode |
| LSB | Least Significant Bit. |
| FO | Fiber optics, optical fiber. |
| MSB | Most Significant Bit. |
| OSI | Open Systems Interconnection |
| PAA | Process map of outputs |
| PAE | Process map of inputs |
| PELV | Protective Extra Low Voltage. |
| PNO | Profibus/PROFINET-Nutzerorganisation e.V. (German Profibus User Organization) |
| Power-LED | LED to signal operating status |
| ProfiNet | Process Field Network |
| Pt 100 | Temperature sensor on platinum base (0°C equals 100Ω). |
| +R | High potential sensor connection |

| | |
|---|---|
| -R | Low potential sensor connection. |
| Repeater | Coupling element to process signals between Profibus segments. |
| RL | Sensor power supply in three-wire mode. |
| RTD | Resistance Temperature Device. |
| RTR | Remote Transmission Request. Request for data using the same identifier as used for data transmission. |
| S | Reference potential |
| SDO | Service Data Object, Objects for access and manipulation to data in the object directory |
| Segment | Left segment of the internal system connection (Sockets 0 and 2) and right segment of the system link (Sockets 1 and 3) |
| SELV | Safety Extra Low Voltage. |
| Simatic Manager | Programming software for program-logic controllers made by Siemens. |
| PLC | Program-logic controller |
| SYNC | Synchronization object |
| Line | System line connected to an appropriate socket with the associated modules (Socket 0 = Line 0, etc.) |
| TH | Thermoelement / thermocouple. |
| TH | Low potential sensor connection. |
| TH+ | High potential sensor connection |
| Type E, Type J, Type K, Type N, Type R | Thermocouples as per DIN EN 60584. |
| U | Voltage. |
| U/I | Voltage / current |
| UA (brown terminal) | Actuator power supply |
| UA (red terminal) | Module power supply. |
| UB | Operating voltage. |
| UI (red terminal) | Module and sensor power supply. |
| US (brown terminal) | Sensor power supply. |

| | |
|---|---|
| VDMA | Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Industrial Equipment Manufacturers) |
| Virtual Modules | Modules in the GSD file, e.g. line modules or placeholders that do not correspond to any real physical module. |
| VZ | Sign (+ or -) |
| ZVEI | Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (German Electrical and Electronic Manufacturers' Association). |

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