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Manual
Cube67+ BN-PNIO

- Description of the Cube67+
- Installation
- Startup
- Diagnostics
- Acyclic Access
- Machine Options Management
- Cube67+ Modules
- Technical Data

Publisher's Note

Product Manual for Cube67+ BN-PNIO (Article Number: 56526)

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Service and Support

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

Our Customer Service Center can support you throughout your 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 Customer Service Center provides support tools. They perform measurements for fieldbus systems, such as PROFINET 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.

IO-Link:
General explanations and functions for IO-Link.

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

www.murrelektronik.com

Bus Node Manuals:
Describe product-specific features and settings to the Bus Node and to the modules which are connected to it.

Art. No.	Designation
56521	Cube67+ BN-PROFIBUS
56525	Cube67+ BN-Ethernet / IP
56526	Cube67+ BN-PROFINET IO
56980	Cube67 BN-PROFIBUS
56981	Cube67 BN-DeviceNet
56982	Cube67 BN-CANopen
56983	Cube67 BN-Ethernet / IP
56984	Cube67 BN-DeviceNet V2

www.murrelektronik.com

Technical Data Manual:
Contains of product-specific overviews to installation and exact technical data, values.

Art. No.	Designation
56971	Technical Data of devices of range Cube67 and Cube67+

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Instruction to Safetycategory 3:

Art. No.	Designation
56972	Instruction to Safetycategory 3

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The following links will provide you with more information on particular bus systems, as well as the standards and specifications on which they are based:

>>> PROFINET (www.profinet.com)

>>> IO-Link (www.io-link.com)

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1 Description of the Cube67+

Cube67+ stands for rational and economic solutions. The innovative fieldbus system from Murrelektronik has simplified and modernized decentralized installations from the ground up. Now there is the Cube67+ that bears a plus sign for even more flexibility.

Cube67+ is a new innovative bus node. With it, Murrelektronik is expanding their field-proven Cube67 System. It allows even greater optimization for fieldbus installations, whatever the application.

Machine Option Management

Machines and plants frequently have the same design and only differ in their expansion stages. In this case, the Cube67+ offers a solution with its integrated Machine Option Management. All you need is to create a cross-variant hardware configuration that maps the complete layout of the machine. Dependent on what Cube67 modules are contained in each variant, they can be enabled or disabled by making an entry in the controller or the control panel.

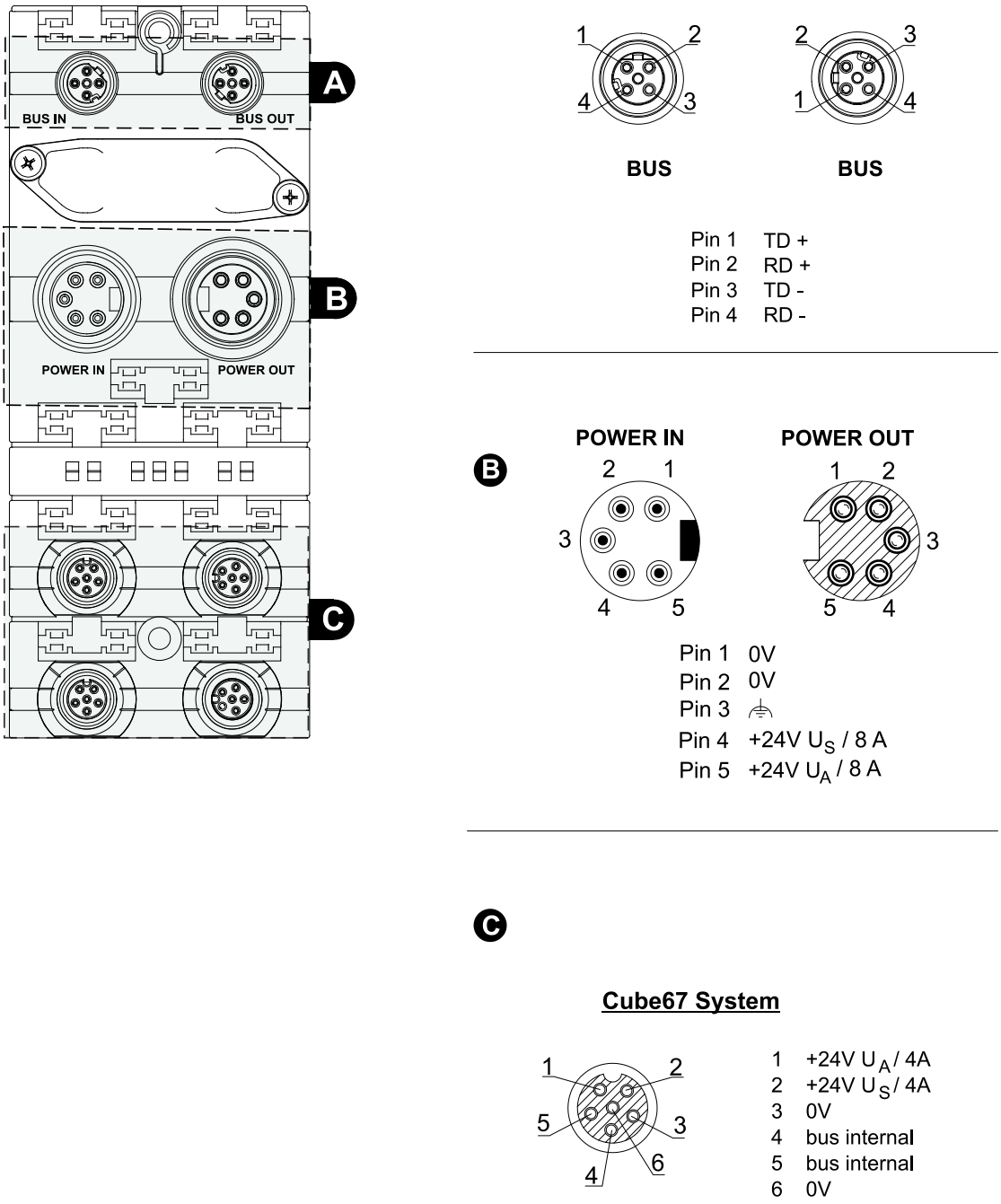
2 Installation

2.1 Mounting

Please refer to the Installation Instructions for the assembly regulations.

You will find an overview in the section "Manual Overview and Layout" in this manual.

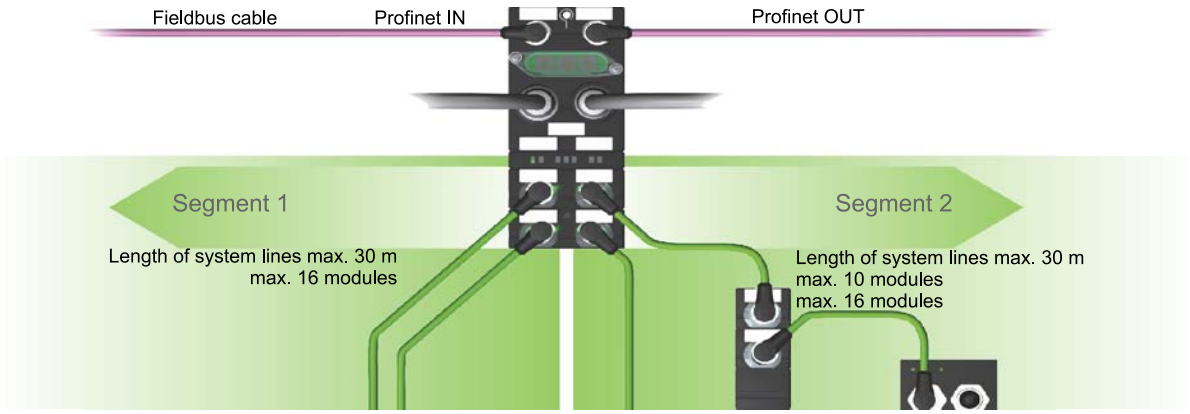
2.2 Terminal Overview of Cube67+ BN-PNIO Art. No. 56526



Fig, 1 Terminal overview of Cube67+ BN-PNIO Art. No. 56526

3 Startup

3.1 Internal System Connection Features



Fig, 2 Internal system connection features

The internal system connection is divided in 2 segments and, due to this division, is now operable with longer line lengths and a larger number of modules.

Sockets 0 and 2 belong to the left segment of the internal system connection; sockets 1 and 3 belong to the right segment. Every segment can be operated with a maximum line length of 30 m. The segments are freely divisible, depending on the application requirements. This means that a single system line with a length of 30 m connected to socket 0 or 2 (or 1 or 3) can be divided as required among the sockets belonging to the segment, either 6 system lines each with a length of 5 m, or 10 system lines with a length of 3 m. The same applies to the number of modules: max. 16 modules are allowed per segment. They can be only connected to one segment socket, or divided as required among the two segment sockets. The layout details required to configure the hardware are contained in the associated PROFINET configuration tool.

If modules are connected to an associated socket x, this is referred to as a connection to line x, whereby x corresponds to the related socket number. For example, Line 0 for Socket 0, Line 1 for Socket 1, etc.

3.2 Internal System Connection Terminations

A terminating resistor must be fitted to the start and end of each internal system connection segment in order to guarantee data transmission, irrespective of whether any modules are connected or not. This means that unused sockets on the internal system connection must be fitted with a terminating resistor, provided at least one module is operated on the segment. This regulation also applies to the output socket "Out" of the last module in the line, provided it is an expansion module.

3.3 Configuration and Parameters

The Cube67+ system is usually configured with the help of a configuration tool provided by the Profinet Controller manufacturer. The controller sends the configuration telegram to the device while the system is booted, defines the number of input and output bytes and the configuration.

With the help of this information, the Cube67+ bus node checks the installation for compliance with the projected configuration. If the bus node detects a difference between the nominal configuration transferred by the PNIO Controller and the physical configuration, the bus node reports a configuration error message (parameter error message) and does not exchange data with the PNIO Controller. A configuration or parameter error is displayed at the bus node by the LED "CFg F". If an error occurs, the LED "Cfg F" lights up red.

Cube67+ System is calibrated as a modular system. If your configuration tool supports this, the bus node "56526 BN-PNIO", 2 port modules, a power supply module, and the "Line 0" module are added automatically when you add the Cube67+ bus node. The bus node "56526 BN-PNIO" is always the first module in the configuration. It is capable of running without any expansion modules.

3.3.1 Maximum Data Length

When you configure the system, pay attention to the maximum length of the Profinet telegram. The maximum data length of a telegram is 1024 bytes. This restriction must be complied with when planning and configuring machines and plants, in particular when a large number of modules are used on a bus node.

3.3.2 Assigning Slots / Real Module

The maximum number of slots in the Profinet configuration is limited to 38 by the GSDML. A maximum of 32 real modules can be connected to the bus node. The remaining slots are required for other modules. These modules, e.g. placeholders (empty slots), line modules, and function modules (Machine Option Management) were introduced to conduct a precise verification of the Profinet configuration and to simplify the configuration for you.

Diagnostic messages are assigned to the associated slots, i.e. if a diagnostic message is received for Slot 3, this message is related to the module at Slot 3. Module numbering may start with Slot 0 or Slot 1, depending on the configuration tool.

3.3.2.1 Line Modules

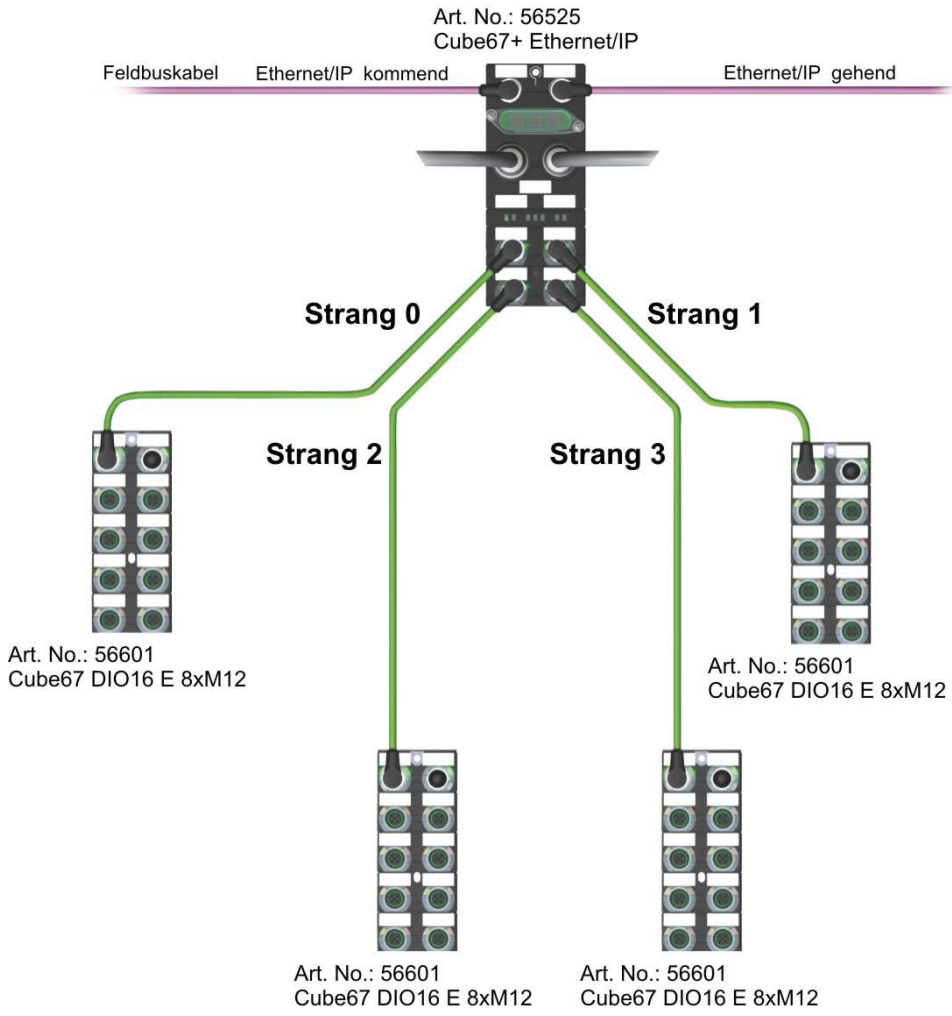
The bus node has enhanced diagnostic options with the line modules. In analogy to the 4 lines of the bus node, 4 line modules are added to the GSDML file. The use of line modules supplies the bus node with an exact topology that can then be compared to the actual topology of the connected modules.

All 4 line modules must be added to the hardware configuration. Line 0 is added automatically when the bus mode is added. The remaining line modules must be added manually.

Modules connected to Socket 0 of the bus node must be added between line modules Line 0 and Line 1 in the hardware configuration. Modules connected to Socket 1 of the BN-PNIO must be connected between Line 1 and Line 2, etc.

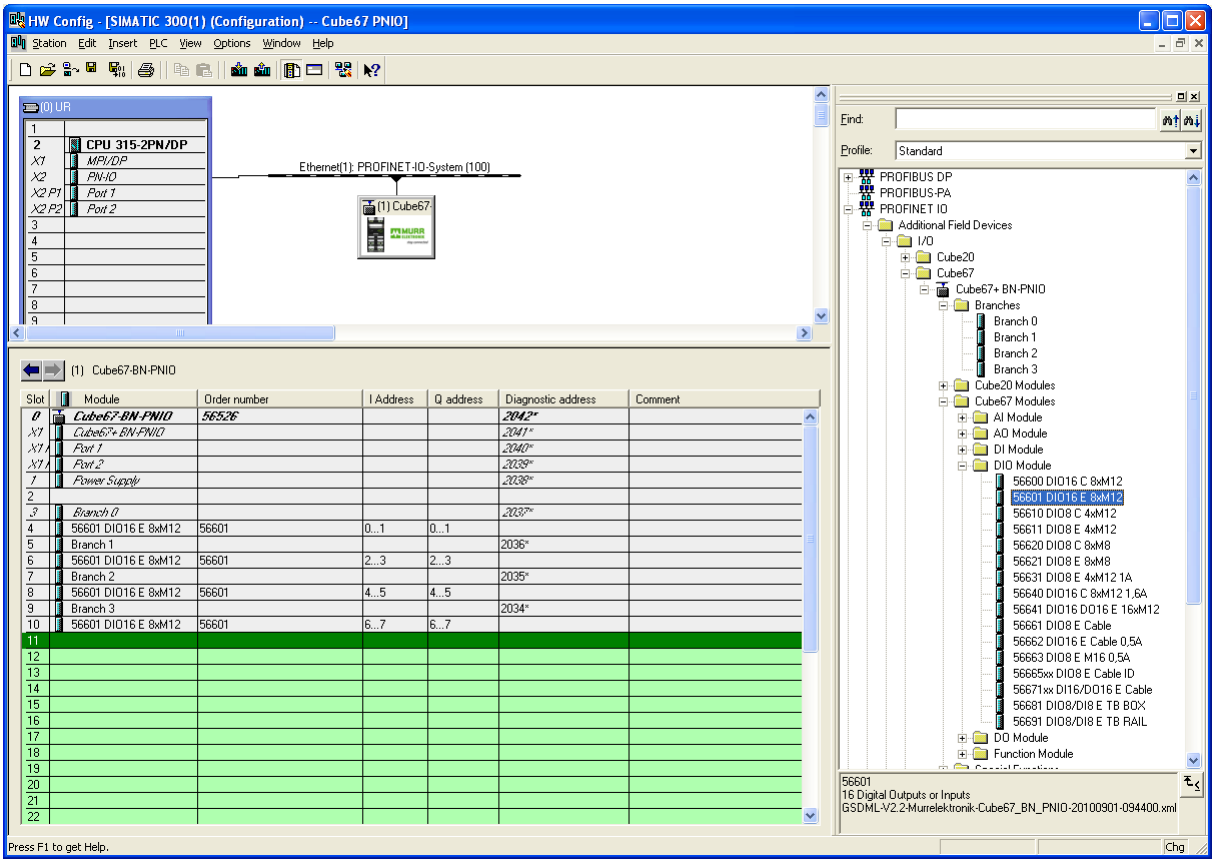
Pay attention to the features of the internal system connection.

Slot 2 is reserved for Machine Option Management.



Fig, 3 Example configuration with standard modules

The example configuration should be configured in Simatic HW Config – as shown in the figure below:



Fig, 4 Example of a line configuration

The bus node software checks for the presence of the virtual modules Line 0 to Line 3. If one of these modules is not present, the bus node signals a configuration error (LED "Cfg F" red).

3.3.2.2 Differences in Cube67+ Modules

Compared to Cube67 modules, all Cube67+ modules can only be operated on one Cube67+ bus node, but not on one Cube67 bus node.

3.3.2.3 Placeholders

In a PROFINET configuration, it is possible to leave slots unassigned. This is considered in the configuration test and offers you the possibility of expanding your machine later, without redesigning the configuration with I/O addresses. You simply add modules to the empty slots.

Due to the new line modules added, it is no longer explicitly recommended to use placeholders. If you can already exclude an expansion of the configuration at the planning stage, the use of placeholders will not provide you with any advantage.

3.3.2.4 Use of Additional Subslots

Additional subslots are used to define additional functionality for a physically real Cube67+ module. The example below is the module 56752 Cube67+ DIO 12 IOL 4 E 8xM12:

Basic module functionality: 4 freely parameterizable M12 sockets each with 2 channels, usable as input or output

Additional module functionality: 4 M12 sockets with I/O link functionality at Pin 4

The basic functionality is defined in the GSDML file via the module 56752 DIO12 8xM12 IO Link. The additional functionality for the 4 I/O link ports is controlled by inserting additional subslots, e.g.:

IOL_DEAKTIVIERT (disabled)

IOL_I_SIO_OEFFNER (NC)

IOL_I_SIO_SCHLIESSER (NO)

IOL_I_1 Byte

IOL_I_2 Byte

…

IOL_I/O_1/1 Byte

IOL_I/O_2/2 Byte

…

IOL_O_1 Byte

IOL_O_2 Byte

…

This permits the selection of functionality as well as the selection of data size in the process map by drag&drop in the configuration tool. It is then possible to make an exact simulation of the real actual configuration. If one of the sockets is required, it is simply disabled by adding the module IOL_DEAKTIVIERT. If a larger data quantity is required, select a module of the corresponding size,

e.g. IOL_I_16 Byte. If you want to use a particular socket as a standard I/O (SIO), then enter the corresponding module, e.g. IOL_I_SIO_SCHLIESSER.

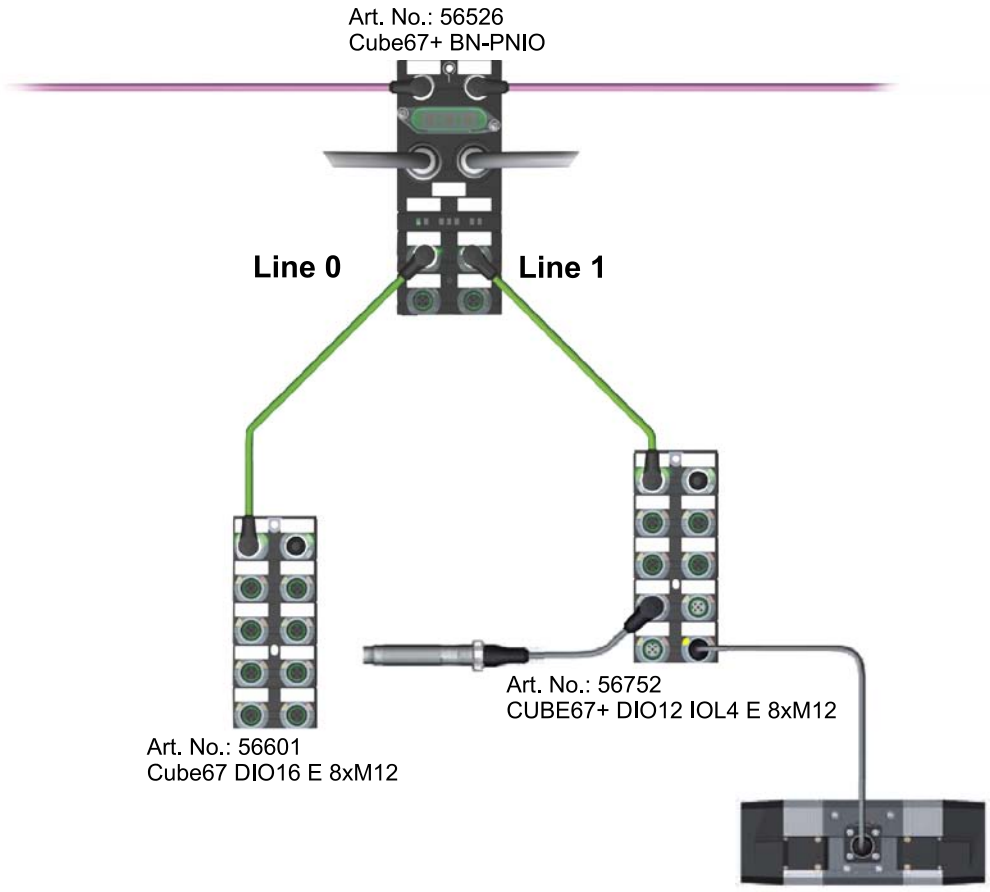
You can then freely define the I and O address for each I/O link socket in the configuration tool using these modules.

On a Cube67+ module, the correct number of virtual modules must always be added behind the basic module in the configuration tool. Errors result in the reporting of a configuration error (LED "Cfg F" red).

Diagnostic messages for additional functionality are reported to the associated subslots.

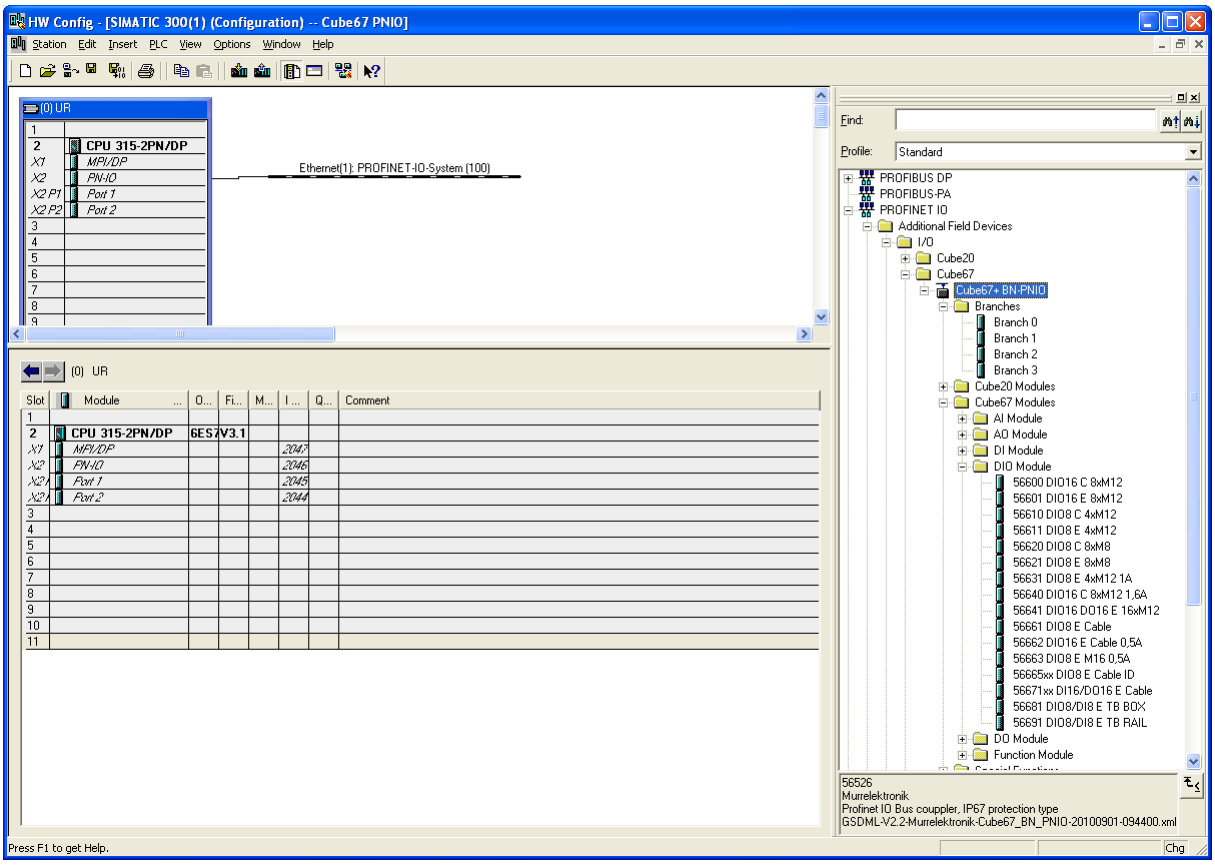
3.3.3 Example: Configuration of a Cube67+ System with SIMATIC Step7®

Let's assume you want to enter the following configuration:



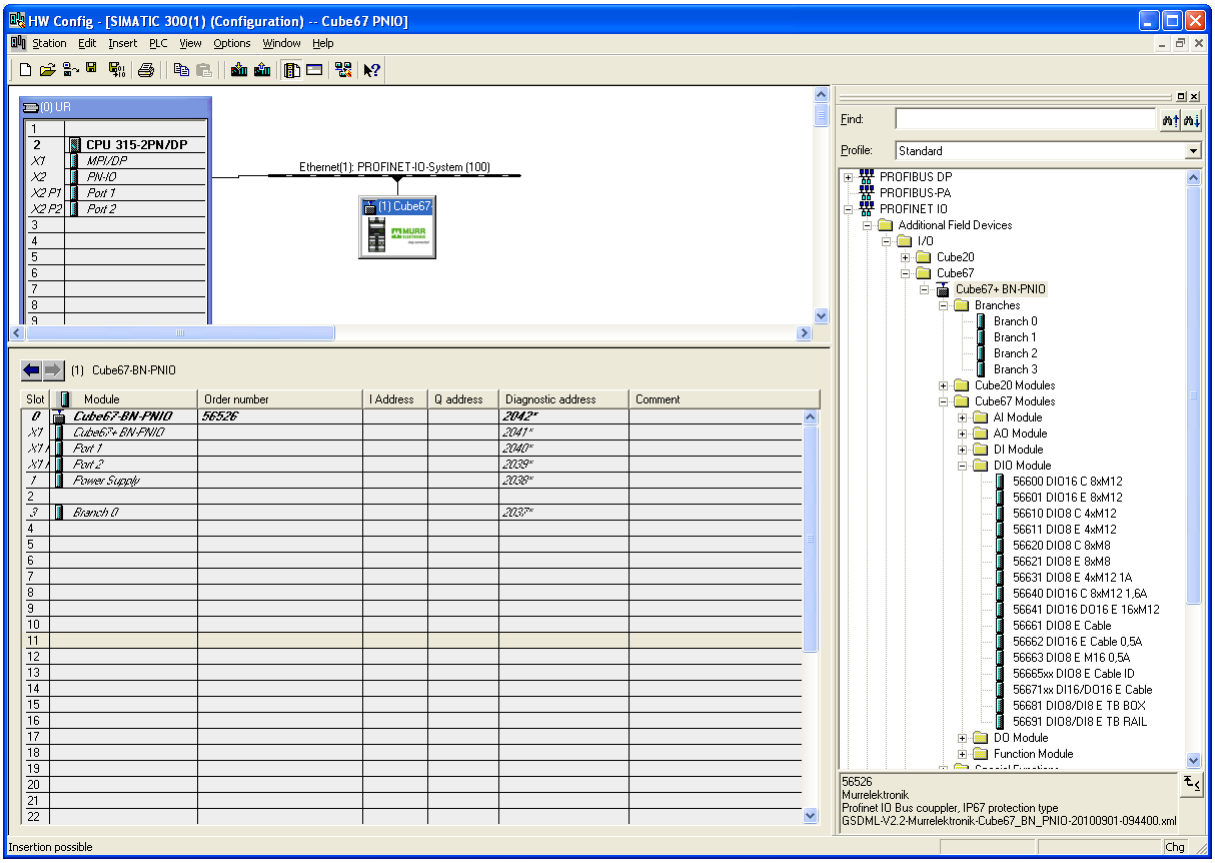
Fig, 5 Configuration of a Cube67+ project

1. **In the Hardware Catalog of the SIMATIC HW Config, you will find Cube67+ BN-PNIO Art. No. 56526 under "Other Field Devices", "I/O" and "Cube67".**

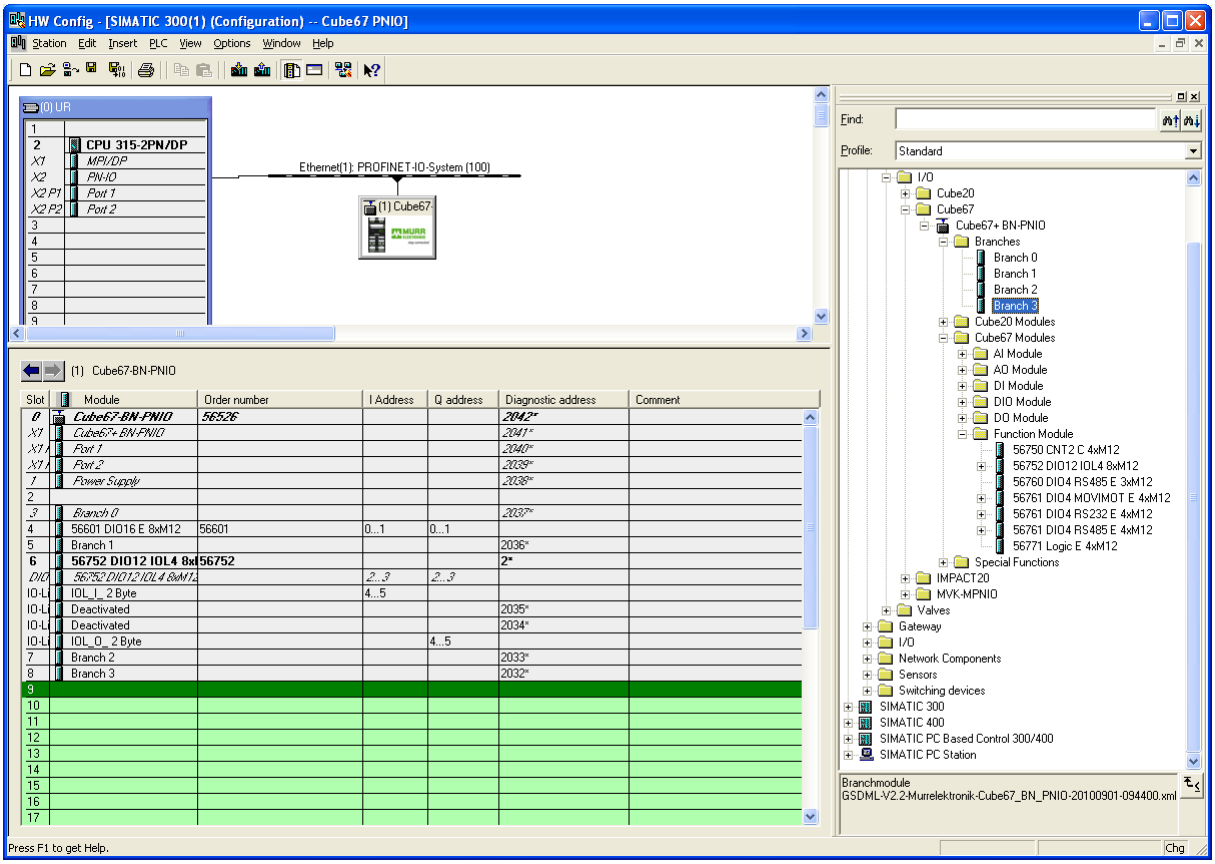


Fig, 6 Cube67+ BN-PNIO Art. No.: 56526 SIMATIC HW Config

2. **Mark the "Cube67+ BN-PNIO" and drag the entry by holding down the left mouse button, or double-click on the PROFINET line. The modules "56526 BN-PNIO" and "Line 0" are added automatically. In order to add other modules (max. 35) to the configuration, simply double-click on the corresponding entry in the Hardware Catalog.**

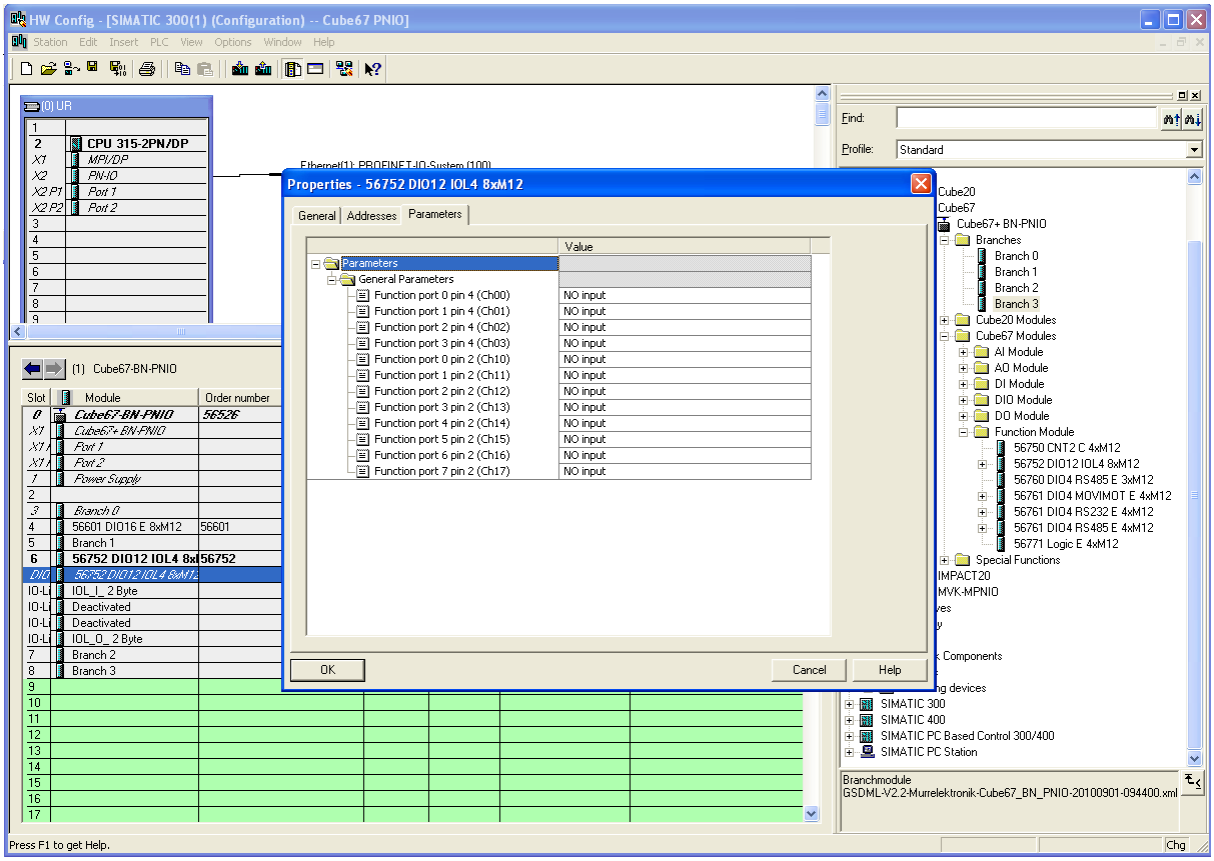


Fig, 7 Cube67+ BN-PNIO added



Fig, 8 Adding Cube67 modules to the SIMATIC HW Config

3. **Double-click on any module to open a list box containing the parameter settings for this module. Select the settings you require.**



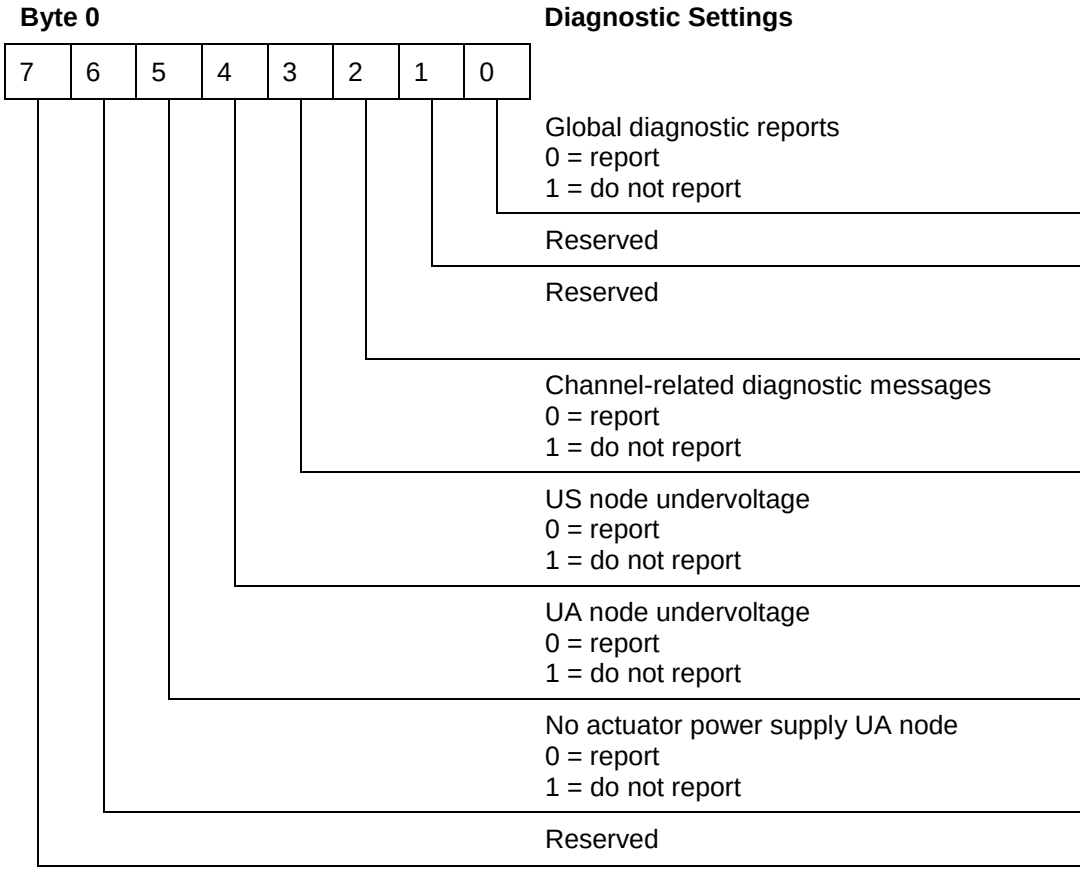
Fig, 9 Parameterizing Cube67 modules in the SIMATIC HW Config

3.3.4 Cube67+ BN-PNIO Art. No. 56526

3.3.4.1 Parameters

Number of parameter bytes: 10

Bit assignment of parameter byte 0



Fig, 10 Parameter byte 0 of Cube67+ BN-PNIO Art. No. 56526

3.3.4.2 Instructions on Diagnostic Settings:

Global diagnostic messages

This defines whether the diagnostics are reported or not. If you select "Do not report", no diagnostics are reported, even those of expansion modules.

Channel-related diagnostic messages

This defines whether channel-related diagnostics are reported or not. If you select "Do not report", no channel-related diagnostics are reported, even those of expansion modules.

US node undervoltage

This defines whether a US undervoltage is reported or not.

UA node undervoltage

This defines whether a UA undervoltage is reported or not.

No actuator power supply UA nodes

This defines whether no actuator power supply of UA is reported or not.

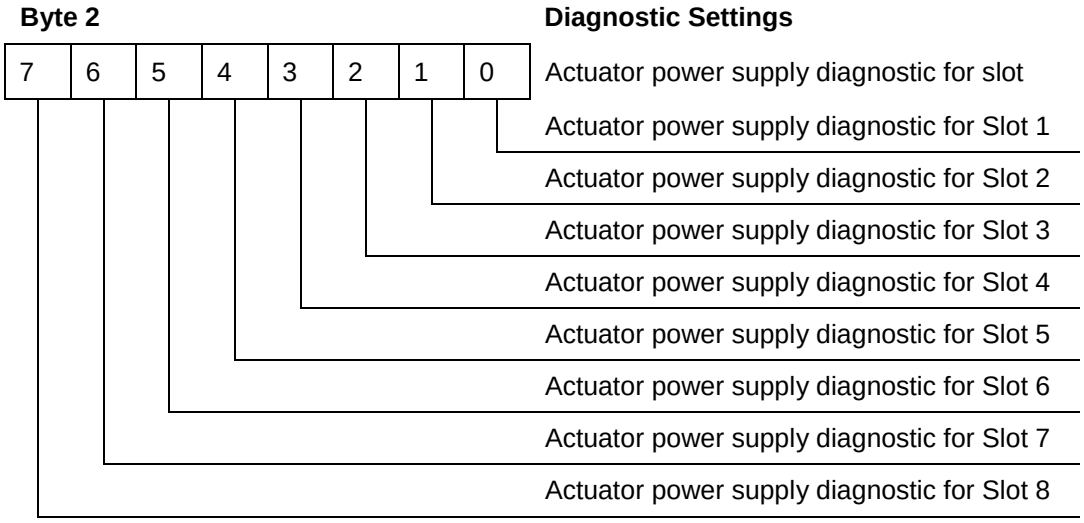
Bit assignment of parameter Byte 1

Reserved

Bit assignment of parameter Byte 2

This defines whether actuator power supply diagnostics, such as undervoltage, or no voltage, are reported for the associated slot or not.

0 = report
1 = do not report



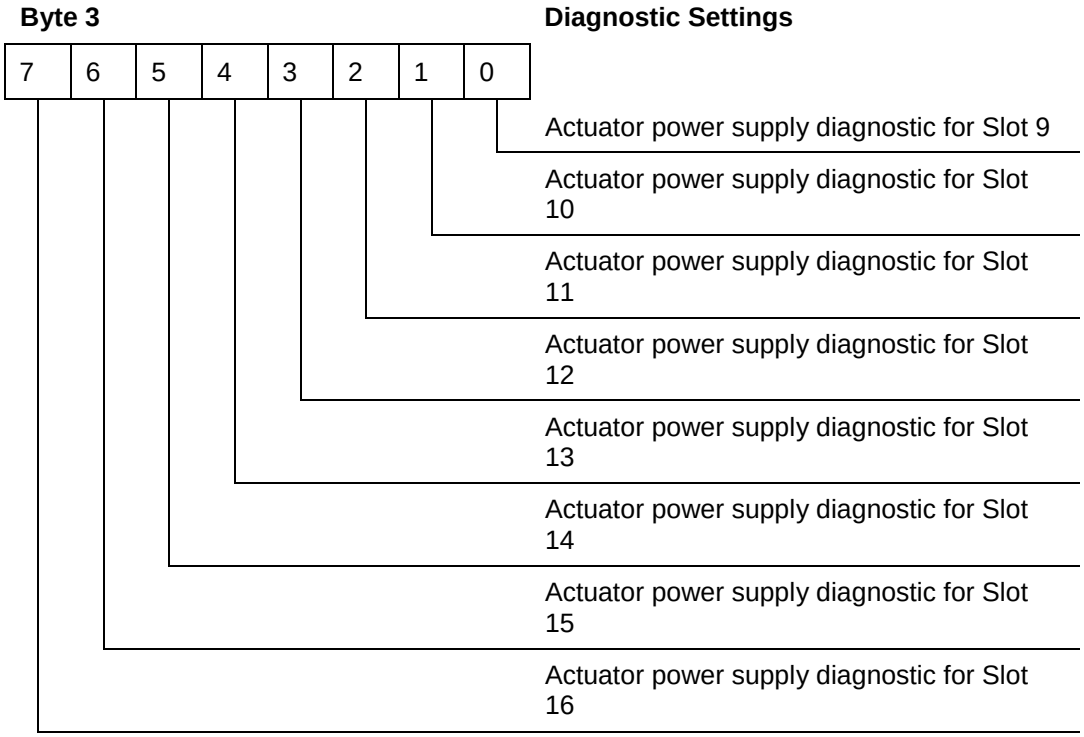
Fig, 11 Parameter byte 2 of Cube67+ BN-PNIO Art. No. 56526

Bit assignment of parameter bytes 3 to 6

This defines whether actuator power supply diagnostics, such as undervoltage, or no voltage, are reported for the associated slot or not.

0 = report
1 = do not report

Byte 3: Actuator power supply diagnostic for Slots 9 to 16



Fig, 12 Parameter byte 3 of Cube67+ BN-PNIO Art. No. 56526

Corresponding assignment of Bytes 4 to 6:

Byte 4: **Slots 17 to 24**

Byte 5: **Slots 25 to 32**

Byte 6: **Slots 33 to 40**

3.4 Starting Up Cube67+ BN-PNIO

3.4.1 GSDML File

The GSDML file in XML format is required to operate the devices described in this manual.

GSDML-Vx.x-Murrelektronik- Cube67_BN_PNIO –JJJJMMTT-HHMMSS.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.

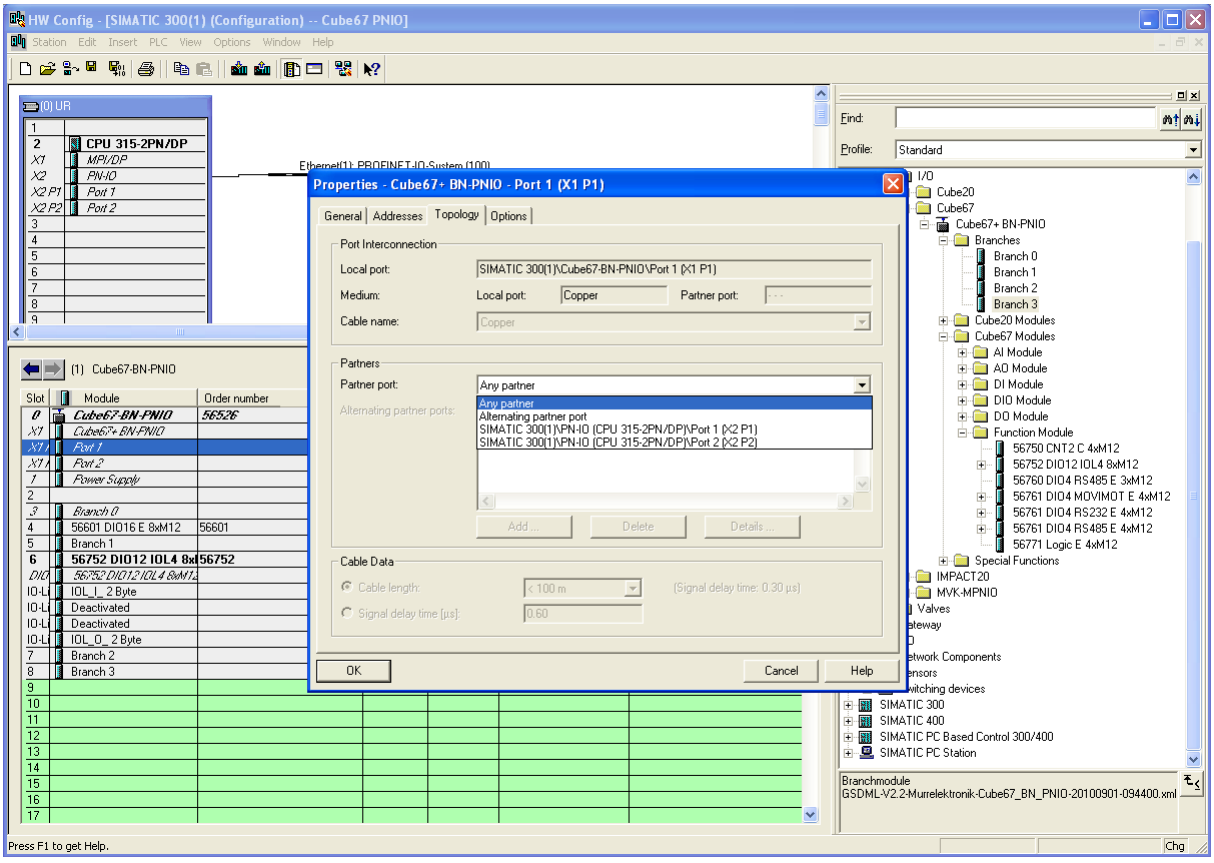
3.4.1.1 Setting the Topology

ProfiNet offers a number of functions, diagnostic, and maintenance options based on the existing topology or utilizing knowledge of the topology. All Cube67+ BN-PNIO devices support the topology setting and automatic topology recognition by the Engineering Tool.

This is followed by setting the topology for the Cube67+ BN-PNIO.

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

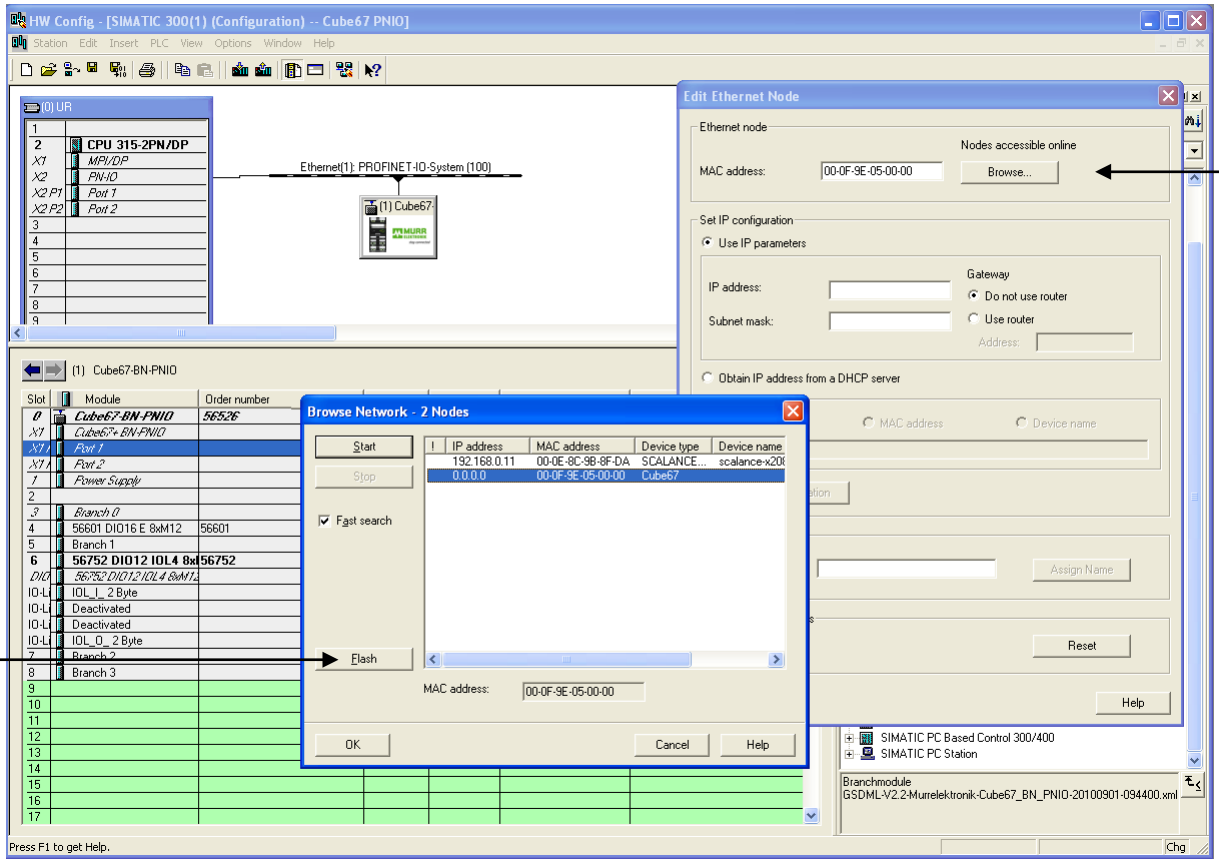
A list of possible ports of other devices in the project is contained in the Topology tab under the "Partner Port" option.



Fig, 13 List of possible partner ports

3.4.1.2 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, 14 Identifying devices in the network

Factory Settings of the Cube67+ BN-PNIO

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

- IP address 0.0.0.0

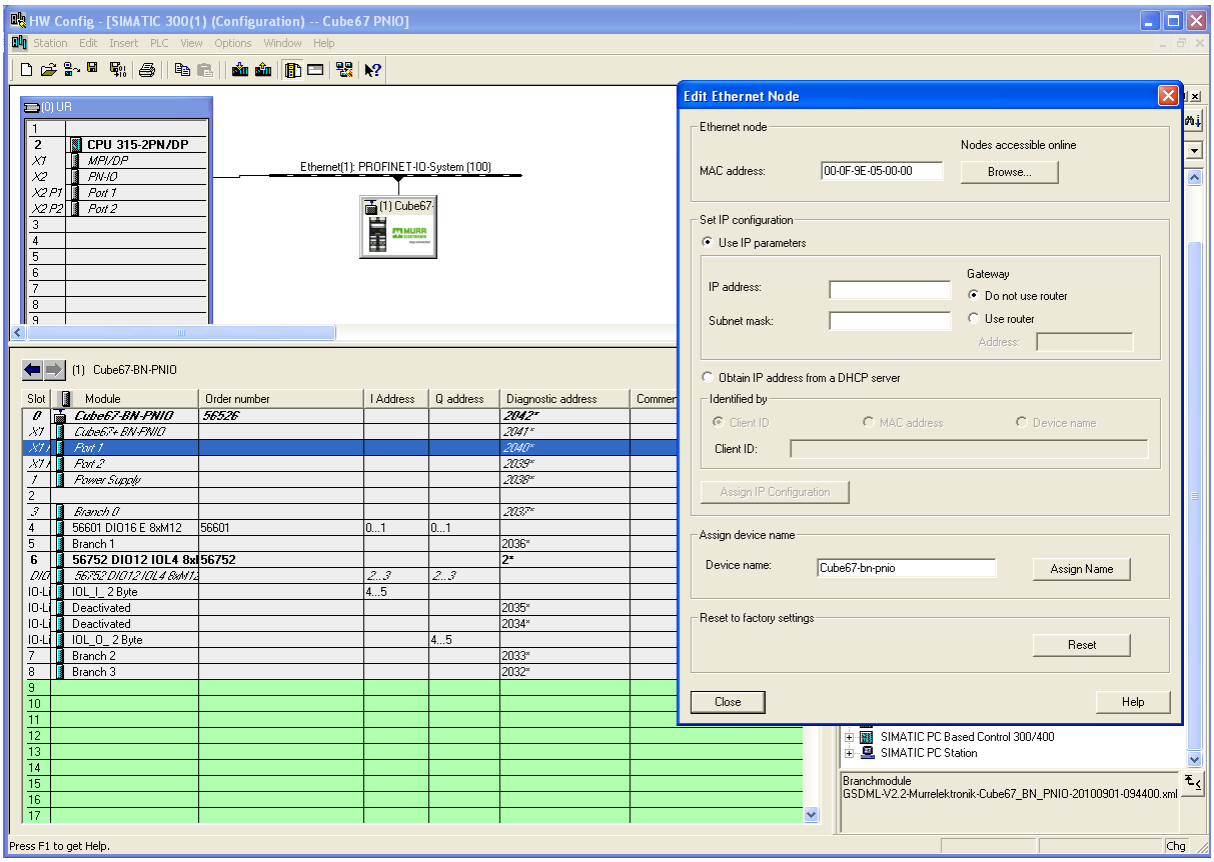
- Device type Cube67+ PROFINET

- Device name:

The device name is unassigned in the factory settings.

3.4.1.3 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, 15 Issuing device names and IP addresses

The Simatic S7 Manager then shows you the data detected from the Cube67+ BN-PNIO. With PROFINET I/O, it is absolutely necessary to assign a unique symbolic name to each device.

The address and name resolution is only regulated using the name that is stored in a nonvolatile memory. After entering a name, click on "***Assign Name"***.

You can issue the Cube67+ BN-PNIO with an IP address that can be saved in a nonvolatile memory in the module. Then enter the required IP address and the subnet mask to be used. Finally click on "***Assign IP Configuration***". Alternatively, if you want to select the IP address automatically by DHCP Server, mark the suboption accordingly.

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

IP address: 0.0.0.0

Device name: (empty)

4 Diagnostics

4.1 LED Indicators

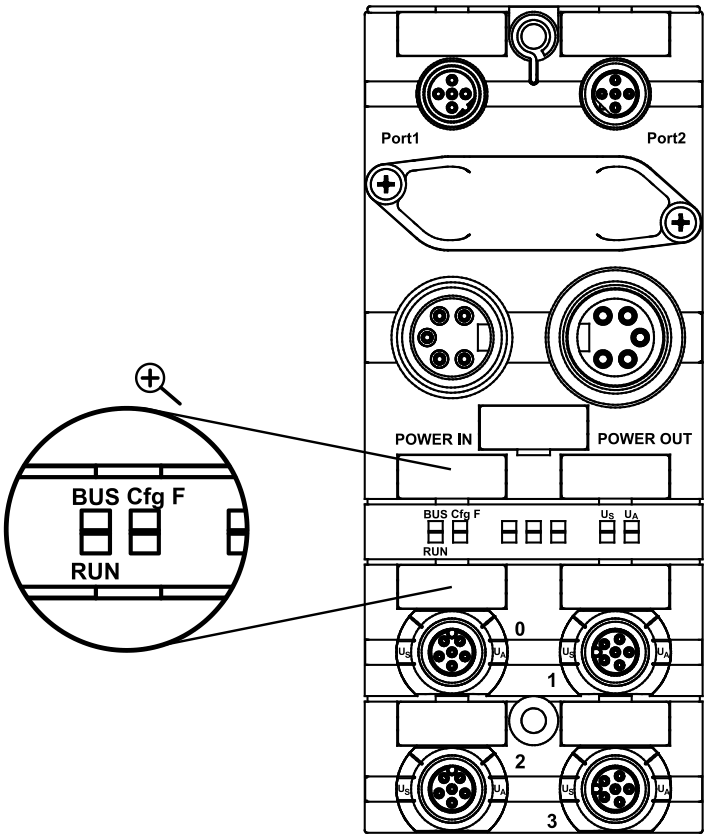
The Cube67+ System is capable of detecting and reporting numerous errors. Errors (diagnostics) are reported in two ways:

Diagnostic by means of LED indicator

Diagnostic for PROFINET alarms.

4.1.1 Meaning of "Bus Run" LED States

The "Bus Run" LED represents the state of PROFINET communication on the Cube67+ BN-PNIO Art. No. 56526.



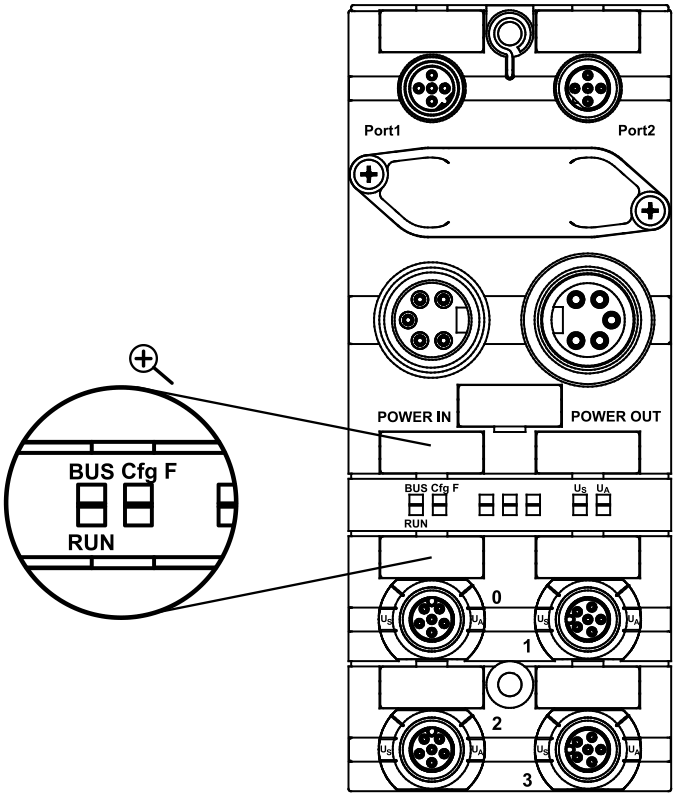
Fig, 16 LED Bus Run on the Cube67+ BN-PNIO Art. No.: 56526

LED Display	Response	State
■	lights up continuously (green)	Profinet IO data exchange
▨	flashing (green)	Not in PROFINET IO data exchange
□	off	Firmware not yet initialized

Tab. 1: LED Bus Run on the Cube67+ BN-PNIO Art. No. 56526

4.1.2 Meaning of "Cfg F" LED States

The "Cfg F" LED represents the state of a correct/incorrect configuration on the Cube67+ BN-PNIO Art. No. 56526.

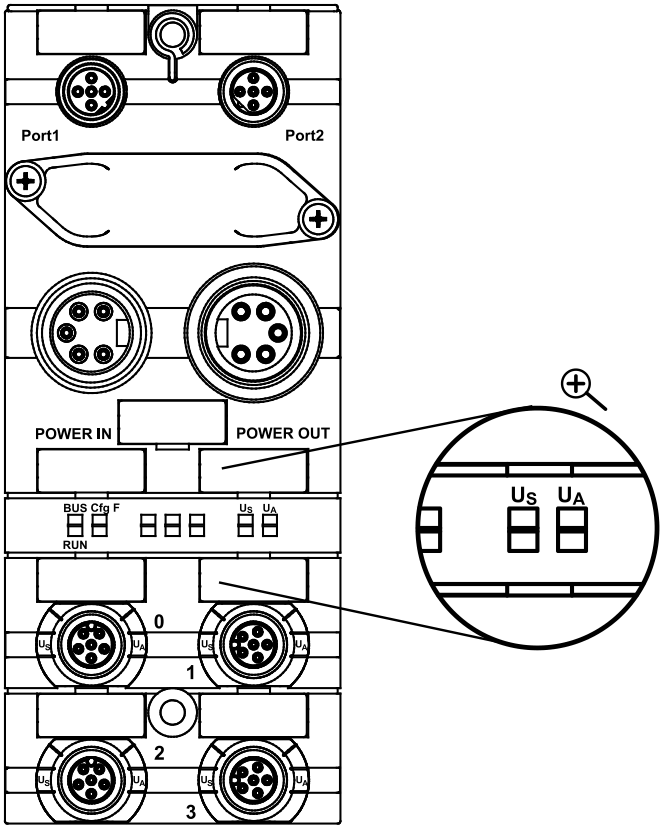


Fig, 17 Cfg F LED on the Cube67+ BN-PNIO Art. No. 56526

LED Display	Response	State
	lights up continuously (green)	Real configuration does not match the projected configuration
	lights up continuously (red)	Real configuration does not match the projected configuration
	off	No configuration

Tab. 2: Cfg F LED on the Cube67+ BN-PNIO Art. No. 56526

4.1.3 Meaning of US and UA LED States



Fig, 18 US and UA LEDs on the Cube67+ BN-PNIO Art. No. 56526

Sensor and System Power Supply

US LED Display	Response	State
	lights up continuously green	OK (> 18 V)
	lights up continuously red	Undervoltage
	off	Not available or sensor power supply < 13 V
	flashing red	Internal error

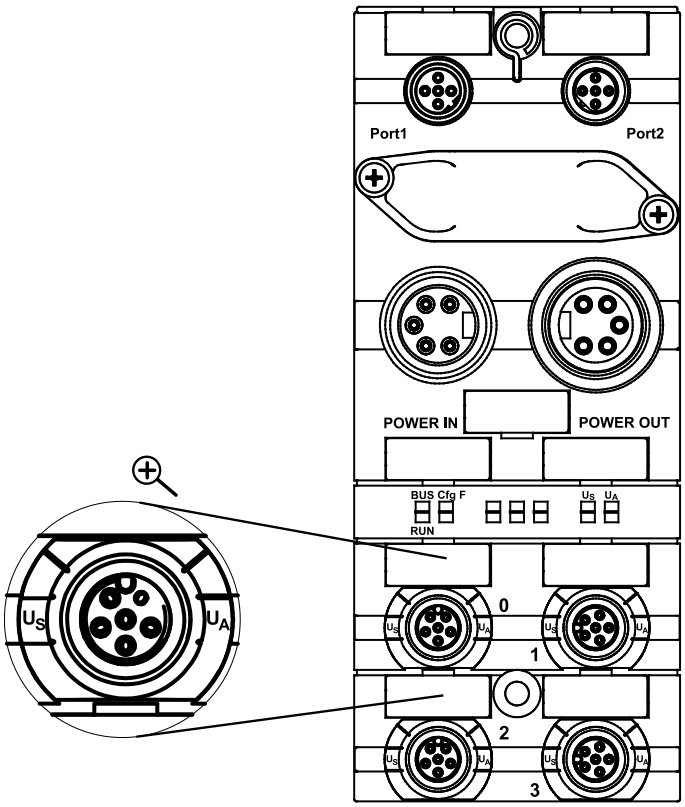
Tab. 3: Status of sensor and system power supply at bus node

Actuator Power Supply

UA LED Display	Response	State
	lights up continuously green	OK (> 18 V)
	lights up continuously red	Undervoltage
	off	Not available or actuator power supply < 13 V
	flashing red	Internal error

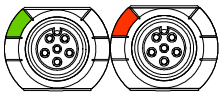
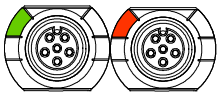
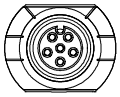
Tab. 4: Status of actuator power supply at bus node

4.1.4 Meaning of US / UA LED States at Internal System Connection Sockets



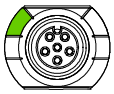
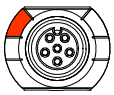
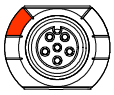
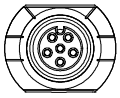
Fig, 19 US and UA LEDs on the Cube67+ BN-PNIO Art. No. 56526

System Communication

LED Display US	Response	State
	green / red lights up continuously	Data transfer:
	green / red flashing	No data exchange
	off	No communication

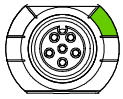
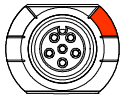
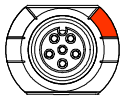
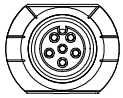
Tab. 5: Status of system communication at bus node

Sensor and System Power Supply

LED Display US	Response	State
	green	OK (> 18 V)
	red	Sensor power supply undervoltage or short-circuit
	red	Overload I > 4 A
	off	Not available or sensor power supply < 13 V

Tab. 6: Status of sensor and system power supply at bus node

Actuator Power Supply

LED Display UA	Response	State
	green	OK (> 18 V)
	red	Actuator power supply undervoltage or short-circuit
	red	Overload I > 4 A
	off	Not available or actuator power supply < 13 V

Tab. 7: Status of actuator power supply at bus node

4.2 Diagnostics via the Fieldbus

All diagnostic messages are reported slot-dependent. Note here that some configuration tools name the first slot as Slot 0; others name it Slot 1. The reported diagnostic messages refer to the numbering of the first slot with "Slot 0".

Troubleshooting

If incorrect modules are reported, rectify the errors in the order of ascending slots.

4.2.1 Standardized PROFINET Diagnostics

Diagnostic Message		Possible Cause	Action
Channel	01hex Short-circuit (sensor supply)	Overload or short-circuit of sensor power supply to 0V.	Change cable to sensor or check sensor for short-circuit.
		Overload or short-circuit of internal system connection (channel type = 000)	Check cables on associated line.
	02hex Undervoltage I/O link	I/O link undervoltage (event 0x5100-0x5119)	Check wiring to I/O link device.
	04hex Overload	Current load on a line greater than 4 A and less than 4.4 A (100-110%)	Check current load and possibly distribute among other lines.
	05hex I/O link overload	I/O link overload (event 0x5410)	Check current load.
	06hex Line break	Defective line. Only for analog inputs and outputs.	Check connection to sensor or sensor itself.
	06hex Line break I/O link	I/O link device not plugged in or incorrect (invalid data length, cycle time too short, etc.)	Check connection to I/O link device. Check data length. Increase cycle time in parameters.
	07hex Upper limit overshot	Analog input measuring range overshot.	Check connection to sensor or sensor itself.
	07hex Upper limit overshot (I/O link)	I/O link event 0x8C10, 0x8C20	Check parameterization or measuring range
	08hex Lower limit undershot	Analog input measuring range undershot	Check connection to sensor or sensor itself.
	08hex Lower limit undershot (I/O link)	I/O link event 0x8C30	Check parameterization or measuring range
	09hex Fault	I/O link fault not assignable to another fault	Check I/O link devices or read out their event memories.
	10hex Parameterization error	Parameterization incorrect.	Check parameterization.
	11hex Actuator power supply undervoltage	Actuator power supply < 18 V	Check power supply unit and cable.
	13hex Actuator power supply undervoltage	Actuator power supply overload	Check current load.

Diagnostic Message		Possible Cause	Action
	15hex Reference channel fault	TH module KTY not plugged in.	Install KTY correctly
	17hex Actuator warning	External power supply to an output.	Check cable.
	18hex Actuator disable	Overload or short-circuit of output signal to 0V.	Check wiring or actuator.
	1Ahex External fault	Desina diagnostic	Check sensor or wiring.
	1Bhex No actuator supply	Actuator power supply < 13 V	Check power supply unit and cable.
	1Chex No sensor voltage	Sensor power supply < 13 V	Check power supply unit and cable.
	1Dhex No ext. actuator power supply	External actuator power supply < 13 V	Check power supply unit and cable.
	1Ehex Ext. actuator power supply undervoltage	Ext. actuator power supply < 18 V	Check power supply unit and cable.

Tab. 8: Troubleshooting

4.2.2 Module-specific Diagnostics

Diagnostic Message		Possible Cause	Action
Channel	609hex (configuration error)	Incorrect configuration configured or inserted	Verify Cube67+ layout and configuration
	610 hex (Machine Option Management enabled)	Configuration not set	Use chapter on Machine Option Management and set configuration

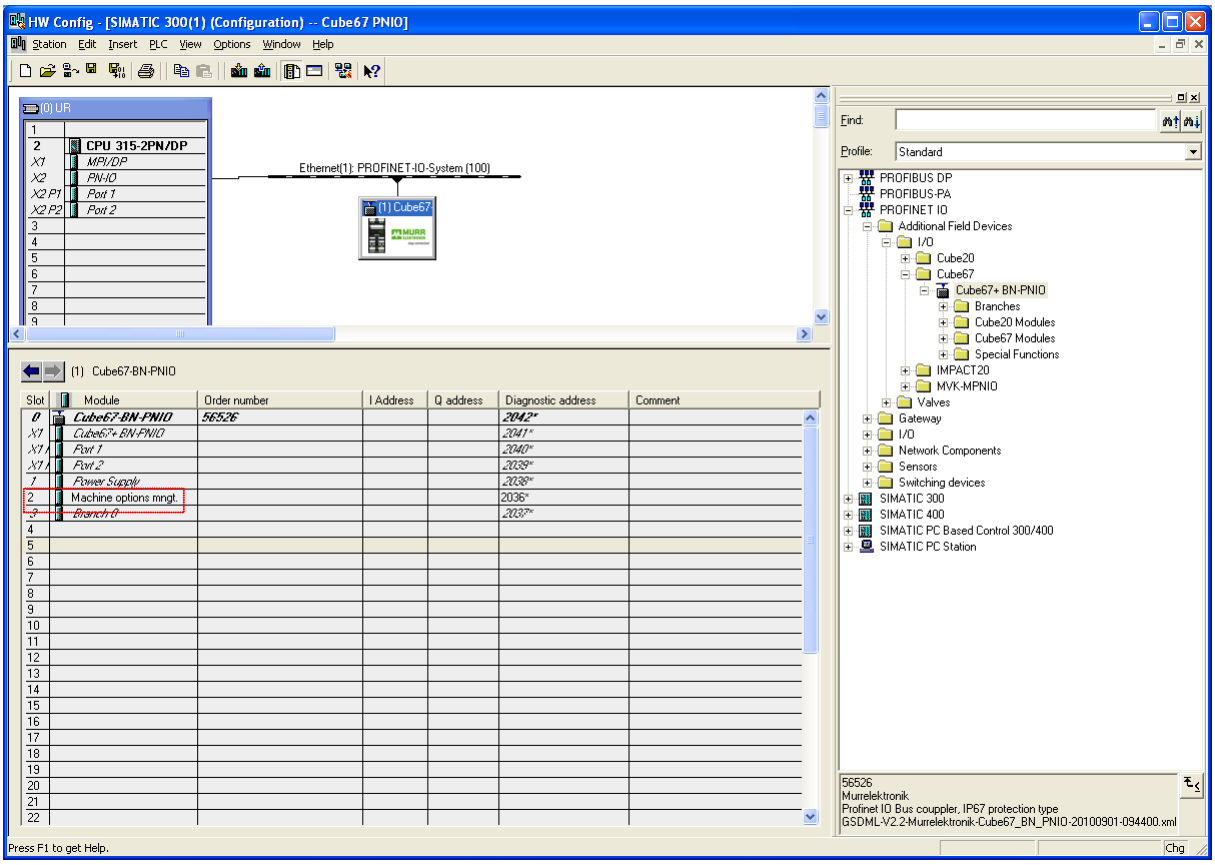
Tab. 9: Troubleshooting, module-specific

5 Acyclic Access

The Cube67+ BN-PNIO Art. No. 56526 supports the following accesses besides IM0, IM1, and IM2.

5.1 Supported Indices

5.1.1 Index 10 Machine Option Management



Fig, 20 Index 10 Machine Option Management

Slots 3 to 38 can be disabled in 8 bytes, provided "Machine Options Management" is parameterized.

Byte0 to Byte4 must always be written

Byte 0 Disable Slots 1 to 8:

Bit	State	Meaning
0	0	Slot 3 enabled
	1	Slot 3 disabled
1	0	Slot 4 enabled
	1	Slot 4 disabled
2	0	Slot 5 enabled
	1	Slot 5 disabled
3	0	Slot 6 enabled
	1	Slot 6 disabled
4	0	Slot 7 enabled
	1	Slot 7 disabled
5	0	Slot 8 enabled
	1	Slot 8 disabled
6	0	Slot 9 enabled
	1	Slot 9 disabled
7	0	Slot 10 enabled
	1	Slot 10 disabled

Tab. 10: Bit assignment of Byte 0

Corresponds to:

Byte 1: Disable Slots 11-18

Byte 2: Disable Slots 19-26

Byte 3: Disable Slots 27-34

Byte 4: Disable Slots 35-38

Write or read accesses in "Default configuration" receive the negative reply "Feature not supported".

Read accesses with "Machine Options Management" receive a positive reply. The reply contains the parameters that were written previously using Index 10.

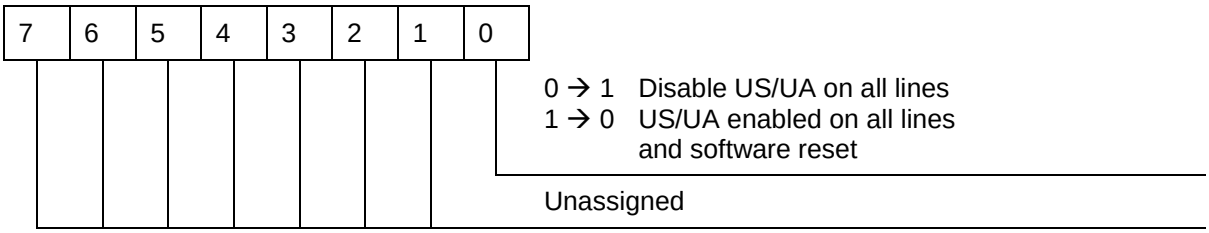
If the configuration is invalid, Index 10 write accesses always receive a positive reply. If the configuration is valid after an Index 10 write access, every following Index 10 write access receives a negative reply with "State conflict".

If "Machine Option Management" is set, but no valid configuration is set yet, no other diagnostics are sent. Diagnostics are only sent after a valid configuration is set.

If "Machine Option Management" is set and individual lines are disabled using Index 10, it may occur that the diagnostic message issued for missing modules may contain incorrect slot numbers.

5.1.2 Index 12 BusControl

Byte 0 BusControl:

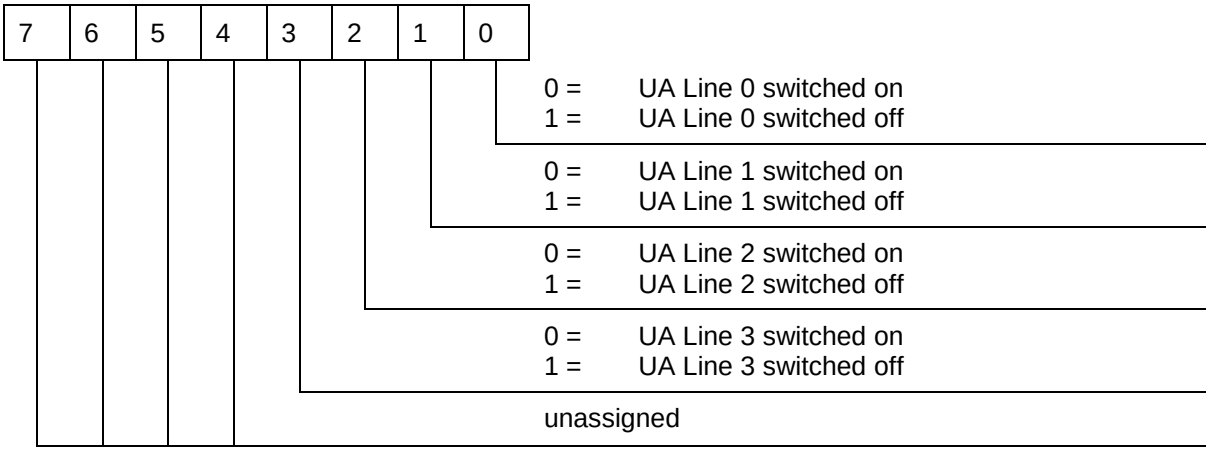


Fig, 21 Bit assignment of Byte 0

The PLC can reset the bus nodes using the BusControl request. This may reset a possibly present UA short-circuit or other fault after its rectification and without switching the power supply of the Cube67+ BN-PNIO on or off manually.

Byte0 and Byte1 must always be written

Byte 1: UA control

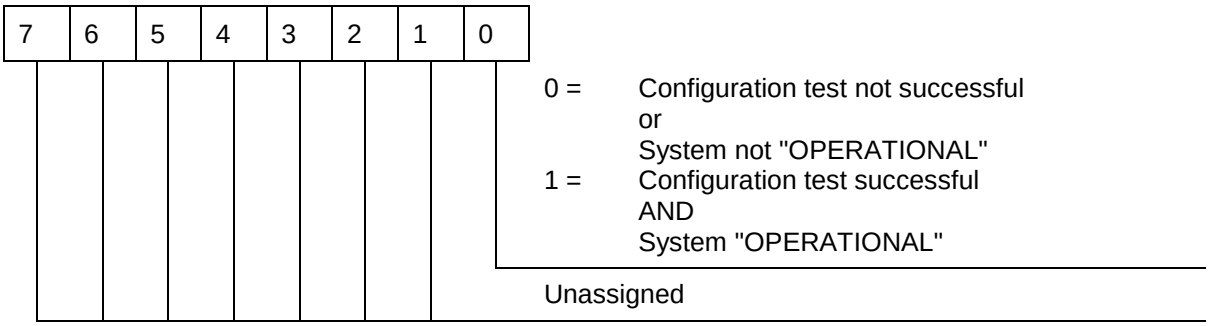


Fig, 22 Bit assignment of Byte 1

Use the BusControl access to switch off and switch back on the actuator power supplies to the individual bus node lines via the PLC. A UA short-circuit or other fault that may be present can then be reset after rectification without resetting the complete bus node.

5.1.3 Index 13

Byte 0 Configuration test



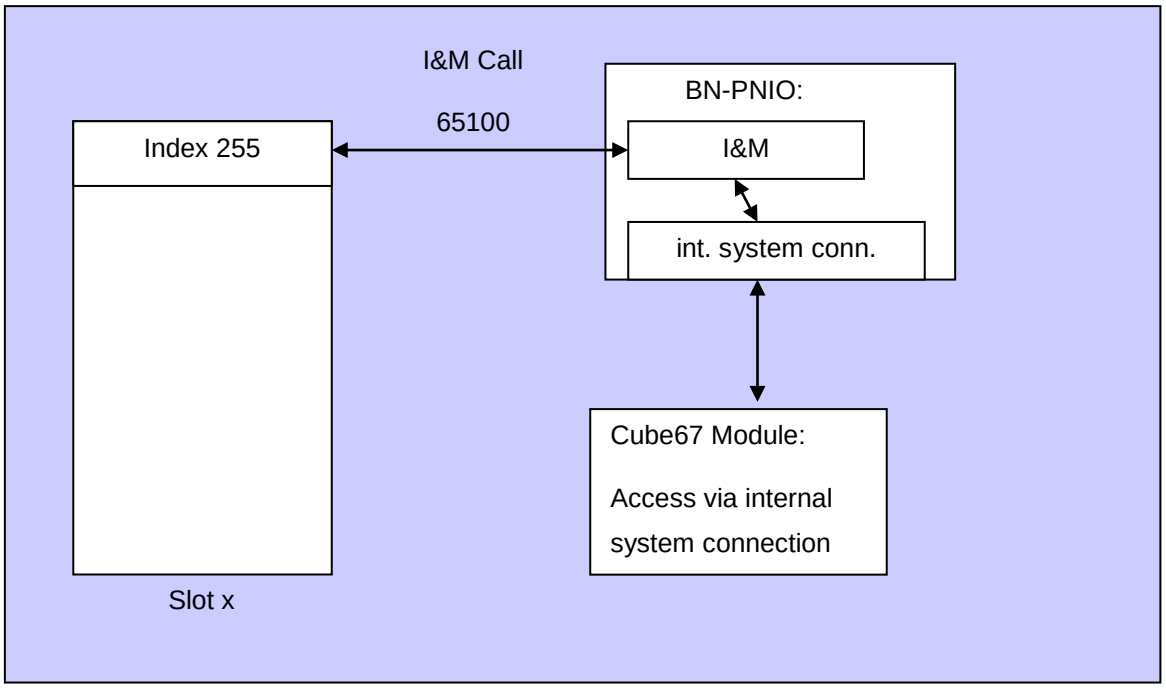
Fig, 23 Bit assignment of Byte 0

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 "Default configuration", the reply will be negative "Feature not supported".

Write accesses receive the negative reply "Feature not supported".

5.1.3.1 Index 100



Fig, 24 Index 100 access to Cube67+ BN-PNIO or Cube67 modules

You can have write or read access to the parameter bytes of modules using the manufacturer-specific Index 100.

If the outputs of an analog module are enabled or reparameterized using DP-V1 IM100 accesses, it is necessary to reset the output data to 0 during the access. On completion of reparameterization, the output data can be re-updated.

Example:

In the simple example below, we will show you how to disable the channel of an analog output module using two Index 100 accesses and then enable another channel of the same module to switch a sensor off and switch another one on. This example was created using a Siemens controller. The requests were executed using modules that you can find in the download section of the Murrelektronik web site.

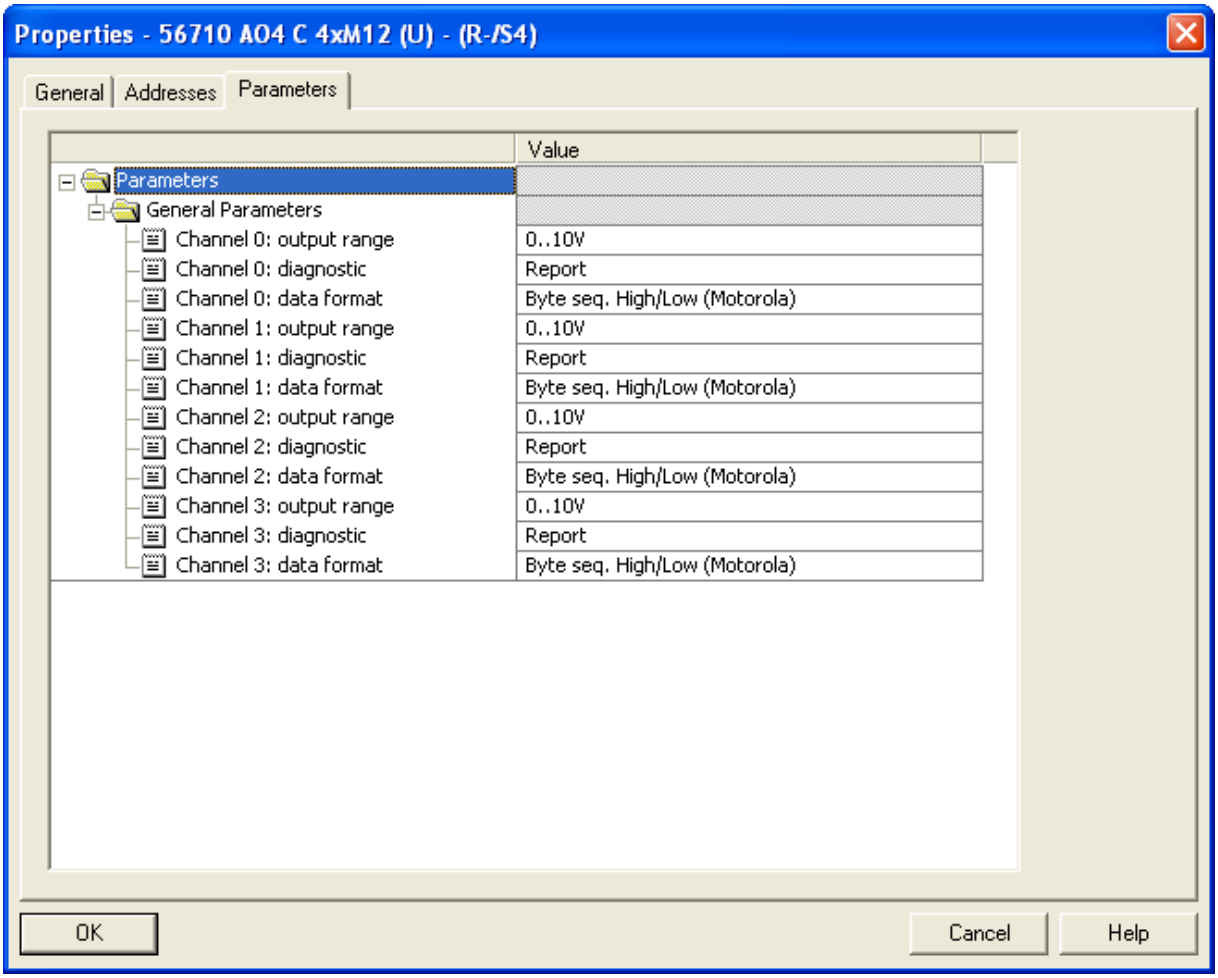
Configuration

0	*Cube67-BN-PNIO*	*56526*			*2042**	
X1	*Cube67+ BN-PNIO*				*2041**	
X1 P1	*Port 1*				*2040**	
X1 P2	*Port 2*				*2039**	
1	*Power Supply*				*2038**	
2						
3	*Branch 0*				*2037**	
4	56710 AO4 C 4xM12 (U)	56710		256...263		
5	Branch 1				2036*	
6	Branch 2				2035*	
7	Branch 3				2034*	

Fig, 25 Configuration example

Channel 0 of Module 56710 is enabled for the range 0 to 10 V.

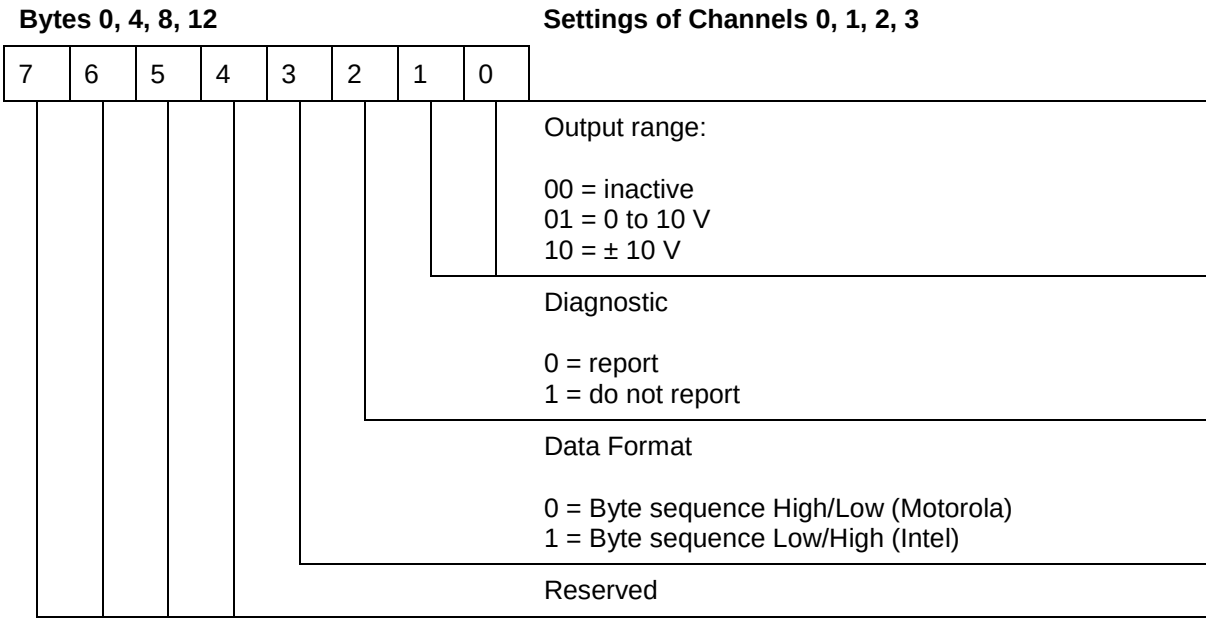
The parameters in detail:



Fig, 26 Module characteristics

The current hex parameterization of the module is 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00. This is also described in the parameter assignment of Module Art. No.56710 (excerpt from Cube67+ BN-P Manual (Art. No. 56980):

Bit assignment of parameter byte 0 (Channel 0), 4 (Channel 1), 8 (Channel 2), 12 (Channel 3)



Fig, 27 *Bit assignment of parameter bytes 0, 4, 8, 12*

Disabling Channel 0 of Module Art. No. 56710

To change the module parameters using Index 100 accordingly, the following Write Request must be sent:

5F 03 FF 08 08 00 FE 4C A0 01 01 00

Meaning of the numerals in detail (all hexadecimal):

5F	Write Request
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes
08	Call Function
00	Reserved
FE 4C	(65100 dec) = IM100
A0 01	Index 20 01, here, the highest bit is set (2+8 = A), this means write access.
01	The first parameter byte (parameter byte 0) is processed.
00	The parameter to be written for the selected bytes:

The Write Request is followed by a reply telegram with the written data length.

After this must come a Read Request (without parameters).

5E 03 FF 08

Meaning of the numerals in detail (all hexadecimal):

5E	Read Request
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes

The parameter change was successful; Channel 0 is now set to "disabled".

Enabling Channel 1 for the range 0 to 10 V

Value 1 must be set for parameter byte 4.

Telegram data in detail:

5F 03 FF 08 08 00 FE 4C A0 01 05 01

Meaning of the numerals in detail (all hexadecimal):

5F	Write Request
03	Slot Number
FF	Number of used index (255dec = IM)
08	Number of useful data in bytes
08	Call Function
00	Reserved
FE 4C	(65100 dec) = IM100
A0 01	Index 20 01, here, the highest bit is set (2+8 = A), this means write access.
05	The 5th parameter byte (parameter byte 4) is processed.
01	The parameter to be written for the selected bytes:

After this must come a Read Request (without parameters).

The parameter change was successful; Channel 1 is now enabled for the range 0 to 10 V.

In the download section of the Murrelektronik web site, you will find STEP7 libraries that contain the modules for IM accesses.
www.murrelektronik.com.

6 Machine Options Management

6.1 Maximum Configuration

The Machine Options Management helps you to carry out the modular configuration of machines. When a machine comprises a base module A and an optional machine module B, you can use the Machine Options Management to disable modules belonging to the – non-existent – machine module B.

This is done by configuring all modules in the configuration tool, even the optional modules of machine module B. This configuration is called the "Maximum Configuration". In addition, the "Machine Options Mngt." module must be added to the slot. The system then reports an error after booting that the correct configuration was not yet set, irrespective of the received configuration or parameterization. The bus node reverts to data exchange, however, the data are not updated.

We will describe Machine Options Management by means of an example.

Here is the maximum configuration:

Slot	Module	Order number	I Address	Q address	Diagnostic address	Comment
0	*Cube67-BN-PNIO*	*56526*			*2042**	
X1	*Cube67+ BN-PNIO*				*2041**	
X1 A	*Port 1*				*2040**	
X1 B	*Port 2*				*2039**	
1	*Power Supply*				*2038**	
2	Machine options mngt.				2036*	
3	*Branch 0*				*2037**	
4	56601 DIO16 E 8xM12	56601	0...1	0...1		
5	56701 AI4 E 4xM12 (U)	56701	256...263			
6	56711 AO4 E 4xM12 (U)	56711		256...263		
7	Branch 1				2035*	
8	56601 DIO16 E 8xM12	56601	2...3	2...3		
9	Branch 2				2034*	
10	Branch 3				2033*	
11						

Fig, 28 Maximum configuration

6.2 Selecting Modules and Setting a Configuration

When the system is in data exchange, set the configuration you want to use by disabling the slots of unused modules using Index 10 ("Machine Options Management"). Refer to Section 5.1.1 for a detailed description. A configuration test then takes place in the system, i.e. the configuration set by Machine Options Management is compared with the real topology. If this test is successful, the configuration is valid and the system continues with data exchange. If the test is not successful, the configuration is invalid and a diagnostic is output (missing or incorrect module).

The result of the test can be requested using Index 13 ("Machine Options Management configuration Test"). You will find a detailed description of this in Section 5.1.3.

If an invalid configuration is detected, you can try and set a valid configuration using Machine Options Management.

In our example, only the modules in Slots 1, 4, and 5 really exist. Slots 3, 7, 9, and 10 are occupied by line modules that must be present. The modules in Slots 6 and 8 do not exist. They are disabled by write access to Index 10.

Slot	Module	Order number	I Address	Q address	Diagnostic address	Comment
0	*Cube67-BN-PNIO*	*56526*			*2042**	
X1	*Cube67+ BN-PNIO*				*2041**	
X1 1	*Port 1*				*2040**	
X1 A	*Port 2*				*2039**	
1	*Power Supply*				*2038**	
2	Machine options mngt.				2036*	
3	*Branch 0*				*2037**	
4	56601 DIO16 E 8xM12	56601	0...1	0...1		
5	56701 AI4 E 4xM12 (U)	56701	256...263			
6	56711 AO4 E 4xM12 (U)	56711		256...263		
7	Branch 1				2035*	
8	56601 DIO16 E 8xM12	56601	2...3	2...3		
9	Branch 2				2034*	
10	Branch 3				2033*	
11						

Fig, 29 Example of an invalid configuration

In the real setup, the red bordered modules are missing (Slots 6 and 8).

Telegram data in detail:

50 00 00 00 00

Meaning of the numerals in detail (all hexadecimal):

28	1. Parameter byte (Parameter byte 0)
00	2. Parameter byte (Parameter byte 1)
…	...
00	5. Parameter byte (Parameter byte 4)

Bit pattern of parameter bytes:

Byte 0

Bit value:	0	0	1	0	1	0	0	0 → Hex: 28
Slot number:	10	9	8	7	6	5	4	3

Byte 1:

Bit value:	0	0	0	0	0	0	0	0 → Hex: 00
Slot number:	18	17	16	15	14	13	12	11

Bytes 2 to Byte 4 are also 0, like Byte 1.

The Write Request receives a positive reply telegram if it was successful. This is irrespective or whether the present configuration is valid or not.

6.3 Configuration Test

Check whether a valid configuration is present by checking at Index 13 using Read Request.

If “Machine Options Management” is set as the default configuration, a positive reply telegram is generated. It contains a 01 for a valid configuration and completed parameterization, and a 00 in all other cases.

If the configuration is valid, the system continues with useful data exchange. If diagnostics are received, they are displayed, provided they were not disabled in the bus node parameters.

If the configuration is invalid, the system does not continue with useful data exchange. Instead, a diagnostic is sent and indicates the first slot error.

In our example, the configuration is valid. The system is now in data exchange mode.

If a valid configuration was set, it is not possible to set any other configurations using Machine Options Management. A negative reply telegram is sent.

To find out what parameters were sent using Index 10, a Read Request can also be set to Index 10 and it returns the written parameters. If nothing was written, zeros are returned.

If a bit is set for a slot that does not exist (example: Slots 1 to 9 are occupied and mask 00 00 02 00 00 is set (= Slot 20 is disabled), this bit is ignored.

6.4 Changing a Module

If you want to change modules, i.e. change your real set-up, please proceed as follows:

1. **Disable all lines using Index 12 "Bus Control".**
2. **Replace the modules.**
3. **Reset the bus node using 12 "Bus Control".**
4. **Set a valid configuration using Index 10.**
5. **Test whether the configuration is valid.**

Example: Changing a Module

1. Disable the lines using Index 12.

Telegram data in detail:

01 00

Meaning of the digits in detail (all hexadecimal):

01	1. Parameter byte: Disable US/UA on all lines.
00	2. Parameter byte

Now UA/US are disabled. The system indicates a configuration error. When they are within the normal range, the bus node US and UA LEDs are green and the line US and UA LEDs are disabled.

2. Replacing modules

Modules 56601 and 56701 on Line 0 are removed; one Module 56601 is connected to Line 1.

3. Resetting the bus node using 12 "Bus Control"

Telegram data in detail:

00 00

Meaning of the digits in detail (all hexadecimal):

00	1. Parameter byte: Reset the bus node.
00	2. Parameter byte

The system then reports an error after run-up. The bus node then reverts to data exchange, however, the data are not updated.

4. Setting a valid configuration using Index 10

Since only the 56601 is connected to Line 1, Slots 3, 4, and 5 of the non-existent modules are disabled using DP-V1 Index 10 Write Access.

Slot	Module	Order number	I Address	Q address	Diagnostic address	Comment
0	Cube67-BN-PNIO	56526			2042*	
X1	Cube67+ BN-PNIO				2041*	
X1 P1	Port 1				2040*	
X1 P2	Port 2				2039*	
1	Power Supply				2038*	
2	Machine options mngt.				2036*	
3	Branch 0				2037*	
4	56601 DIO16 E 8xM12	56601	0...1	0...1		
5	56701 AI4 E 4xM12 (U)	56701	256...263			
6	56711 AO4 E 4xM12 (U)	56711		256...263		
7	Branch 1				2035*	
8	56601 DIO16 E 8xM12	56601	2...3	2...3		
9	Branch 2				2034*	
10	Branch 3				2033*	
11						

Fig, 30 Example of changing modules

Telegram parameters in detail:

0E 00 00 00 00

Meaning of the digits in detail (all hexadecimal):

0E	1. Parameter byte (Parameter byte 0)
00	2. Parameter byte (Parameter byte 1)
…	...
00	5. Parameter byte (Parameter byte 4)

Bit pattern of 1st parameter byte:

Byte 0

Bit value:	0	0	0	0		1	1	1	0 → Hex: 0E
Slot number:	10	9	8	7		6	5	4	3

5. Test whether the configuration is valid.

Check whether a valid configuration is present by using a Read Request at Index 13. If this is the case, the system is in data exchange mode. The module change was successful.

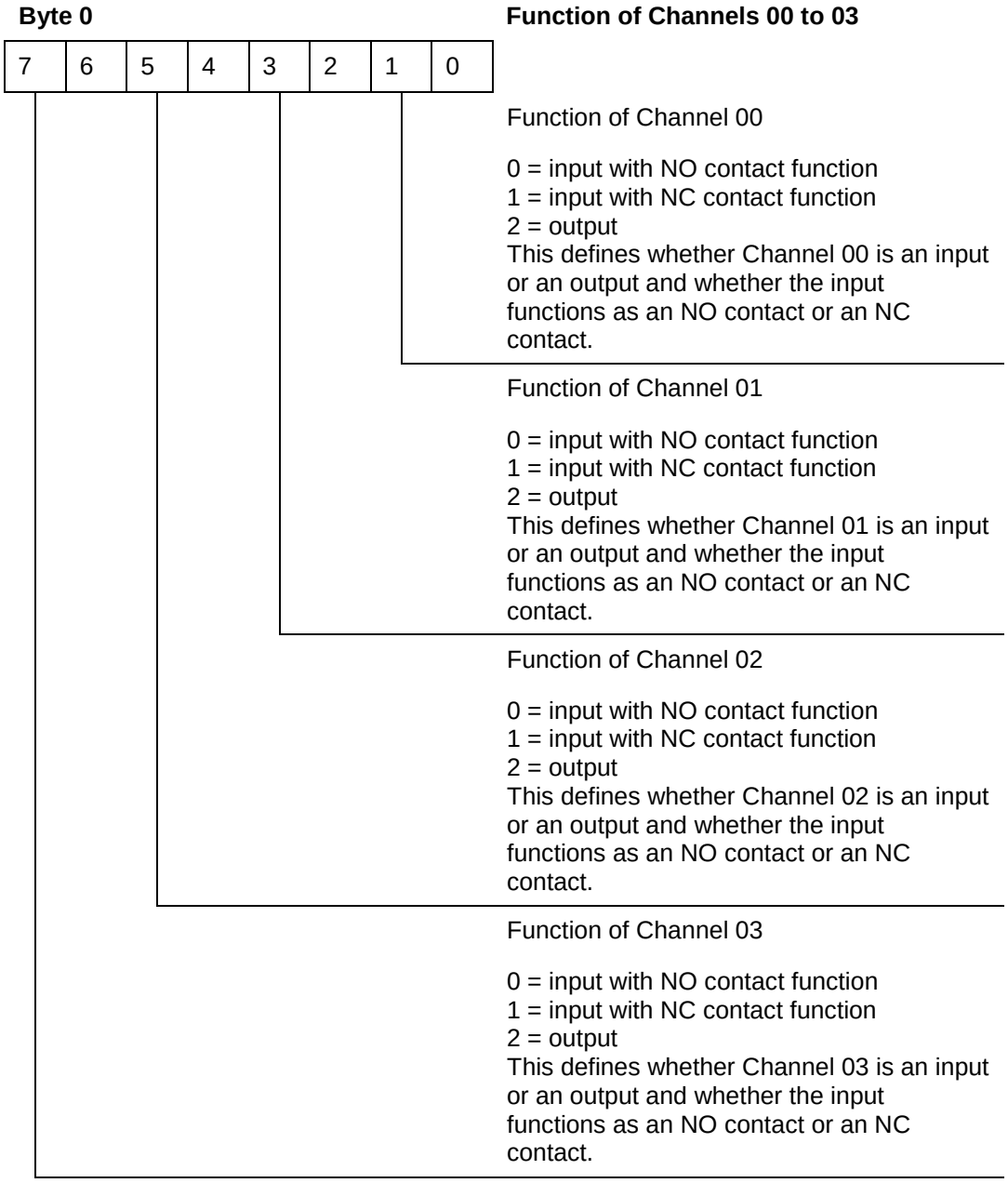
7 Cube67+ Modules

7.1 Cube67+ DIO12 IOL4 E 8xM12 Art. No. 56752

7.1.1 Parameters

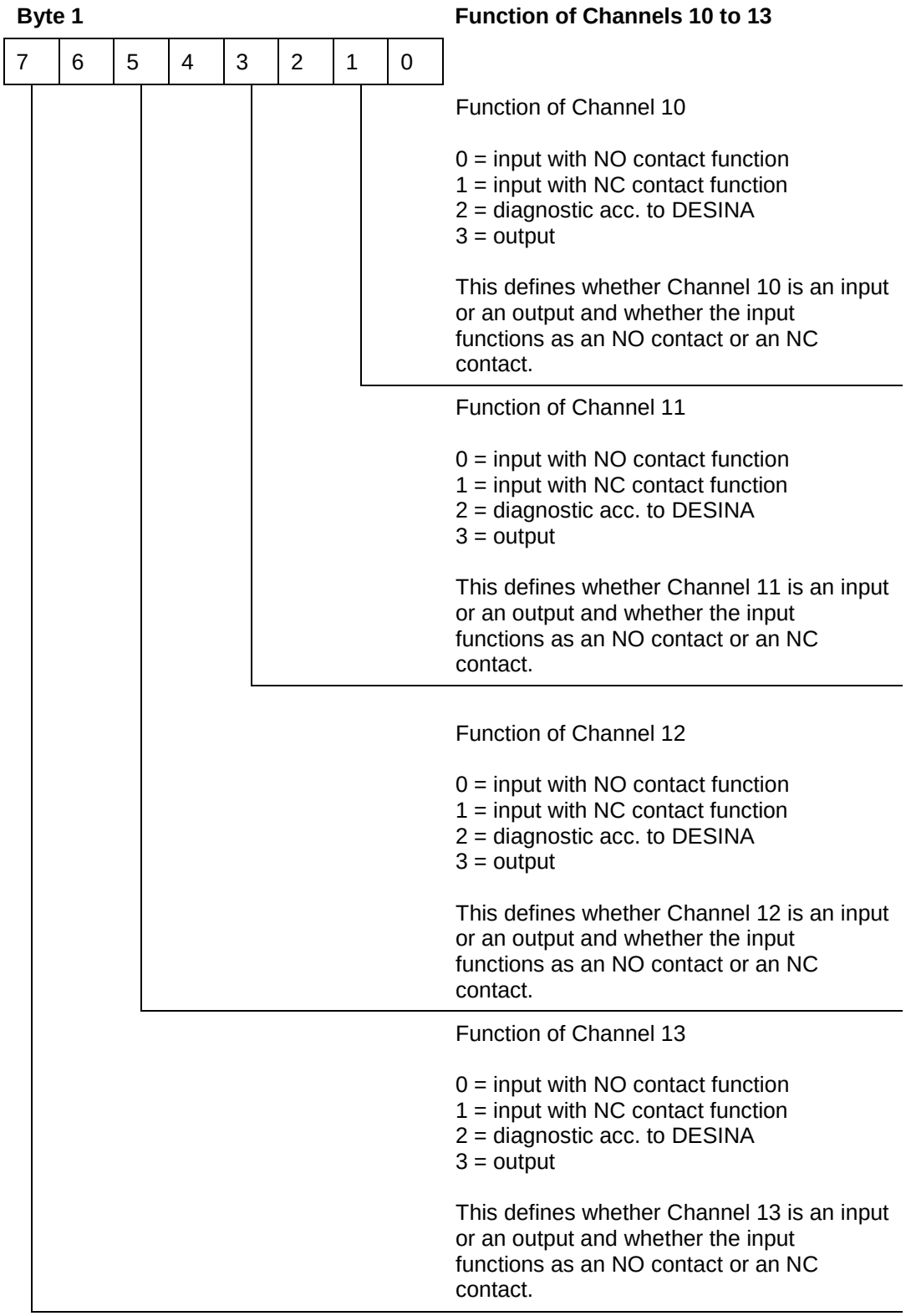
Number of parameter bytes: 18

Bit assignment of parameter byte 0



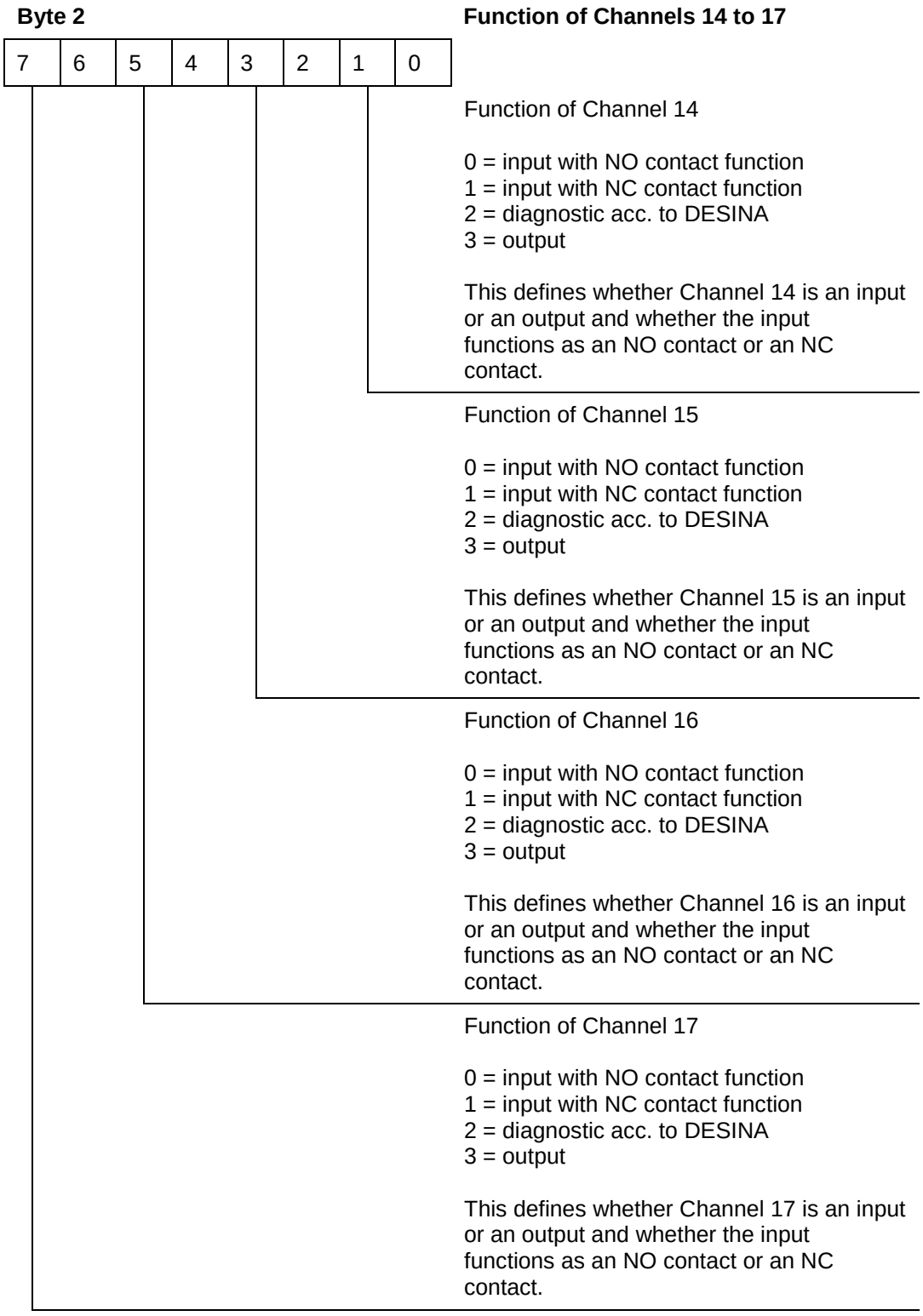
Fig, 31 Parameter byte 0 Art. No. 56752

Bit assignment of parameter byte 1



Fig, 32 Parameter byte 1 Art. No. 56752

Bit assignment of parameter byte 2

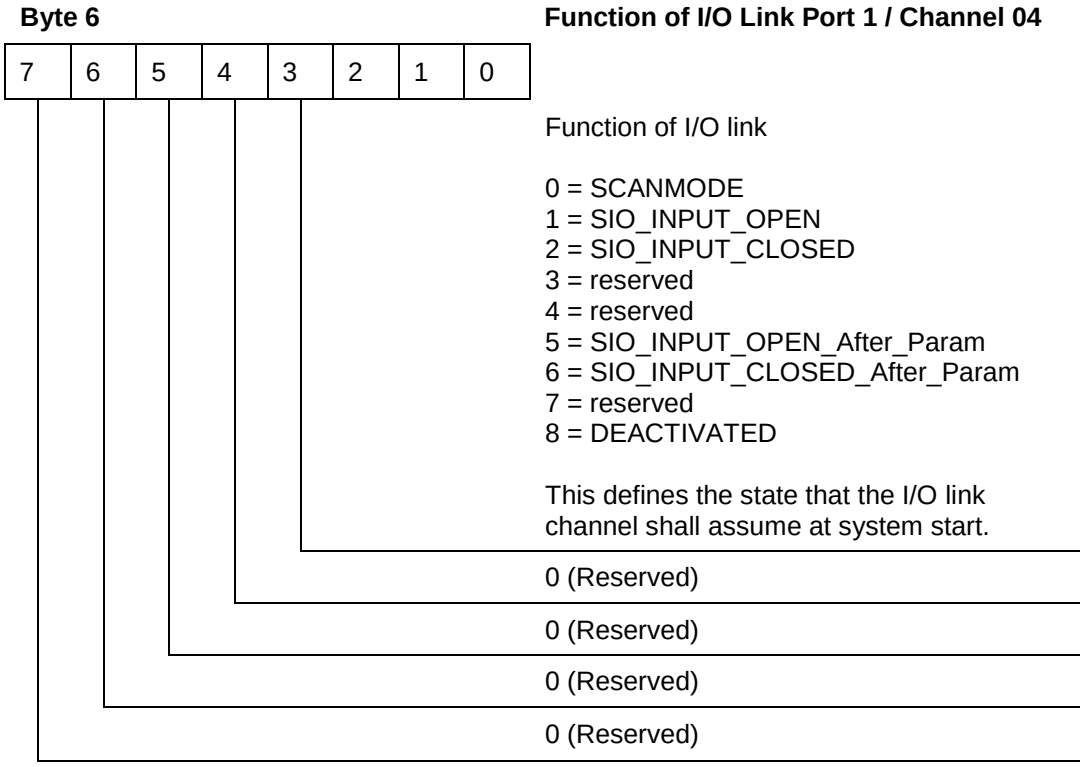


Fig, 33 Parameter byte 2 Art. No. 56752

Bit assignment of parameter bytes 3 to 5

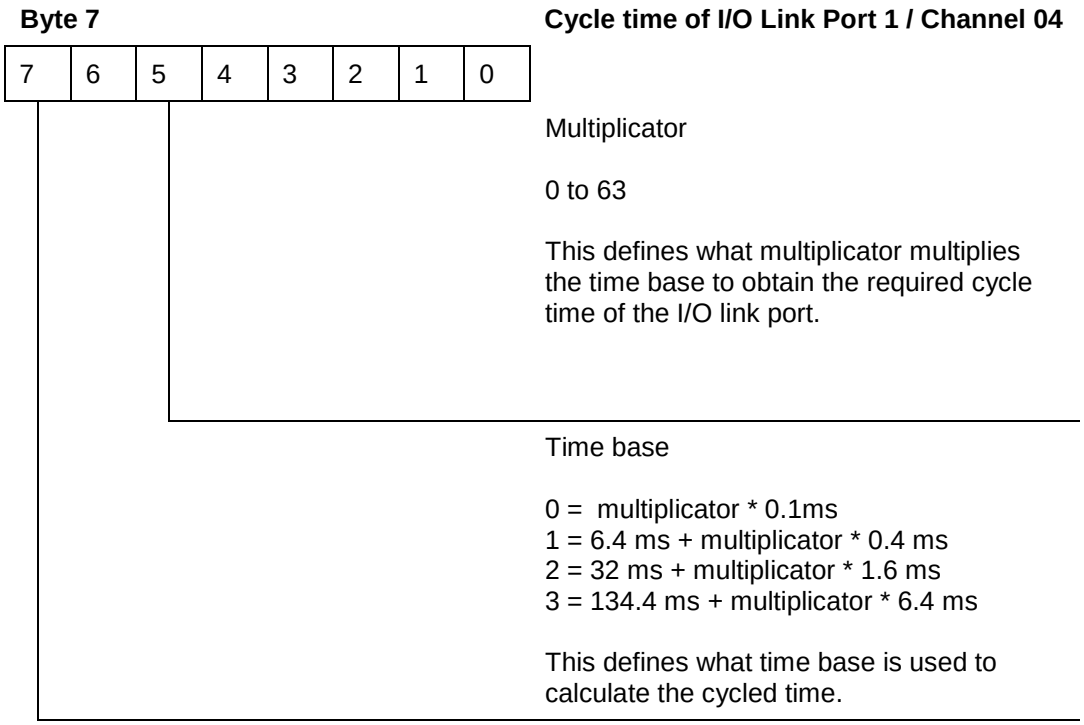
0 (reserved)

Bit assignment of parameter byte 6



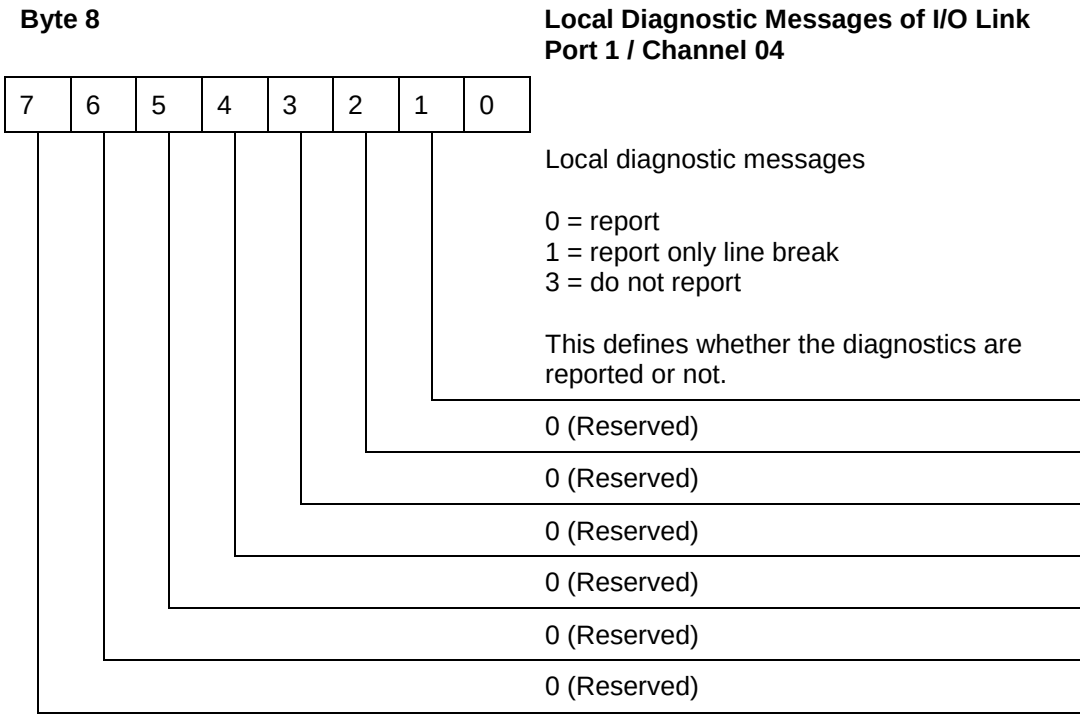
Fig, 34 Parameter byte 6 Art. No. 56752

Bit assignment of parameter byte 7



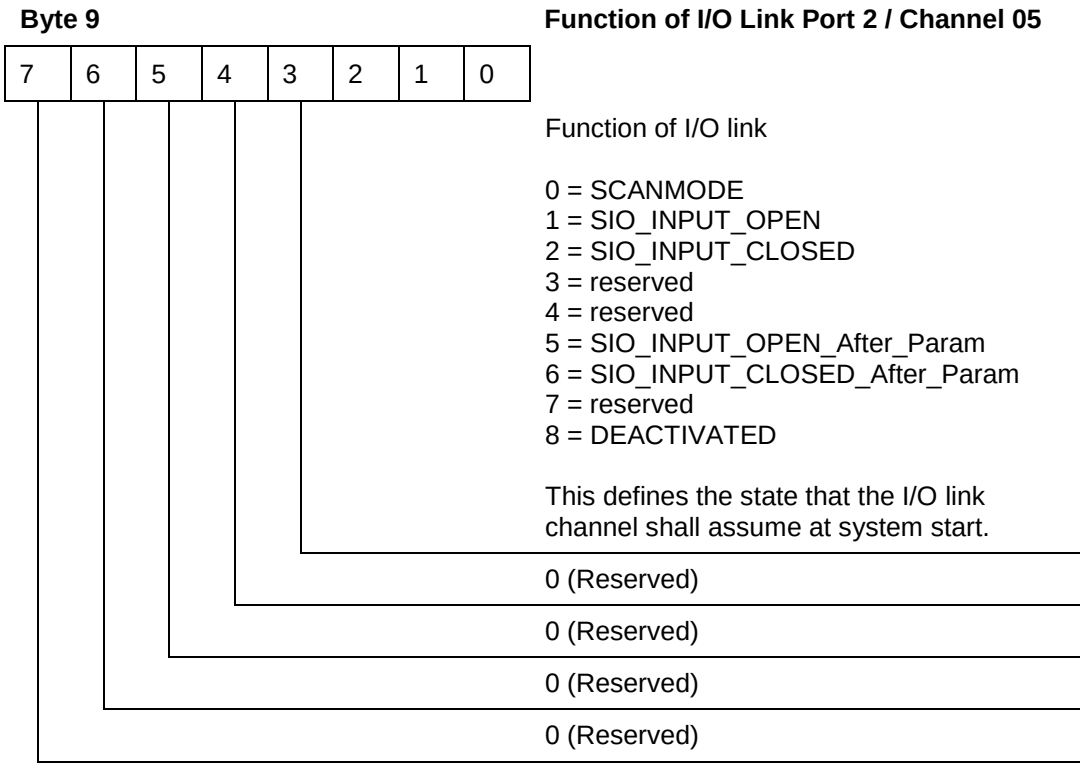
Fig, 35 Parameter byte 7 Art. No. 56752

Bit assignment of parameter byte 8



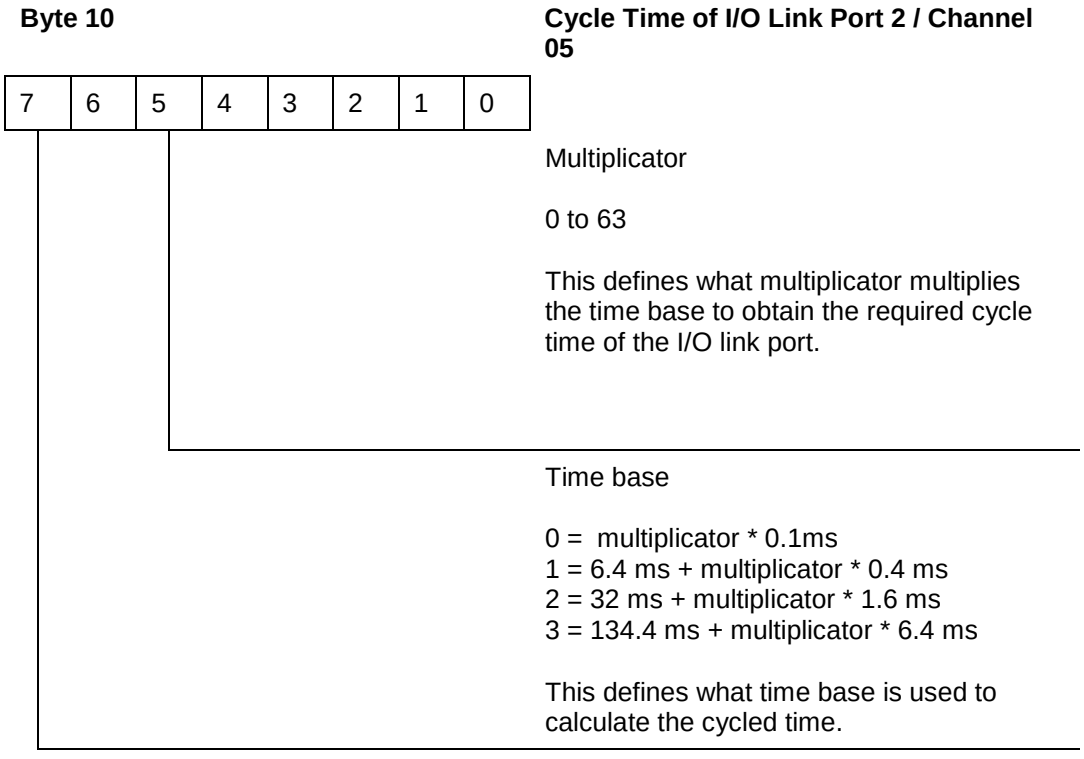
Fig, 36 Parameter byte 8 Art. No. 56752

Bit assignment of parameter byte 9



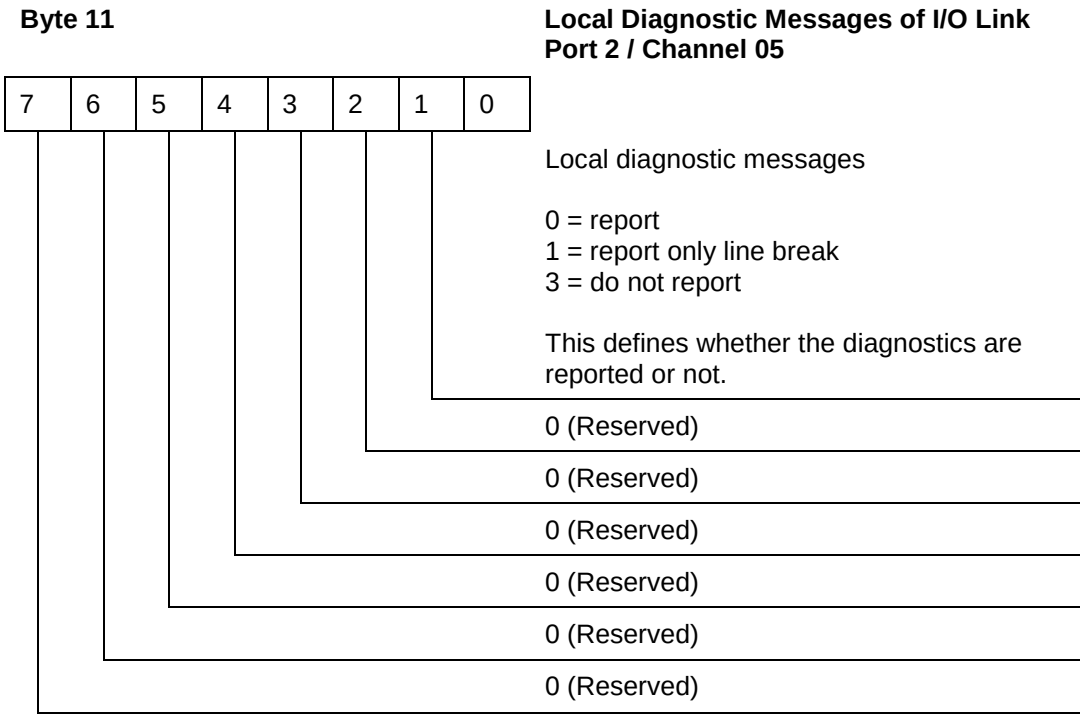
Fig, 37 Parameter byte 9 Art. No. 56752

Bit assignment of parameter byte 10



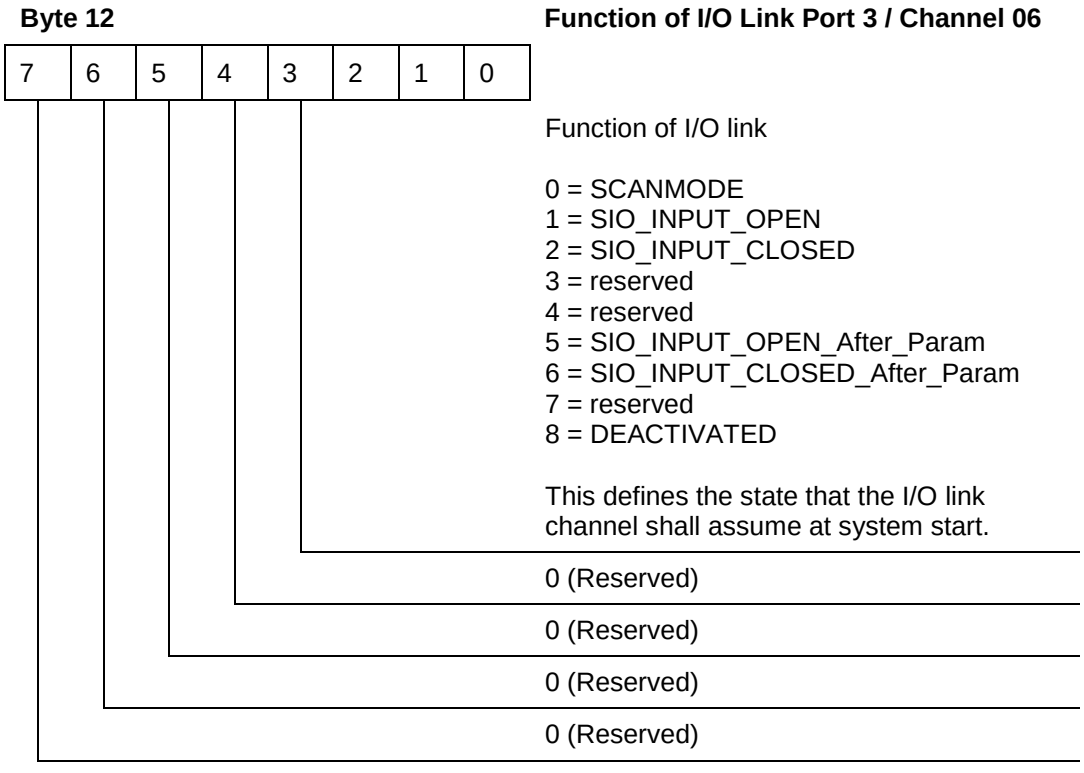
Fig, 38 Parameter byte 10 Art. No. 56752

Bit assignment of parameter byte 11



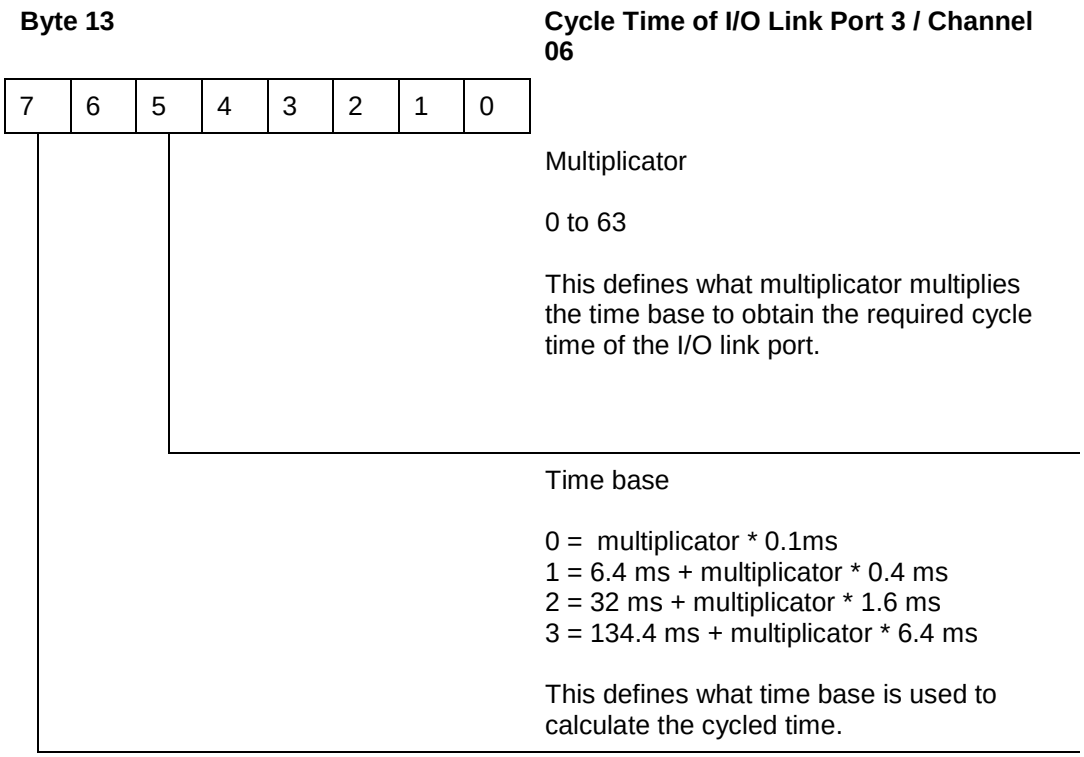
Fig, 39 Parameter byte 11 Art. No. 56752

Bit assignment of parameter byte 12



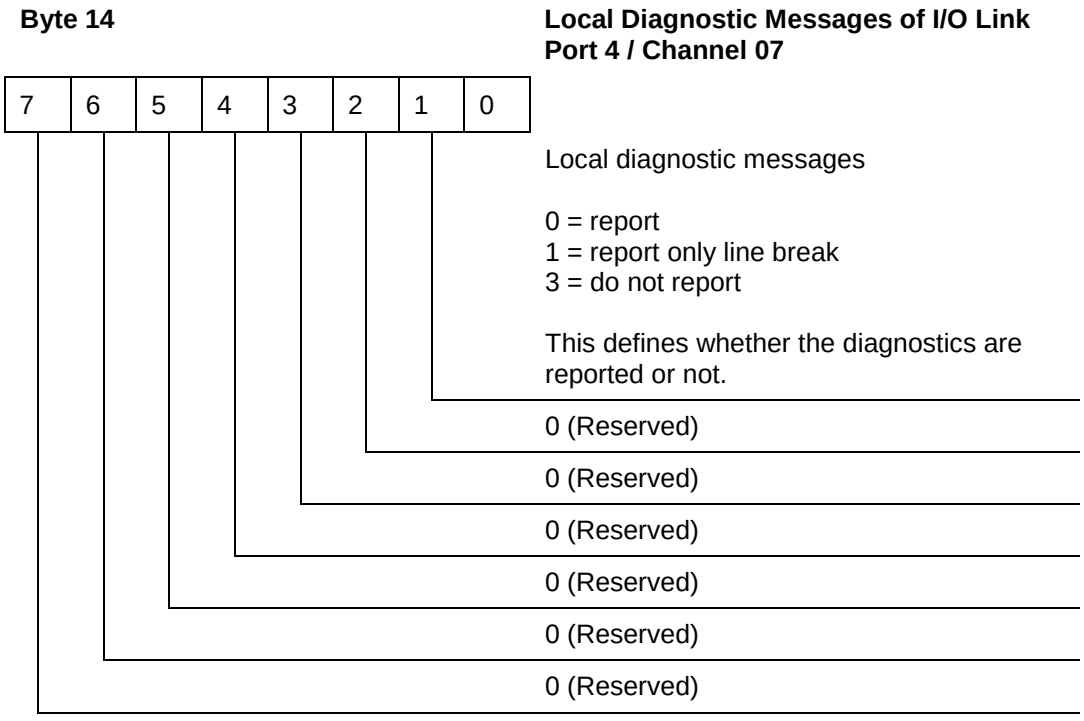
Fig, 40 Parameter byte 12 Art. No. 56752

Bit assignment of parameter byte 13



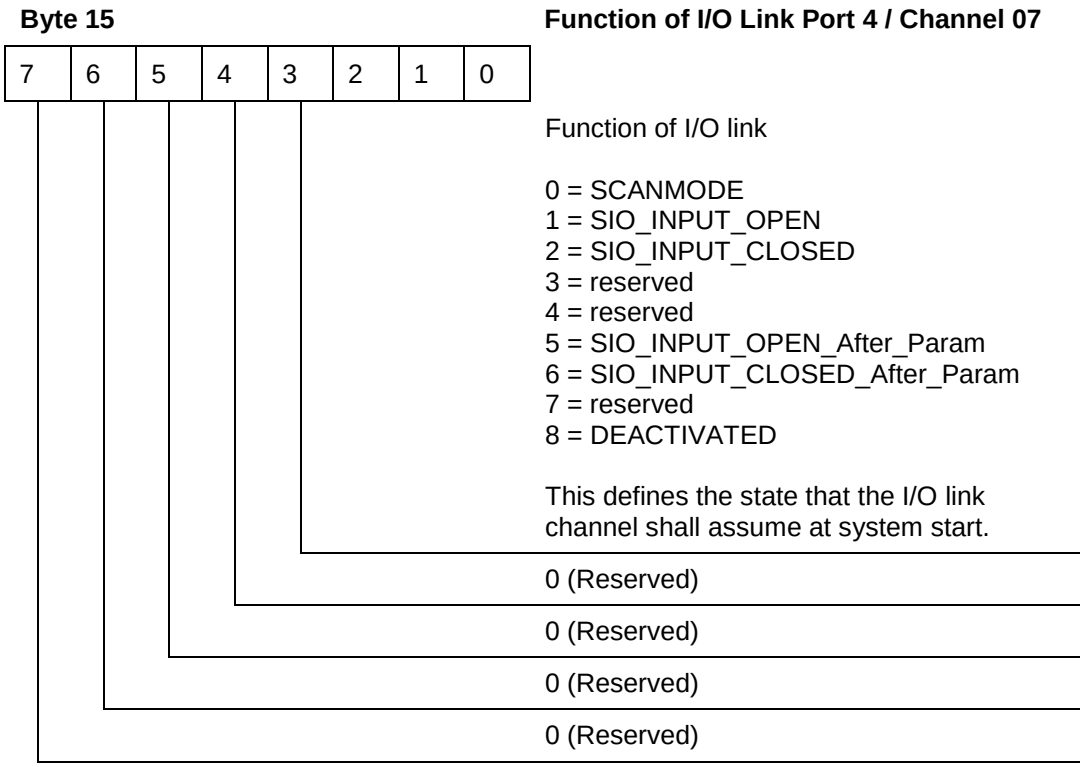
Fig, 41 Parameter byte 13 Art. No. 56752

Bit assignment of parameter byte 14



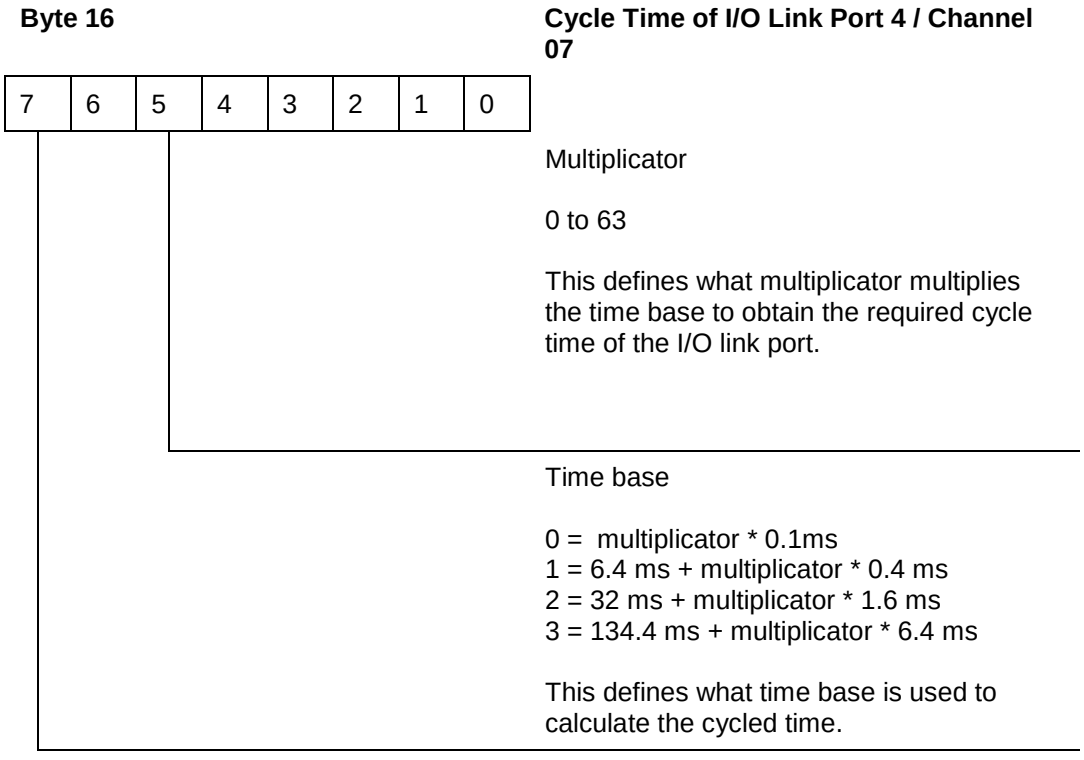
Fig, 42 Parameter byte 14 Art. No. 56752

Bit assignment of parameter byte 15



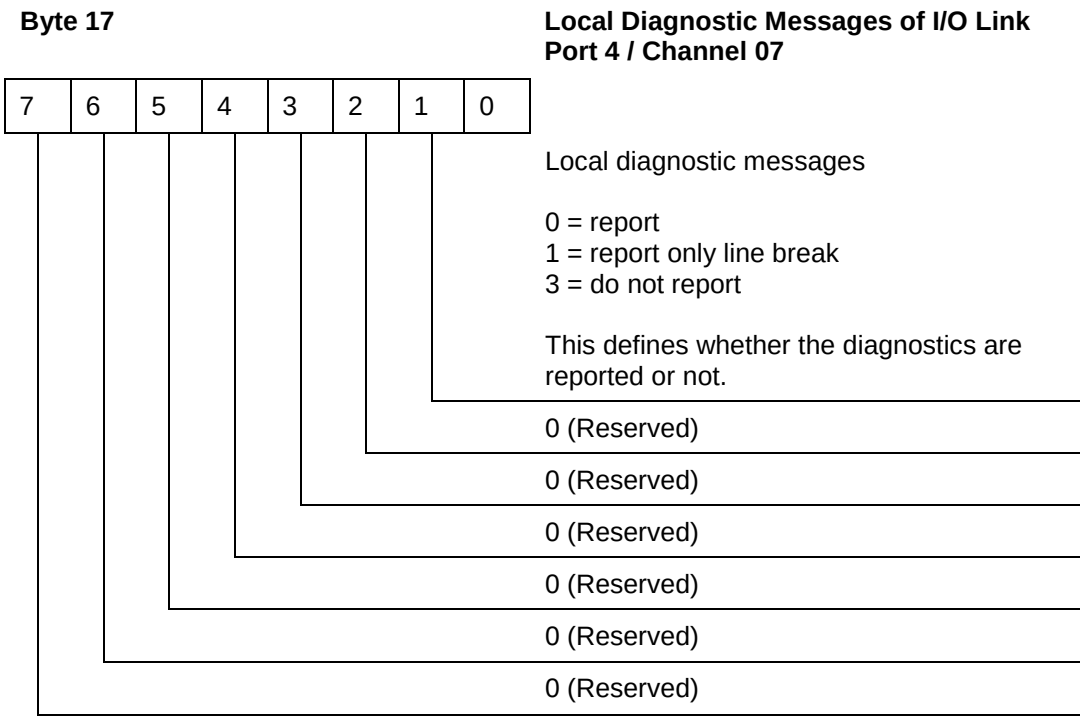
Fig, 43 Parameter byte 15 Art. No. 56752

Bit assignment of parameter byte 16



Fig, 44 Parameter byte 16 Art. No. 56752

Bit assignment of parameter byte 17



Fig, 45 Parameter byte 17 Art. No. 56752

7.1.2 Data of Cube67+ DIO12 IOL4 E 8xM12

Bit assignment of I/O data – input data PAE

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 11: PAE data byte 1 Art. No. 56752

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 12: PAE data byte 2 Art. No. 56752

Bit assignment of I/O data – output data PAA

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 13: PAA data byte 1 Art. No. 56752

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 14: PAA data byte 2 Art. No. 56752

In addition to the 2 bytes for PAE and PAA each, the configured I/O Link PAE and PAA bytes are transmitted. The data length in each case depends on the virtual modules used.

7.1.3 I&M Functions of Cube67+ DIO12 IOL4 E 8xM12

For communication with the I/O link sensors, the Cube67+ DIO12 IOL4 E 8xM12 also supports I&M functions. They are used for communication with the I/O link devices as well as to represent module-specific information.

Index 0xAFF0 read = IM0 of Cube67+ DIO12 IOL4 E 8xM12

Index 0xB000 read = I/O link MM as per specification

Index 0xB001 read = IM17 information of I/O link port 1

Index 0xB002 read = IM18 information of I/O link port 2

Index 0xB003 read = IM19 information of I/O link port 3

Index 0xB004 read = IM20 information of I/O link port 4

Index 0xB062 read and write = communication channel to connected I/O link devices

Index 0xB063 read = I/O link master directory

7.2 Cube67+ DIO4 RS232/485 E 4xM12 Art. No. 56761

7.2.1 SEW-MOVILINK Useful Data Protocol

The base module "Cube67+ DIO4 MOVIMOT E 4xM12" supports the SEW-MOVILINK protocol from SEW-Eurodrive GmbH & Co. KG. The following protocol data are supported:

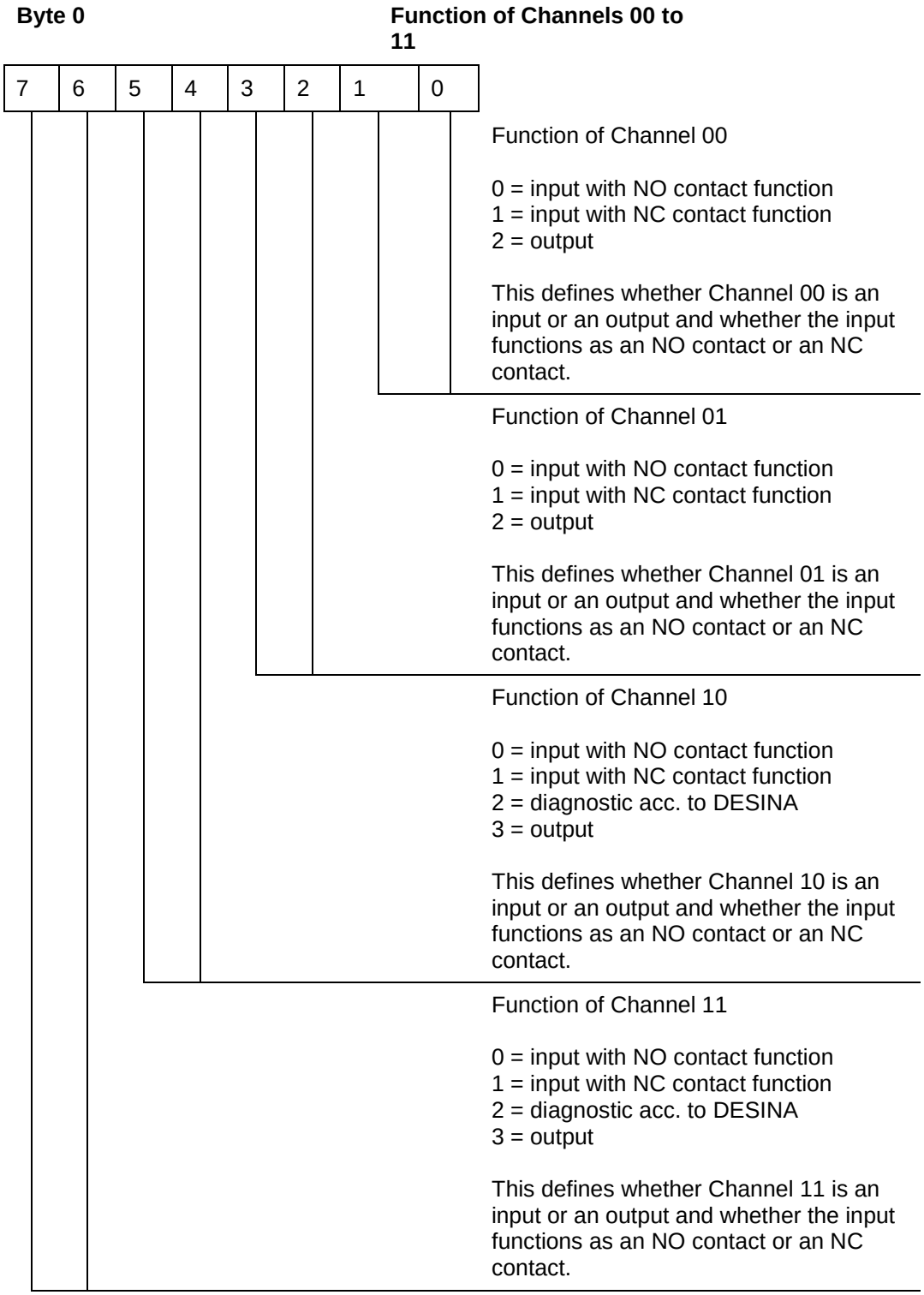
- MOVIMOT address fixed 1
- PA useful data type 3 (2 words cyclic) for virtual module MOVIMOT_TX_2 Word
- PA useful data type 5 (3 words cyclic) for virtual module MOVIMOT_TX_3 Word
- PE useful data 2 words (status word 1, current) for virtual module MOVIMOT_RX_2 Word
- PE useful data 3 words (status word 1, current, and status word 2) for virtual module MOVIMOT_RX_3 Word
- Automatic generation of block check character (BCC) in PA useful data
- Automatic evaluation of block check character (BCC) in response telegram
- Automatic timeout watchdog

7.2.2 Parameters

Number of parameter bytes: 9

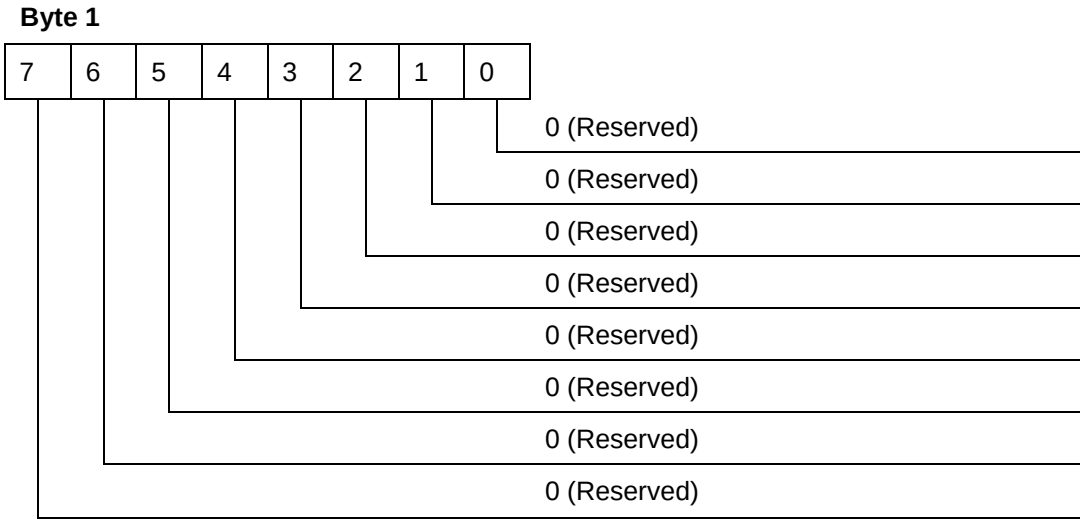
The detailed descriptions of the functions are in Sections 6.2.2.1 through 6.2.2.7.

Bit assignment of parameter byte 0



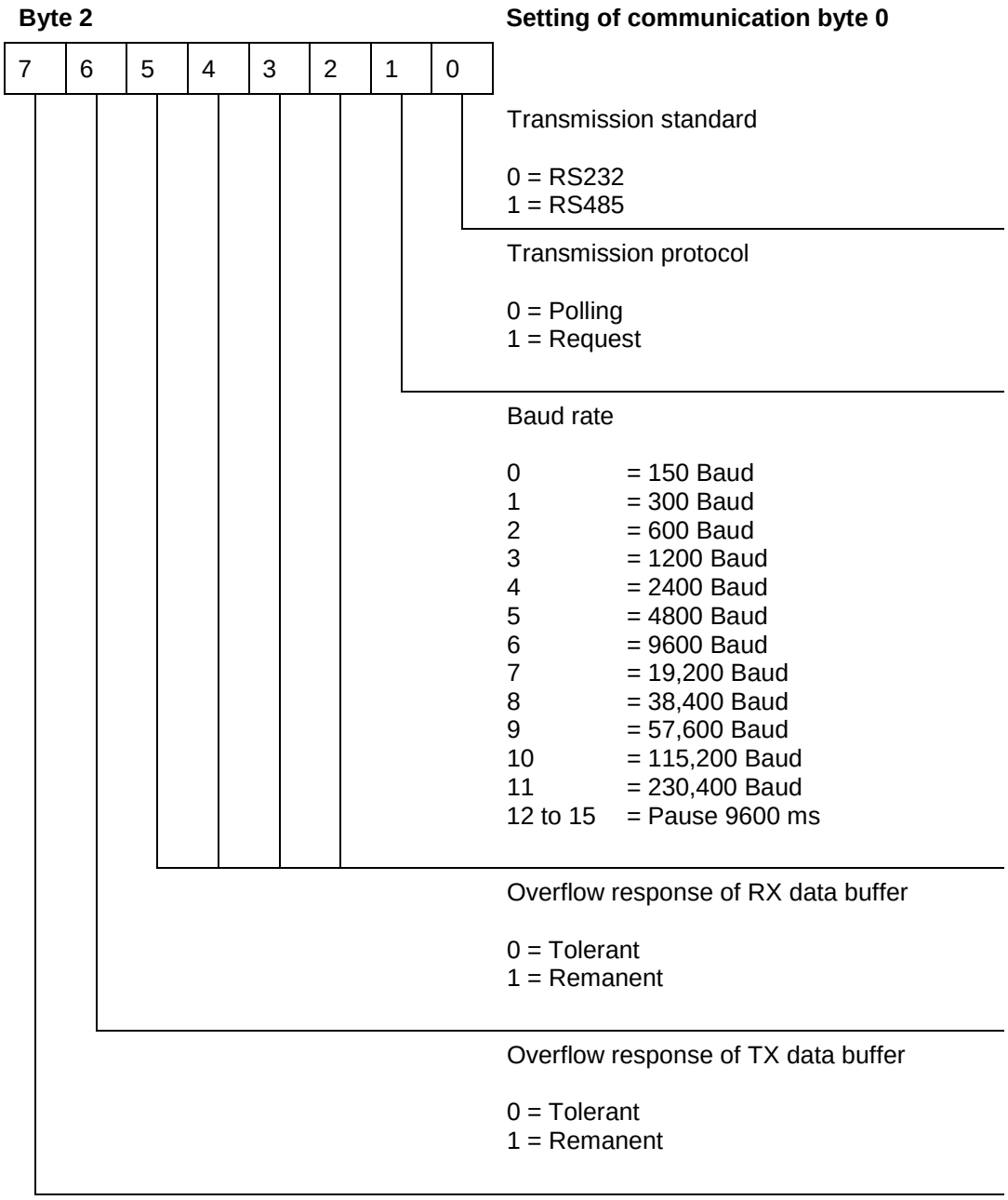
Fig, 46 Parameter byte 0 Art. No. 56761

Bit assignment of parameter byte 1



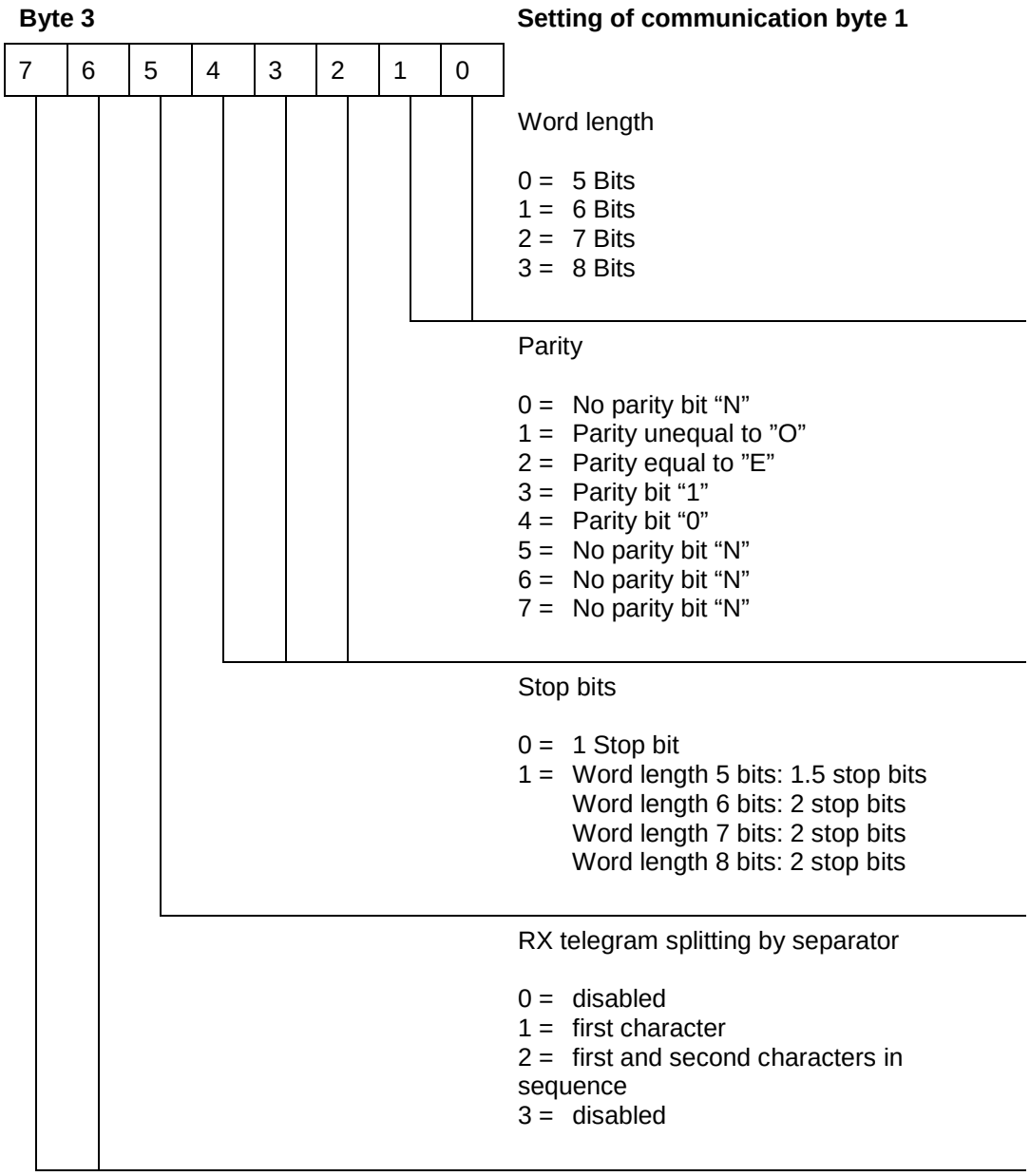
Fig, 47 Parameter byte 1 Art. No. 56761

Bit assignment of parameter byte 2



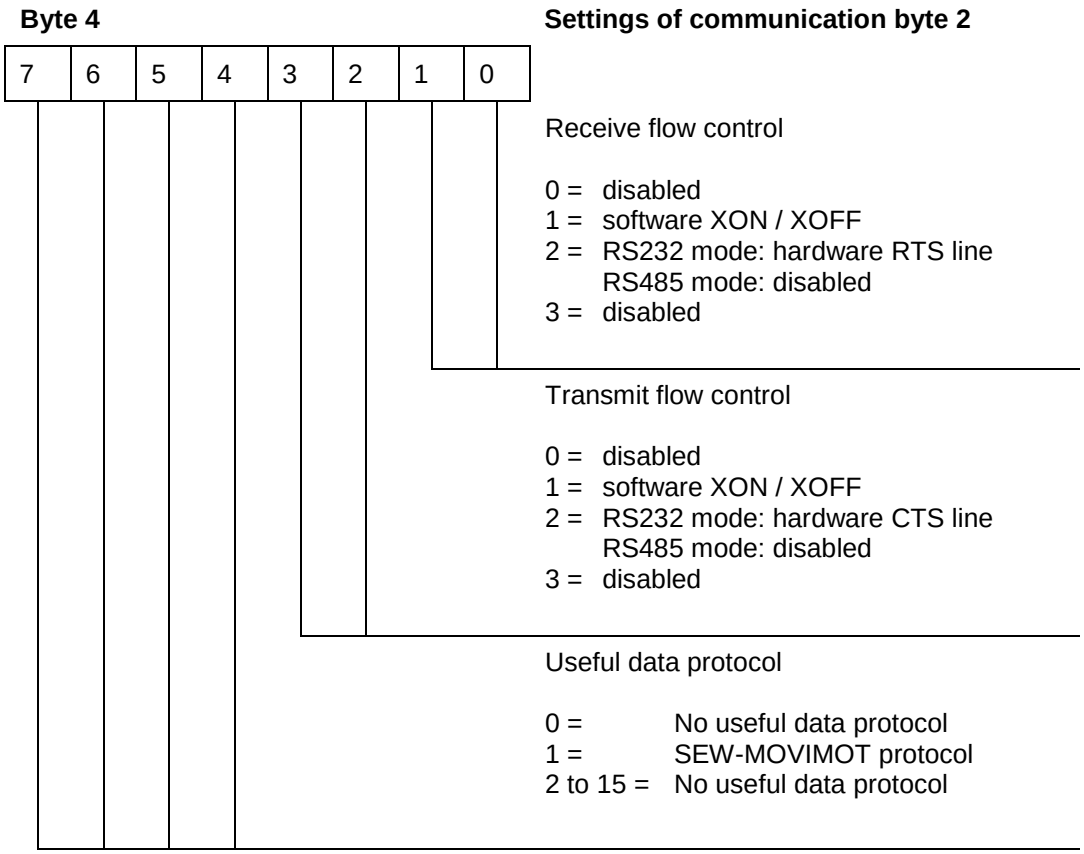
Fig, 48 Parameter byte 2 Art. No. 56761

Bit assignment of parameter byte 3



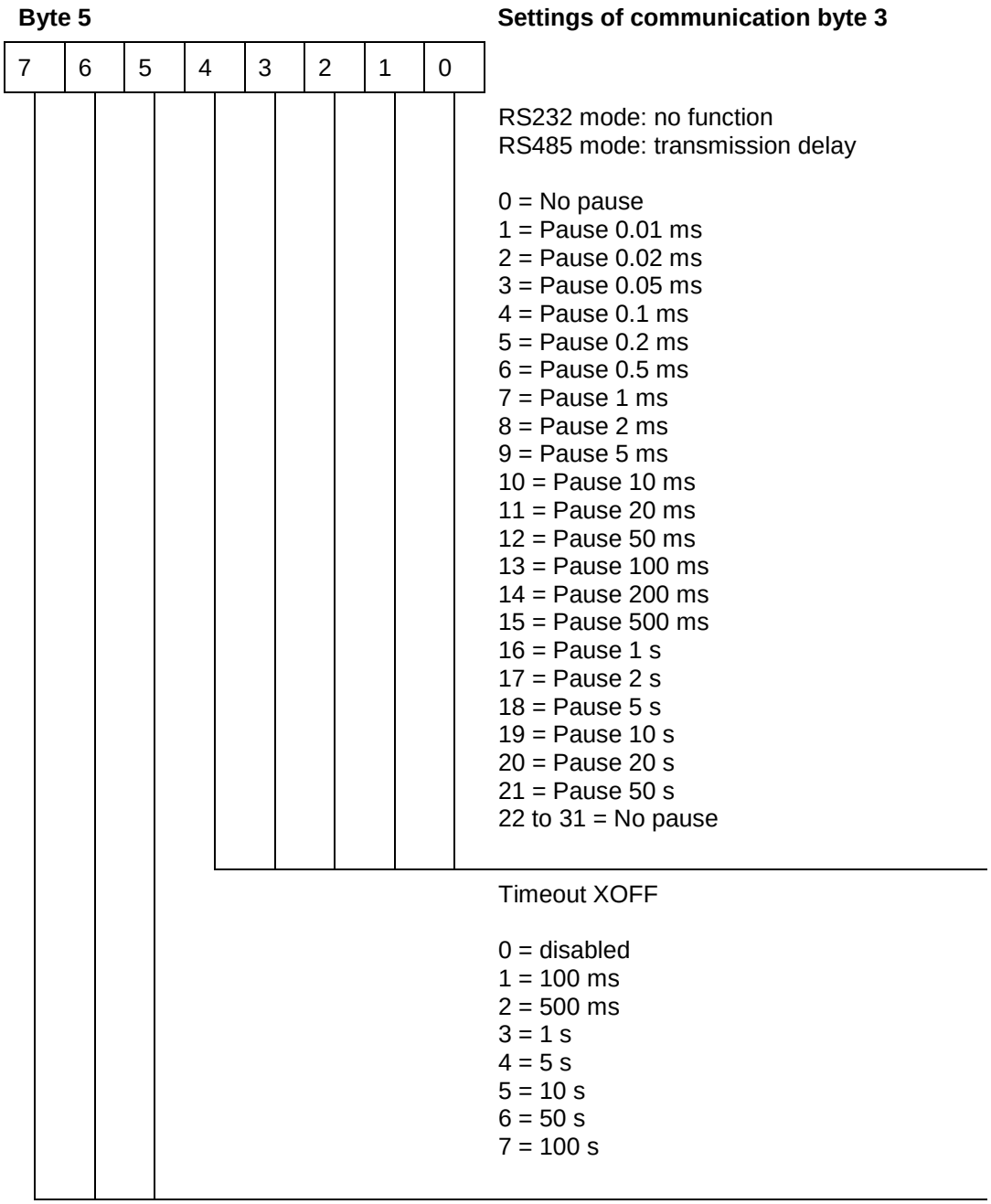
Fig, 49 Parameter byte 3 Art. No. 56761

Bit assignment of parameter byte 4



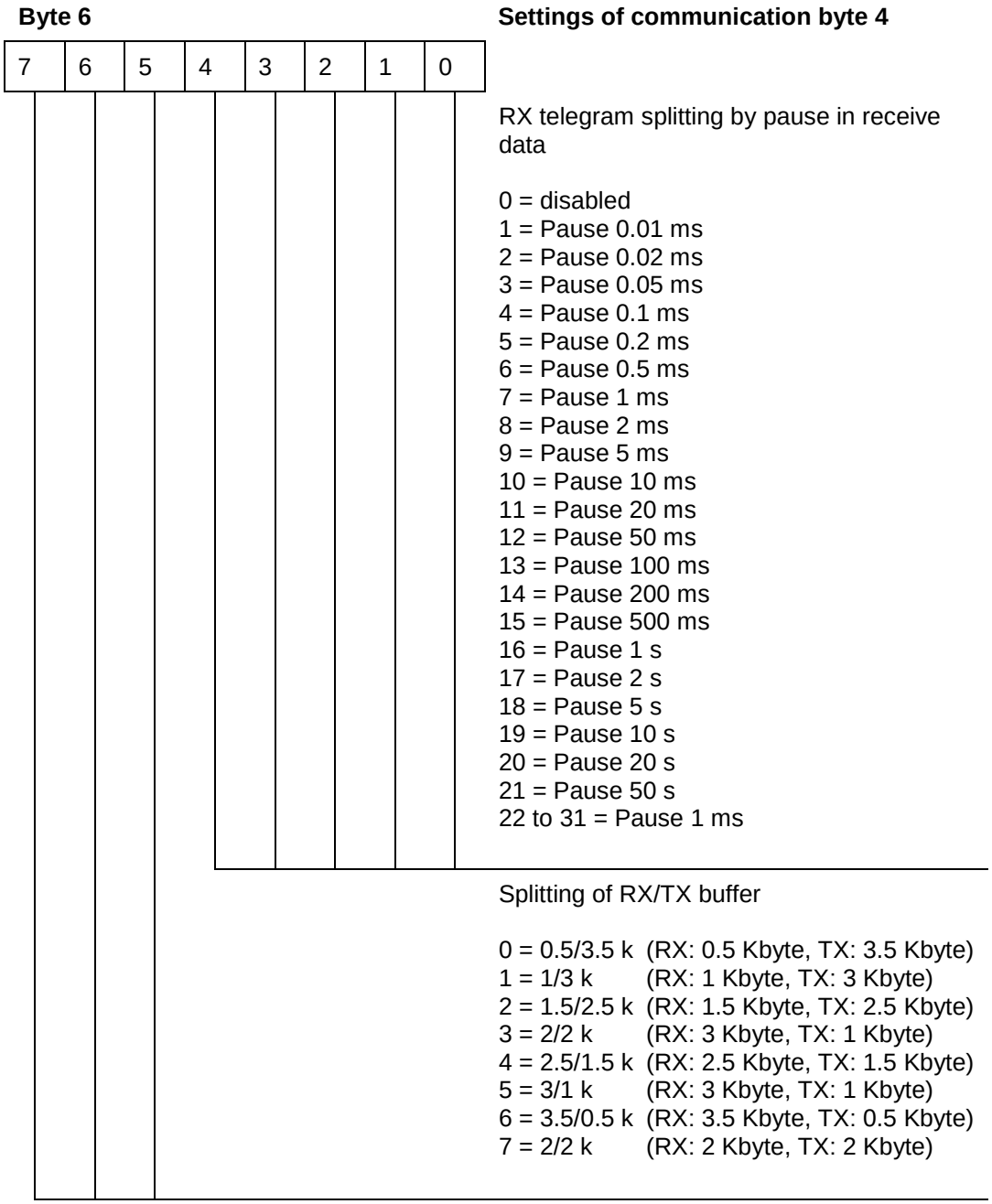
Fig, 50 Parameter byte 4 Art. No. 56761

Bit assignment of parameter byte 5



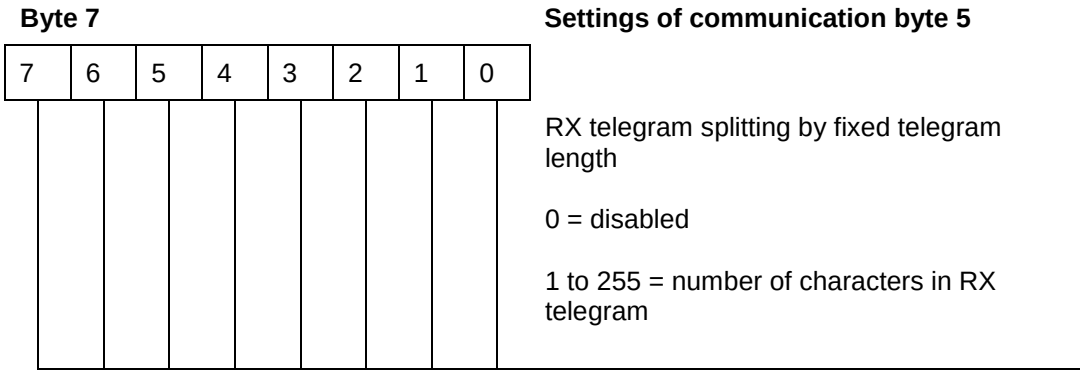
Fig, 51 Parameter byte 5 Art. No. 56761

Bit assignment of parameter byte 6



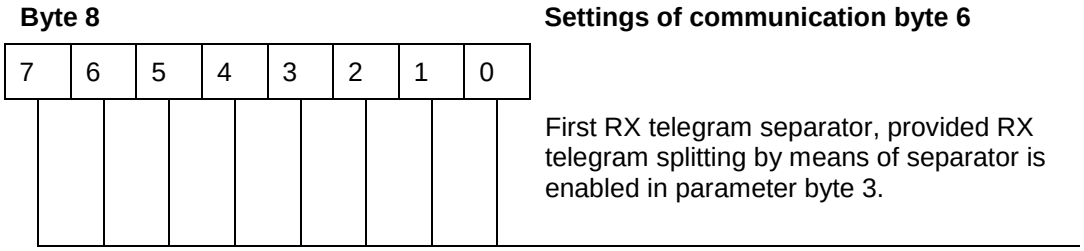
Fig, 52 Parameter byte 6 Art. No. 56761

Bit assignment of parameter byte 7



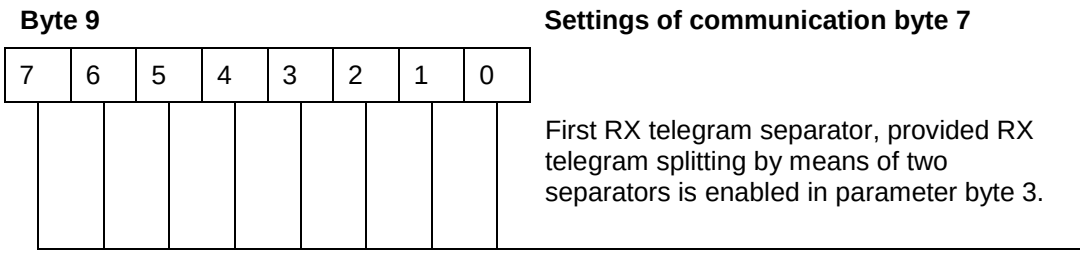
Fig, 53 Parameter byte 7 Art. No. 56761

Bit assignment of parameter byte 8



Fig, 54 Parameter byte 8 Art. No. 56761

Bit assignment of parameter byte 9



Fig, 55 Parameter byte 9 Art. No. 56761

7.2.2.1 RX Telegram Segregation

RX telegram segregation is not used in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

The characters continuously received from the communication interface are mapped on the fieldbus in the communication input data. Sequences of received characters are mapped in the form of segregated telegrams. The telegrams can be limited by various independent mechanisms:

Segregating by Separators

This mechanism is suitable for receive data that do not contain every character and that have no fixed length.

One or two separators may be defined to segregate the telegrams.

Segregating Telegrams	Condition
1 separator	When the first separator occurs in the receive data
2 separators	When the first separator occurs in the receive data and the next character in the receive data corresponds to the second separator.

The separators are represented in the communication input data. The two separators are 0 in the presetting.

Make sure that the selected separator(s) do(es) not occur in the actual useful data when you define separators yourself.

Segregating by pause (timeout) in the receive data

This mechanism is suitable for receive data which may contain any character and that has no fixed length. It acts as protection against error states resulting from other segregations.

If the segregation is enabled by timeout, telegram segregation takes place when the time lapse between two received characters is greater than the timeout setting. The telegram is only placed in the receive buffer when the timeout expires The pause time only starts and ends after full characters are received, i.e. the time is measured between the end of the current character and the start of the next character.

Segregating by fixed telegram length

This mechanism is suitable for receive data that have a fixed length. In addition, we recommend you to segregate using a sufficiently long timeout to protect against error states.

A new telegram is formed after a fixed number of characters received.

Segregating the communication input data

This mechanism is always available and cannot be bypassed.

If the telegram data length is longer than the maximum data length that can be represented in the communication input data, a new telegram is generated.

The telegram is always segregated if at least one of the four conditions above is fulfilled. The segregated telegram is set in the receive buffer and entered in the communication input data, depending on the selected transmission protocol (request or polling).

If several telegrams are located in the receive buffer, they are processed using the FIFO method, i.e. the first telegram that arrived is placed first in the communication input data.

Besides a limit using a fixed telegram length, we also recommend a limit by setting a sufficiently long pause in the receive data. This then ensures that there is no sustained offset in receive data if characters are missing due to transmission errors.

7.2.2.2 Transmission Protocol

In the base module "Cube67+ DIO4 MOVIMOT E 4xM12", the transmission protocol is fixed to the "polling" setting and is not parameterizable.

Telegrams received are represented in the communication in input data using the FIFO method. Telegrams are removed from the receive buffer in different ways, depending on the transmission protocol:

"Polling" Transmission Protocol	On receipt of a complete telegram, it is removed directly from the receive buffer and represented in the communication input data.
"Request" Transmission Protocol	The telegrams in the receive buffer are only removed from the receive buffer on request and represented in the communication input data. The request is generated by setting Bit 0 in the command byte unequal to Bit 0 in the status byte. If a complete telegram is located in the receive buffer during the request, it is removed from the receive buffer on request and represented in the communication input data. In this case, the data length in Byte 2 of the communication input data is unequal to 0. If there is no complete telegram located in the receive buffer during the request, the communication input data and the data length from Byte 2 is set to 0.

7.2.2.3 Data Buffer Overflow Response

The data buffer overflow response is not relevant in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

When the module is in specific operating states, more characters may have to be set in a data buffer than there are free places. This leads to an error input in the status byte of the communication input data for this data buffer. Please refer to Section 7.2.3 for a segregation of the status bits. Each of the status bits is retained until they are reset in the communication output data using the command byte, even if the state of buffer memory is again errorfree later.

An overflow in the receive buffer results in rejection of an incomplete telegram. This does not affect complete telegrams in the receive buffer.

An overflow in the send buffer first results in the rejection of send characters. The characters in the send buffer are sent via the communication interface.

Later, after the occurrence of a buffer overflow and when there is again some free space in the buffer memory, there are two possible responses:

"Tolerant" Overflow Response	Characters are set in the related buffer memory.
"Remanent" Overflow Response	No characters are set in the related buffer memory.

7.2.2.4 Flow Control

No flow control is used in the base module "Cube67+ DIO4 MOVIMOT E 4xM12" and it is therefore not parameterizable.

Flow control can be enabled separately for the transmit and receive parts of the communication interface. This prevents any overwriting of a data buffer for one of the users. Normally, you can select the same setting for the send and receive parts. In special cases, however, it is better to select different settings for the send and receive parts. The following protocols for flow control are supported:

Software XON/XOFF

In RS232 and RS485 modes, flow control is possible using the control characters XON and XOFF. Send or receive readiness is indicated by the control characters XON and XOFF. After receiving the control character XOFF in the receive data, no more characters are sent over the communication interface, even if there are still characters in the send buffer. The send process is only re-enabled after the control character XON is received.

The module sends control character XOFF, if necessary, within the actual send data, if the number of free characters in the receive buffer drops below a specific value. After the number of free characters is above this value again, control character XON is sent.

Software flow control can not be used if the control characters XON or XOFF occur in the useful data of the communication interface.

RTS/CTS Hardware

The module only sends data if receive standby is signaled on the communication interface via the CTS line.

The module signals receive standby via the RTS line. The state is dependent on the number of free characters in the receive buffer, in analogy to the software flow control.

7.2.2.5 RS485 Transmission Delay

Transmission in the base module "Cube67+ DIO4 RS232 E 4xM12" is in full-duplex mode. For this reason, RS485 transmission delay is not used and can not be parameterized.

In the base module "Cube67+ DIO4 MOVIMOT E 4xM12", RS485 transmission delay is aligned to the SEW-MOVIMOT protocol and can not be parameterized.

Transmission in RS485 mode is in half-duplex. A waiting time before sending can be defined to ensure the correct half-duplex mode, i.e. in order to exclude two users from sending simultaneously. If new data is received during the waiting time, the waiting time starts again. Transmission only starts after the waiting time expires.

7.2.2.6 Timeout XOFF

No flow control is used in the base module "Cube67+ DIO4 MOVIMOT E 4xM12". For this reason, the setting for Timeout XOFF is not parameterizable.

If the software flow control is operated for send data by means of control character XON / XOFF, a time lapse (timeout) to receive control character XON can be fixed in the receive data on the communication interface. This timeout starts with reception of control character XOFF over the communication interface. If control character XON does not occur in the receive data of the communication interface after expiry of the timeout, another telegram is sent over the communication interface, provided send data is present in the receive buffer.

This prevents the system from "missing" a control character XON in the receive data of the communication interface due to transmission errors. It may be possible also that no data was sent.

7.2.2.7 Data Buffer Segregation

It is not possible to parameterize the segregation of the data buffer in the base module "Cube67+ DIO4 MOVIMOT E 4xM12".

The module contains a data buffer with a size of 4 Kbytes. The data buffer can be segregated between send and receive data in several gradations. Normally, it is practical to segregate the buffer memory into equal gradations, i.e. 2 Kbytes receive buffer and 2 Kbytes send buffer. To avoid buffer overruns, it may also be practical to vary this segregation.

7.2.3 DIO Data of Cube67+ DIO4 RS232/485 E 4xM12

Bit Assignment of I/O Data – DIO Input Data PAE

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	-	-	-	-	-	-	1	0

Tab. 15: PAE data byte 1 Art. No. 56761

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	-	-	-	-	-	-	1	0

Tab. 16: PAE data byte 2 Art. No. 56761

Bits 2 to 7 are unassigned and have the value "0".

Bit assignment of I/O data – DIO output data PAA

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	-	-	-	-	-	-	1	0

Tab. 17: PAA data byte 1 Art. No. 56761

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	-	-	-	-	-	-	1	0

Tab. 18: PAA data byte 2 Art. No. 56761

Bits 2 to 7 are unassigned and have the value "0".

7.2.4 Communication Data of Cube67+ DIO4 RS232/485 E 4xM12

7.2.4.1 Data without useful data protocol

Bit Assignment of I/O Data – Communication Input Data PAE

The length of the communication input data L is determined in bytes in the configuration by a virtual input module with prefix "RS_RX". Length L results from the number following the prefix.

Byte assignment of communication input data

Byte	Name	Value	Meaning
0	Status	0 to 255	Status of receive data; for explanations, please refer to the table below:
1	Receive counter	0 to 255	Consecutive receive telegram number
2	Data length	0 to L-3	Number of following receive data bytes
3 to L-1	Receive data	0 to 255	Receive data from interface

Tab. 19: PAE data communication Art. No. 56761

Bit assignment Status in Byte 0 of communication input data

Bit	Name	Value	Meaning
0	Status of receive request	0 to 1	Status Request, in conjunction with command byte
1	Reset	0 to 1	1: Communication interface is initialized
2	Status of receive buffer	0 to 3	0: No telegram present 1: min. one telegram present 2: Fill level > 80% 3: Overflow (remanent)
3			
4	Status of send buffer	0 to 3	0: empty 1: min. one byte present 2: Fill level > 80% 3: Overflow (remanent)
5			
6	Receive error	0 to 1	0: no error 1: error in receive data on communication interface (remanent)
7	Error in telegram	0 to 1	0: no error 1: Receive error in telegram

Tab. 20: PAE data status byte Art. No. 56761

Bit Assignment of I/O Data – Communication Output Data PAA

The length of the communication output data L is determined in bytes in the configuration by a virtual input module with prefix "RS_TX". Length L results from the number following the prefix.

Byte assignment of communication output data

Byte	Name	Value	Meaning
0	Command	0 to 255	Command for parameterization; for explanations, please refer to the table follow:
1	Send counter	0 to 255	Send telegram number; if there is a change compared with the previous value, data is sent over the interface.
2	Data length	0 to L-3	Number of following send data bytes
3 to L-1	Send data	0 to 255	Send data for interface

Tab. 21: PAA data communication Art. No. 56761

Bit assignment command in Byte 0 of communication output data

Bit	Name	Value	Meaning
0	Receive request	0 to 1	Request for receive data in request mode, if content unequal to Status bit 0.
1	Reset	0 to 1	1: Initialize communication interface, delete data buffer content, delete remanent errors.
2	Delete RX buffer	0 to 1	1: Delete content of receive buffer.
3	Reserved	0	
4	Delete TX-Buffer	0 to 1	1: Delete content of send buffer.
5	Reserved	0	
6	Delete receive errors.	0 to 1	1: Reset status of remanent receive errors.
7	Reserved	0	

Tab. 22: PAA data command byte Art. No. 56761

Reception of Data over the Communication Interface

If a change occurs in the status of the communication interface, the change is mapped in Byte 0 of the communication input data. This is independent on whether complete telegrams are received. Mapping the received telegrams depends on the transmission protocol selected:

"Polling" Transmission Protocol

With every telegram received over the communication interface, the receive counter is incremented by one in Byte 1 of the communication input data. After the value 255 is reached, the counter reverts to the value 0.

To determine whether a complete telegram was received over the communication interface, the receive counter in Byte 1 in the communication input data must be read out cyclically (polling) and compared with the previous value. The receive data including the data length can then be read starting with Byte 2 in the communication input data.

If the system detects an increment of more than one compared with the previous value in Byte 1 of the communication input, telegrams were received in the meantime and their content can no longer be determined.

"Request" Transmission Protocol

It is possible to determine whether complete telegrams are present in the receive buffer by evaluating Bits 2 and 3 of the status byte in Byte 1 of the communication input data. If a telegram is present and it is supposed to be read out, request bit 0 of the command byte in Byte 1 of the communication output data must be set to the complementary value of the request status bit 0 in Byte 1 of the communication input data. This means: The value in the communication output data must be set to 0 if the value in the communication input data was 1, and vice versa. This initiates a receive data request.

The content of the received telegram including the data length can then be read starting with Byte 2 in the communication input data. The receive counter Byte 1 of the communication input data is incremented by 1, or set to 0 (provided the previous counter status was 255), compared with the status before the receive data request.

If a request is initiated by receive data without at least one complete telegram present in the receive buffer, the receive counter is not changed in Byte 1 of the communication input data and the communication input data is set to 0 starting with Byte 2.

Sending Data over the Communication Interface

Commands for the communication interface using Byte 0 in the communication output data can be sent independent of send data. If only a command is sent, make sure that the send counter in Byte 1 in the communication output data is not changed.

The following chronological sequence must be complied with to prevent sending any unrequired data over the communication interface:

Write Access	Comments
1. On the send data, including the length bytes starting with Byte 2 in the communication output data.	If the same data is sent a second time over the communication interface, no write access is required here.
2. On Command Byte No. 0 in the communication output data	Make sure that Bit 1 and Bit 0 are set to 0, otherwise no data is sent over the communication interface.
3. On the send counter in Byte No. 1 in the communication output data.	The send data is sent over the communication interface as soon as a change in the existing value takes place in the send counter.

The status of the send buffer can be determined by evaluate Bits 4 and 5 of the status byte and to present an overflow of further send data. The status byte is located in Byte 1 of the communication input data.

7.2.4.2 Data with Useful Data Protocol SEW-MOVIMOT

Byte Assignment of I/O Data – Process Input Data PE

The length of the process input data L is determined in words in the configuration by a virtual input module with prefix "MOVIMOT_RX". A word consists of two bytes. Length L results from the number following the prefix.

Byte assignment of process input data with input data length of 2 words ("MOVIMOT_RX_2 Word")

Word	Name	Value	Meaning
0	Status word 1	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Output current	0 to 65535	PDU date in protocol SEW-MOVILINK

Tab. 23: PE data 2 words SEW-MOVILINK Art. No. 56761

Byte assignment of process input data with input data length of 3 words ("MOVIMOT_RX_3 Word")

Word	Name	Value	Meaning
0	Status word 1	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Output current	0 to 65535	PDU date in protocol SEW-MOVILINK
2	Status word 2	0 to 65535	PDU date in protocol SEW-MOVILINK or 0

Tab. 24: PE data 3 words SEW-MOVILINK Art. No. 56761

The length of PE data in the response telegram of the SEW-MOVILINK protocol depends on the selected length of the PA data. 2 words of PA data result in 2 words of PE data. The same applies to 3 words of PA data. If there is a difference in data length in the configuration, Word 3 is either set to zero (RX 3 words, "MOVIMOT_RX_3 Word" module and TX 2 words, "MOVIMOT_TX_2 Word" module), or rejected (RX 2 words, "MOVIMOT_RX_2 Word" module and TX 3 words, "MOVIMOT_TX_3 Word" module).

If no response telegram is received within 1 second, or if the data frame in the response telegram of the SEW-MOVILINK protocol is incorrect, the process input data are completely reset to zero.

Byte Assignment of I/O Data – Process Output Data PA

The length of the process output data L is determined in words in the configuration by a virtual output module with prefix "MOVIMOT_TX". A word consists of two bytes. Length L results from the number following the prefix.

Byte assignment of process output data with output data length of 2 words ("MOVIMOT_TX_2 Word")

Word	Name	Value	Meaning
0	Control word	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Revolutions	0 to 65535	PDU date in protocol SEW-MOVILINK

Tab. 25: PA data 2 words SEW-MOVILINK Art. No. 56761

Byte assignment of process output data with output data length of 3 words ("MOVIMOT_TX_3 Word")

Word	Name	Value	Meaning
0	Control word	0 to 65535	PDU date in protocol SEW-MOVILINK
1	Revolutions	0 to 65535	PDU date in protocol SEW-MOVILINK
2	Ramp status word	0 to 65535	PDU date in protocol SEW-MOVILINK or 0

Tab. 26: PA data 3 words SEW-MOVILINK Art. No. 56761

PA data are sent cyclically over the communication interface, taking account of the time specifications in the SEW-MOVILINK protocol. If there is a fault on the fieldbus, the PA data are set to zero

7.2.5 I&M Functions of Cube67+ DIO4 RS232/485 E 4xM12

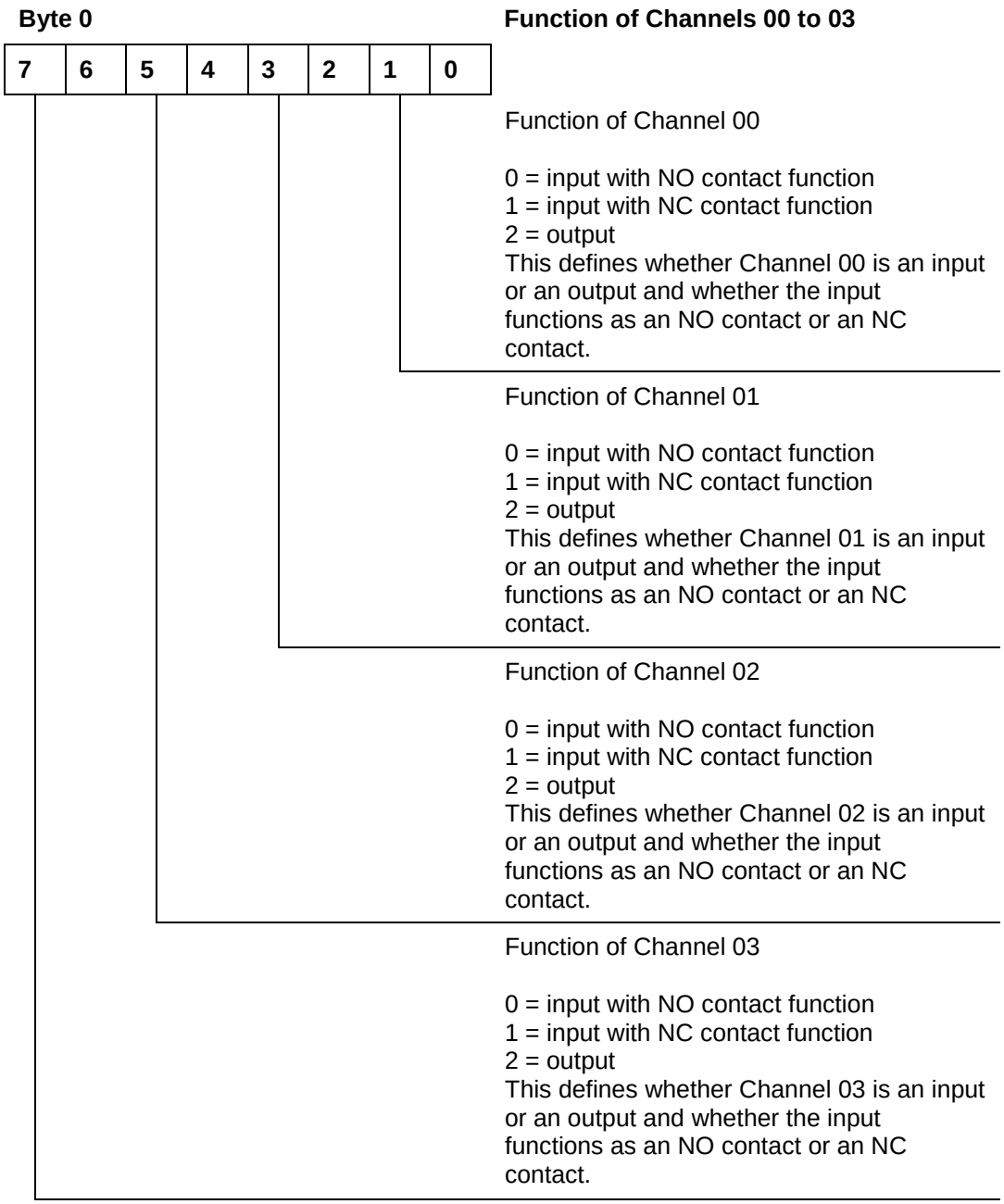
Index AFF0 read = IM0 of Cube67+ DIO4 RS232/485 E 4xM12

7.3 Cube67+ DIO12 IOL4 E 8xM12 Art. No. 56765

7.3.1 Parameters

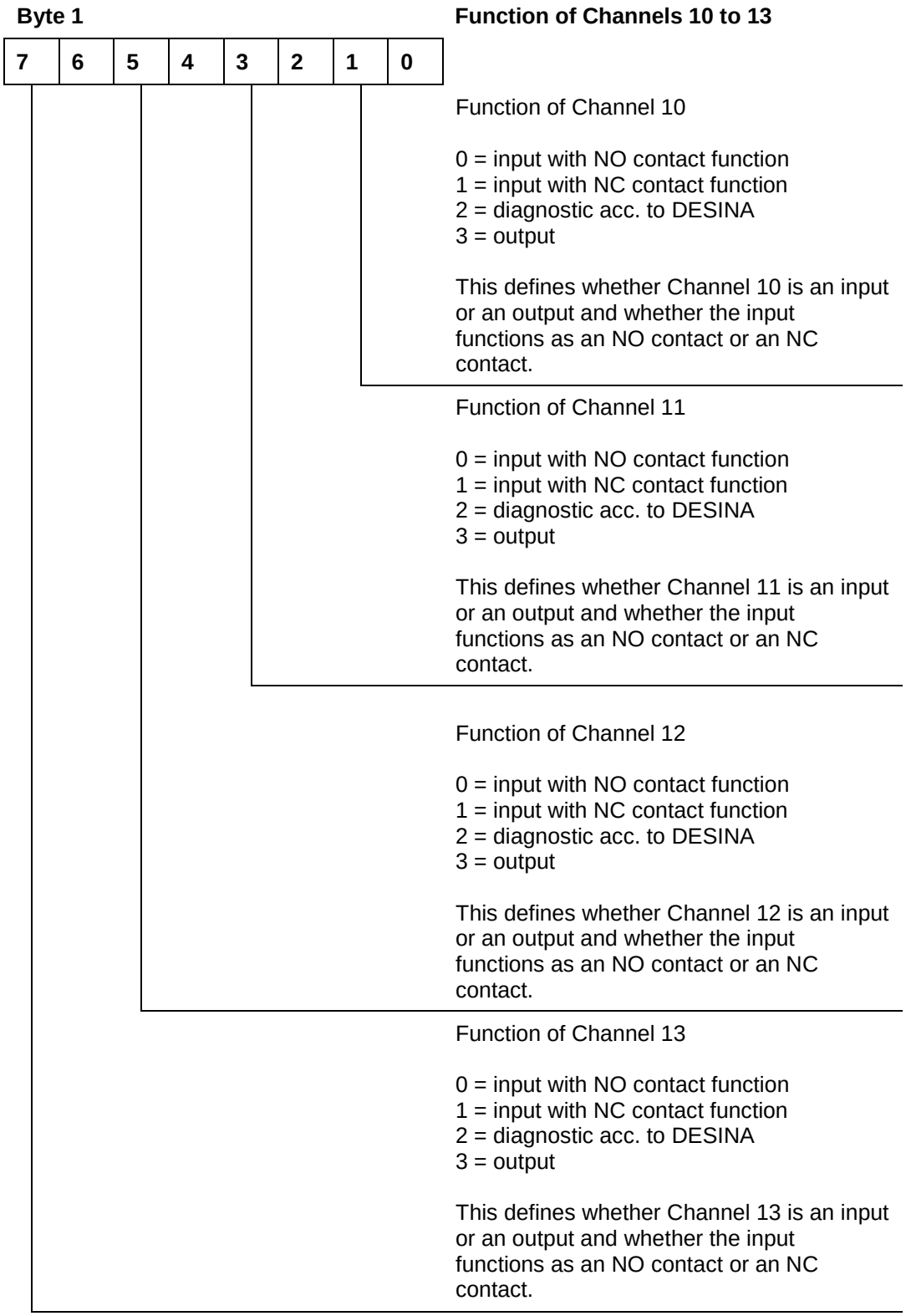
Number of parameter bytes: 18

Bit assignment of parameter byte 0



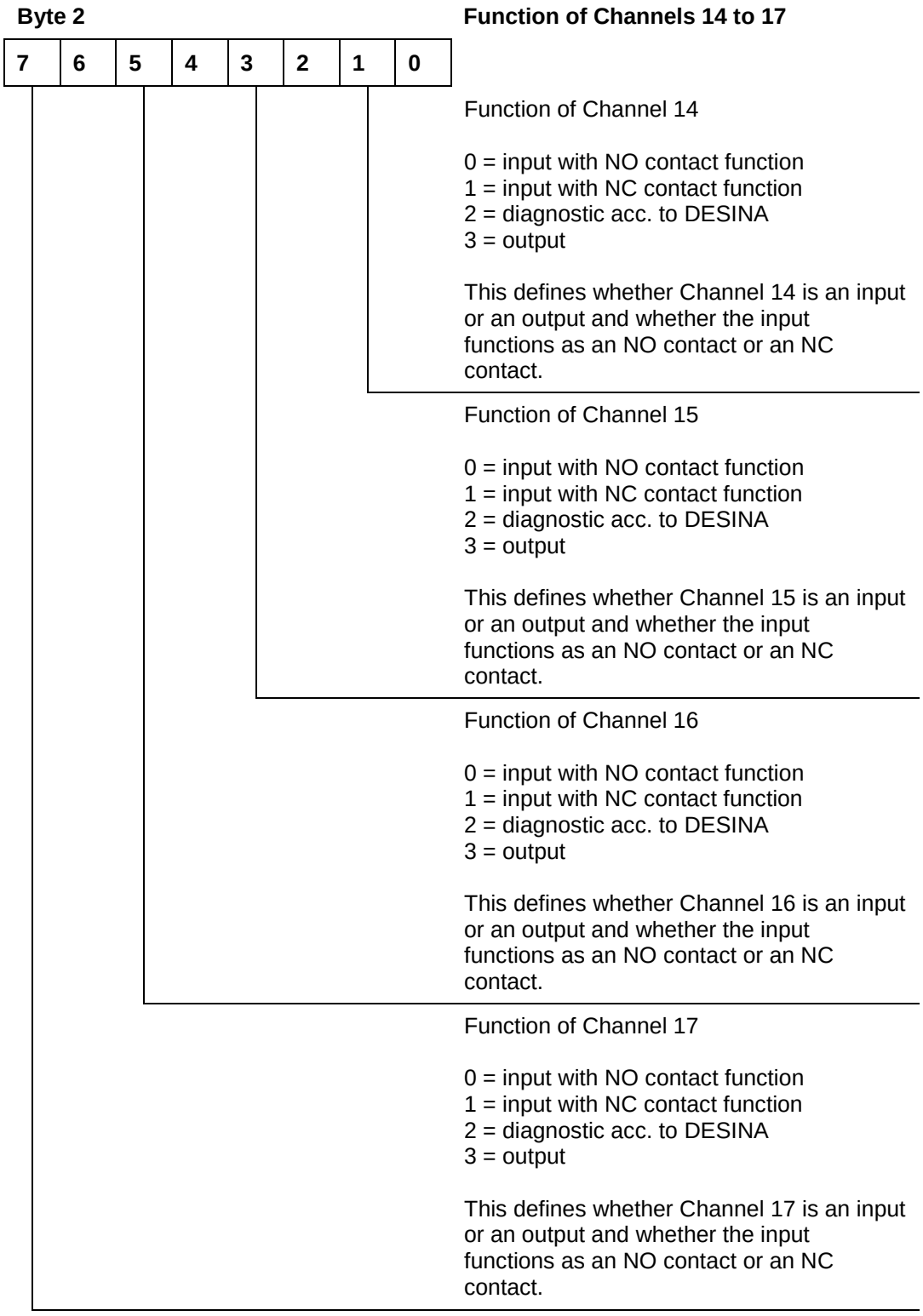
Fig, 56 Parameter byte 0 Art. No. 56765

Bit assignment of parameter byte 1



Fig, 57 Parameter byte 1 Art. No. 56765

Bit assignment of parameter byte 2

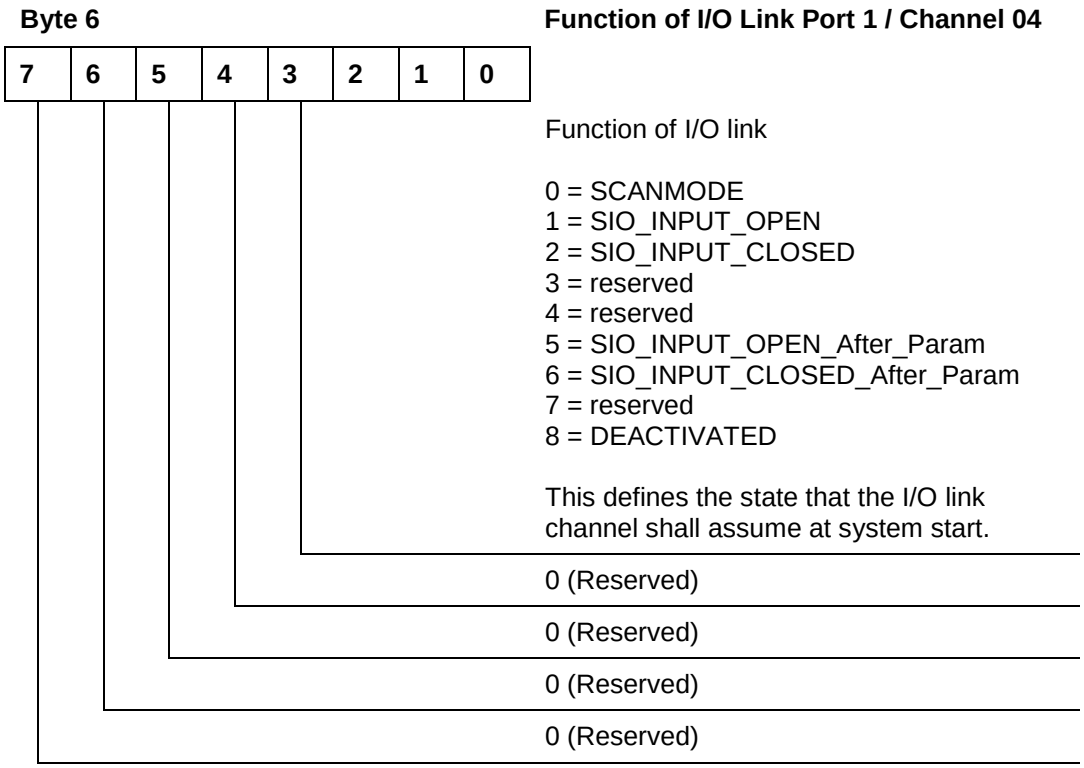


Fig, 58 Parameter byte 2 Art. No. 56765

Bit assignment of parameter bytes 3 to 5

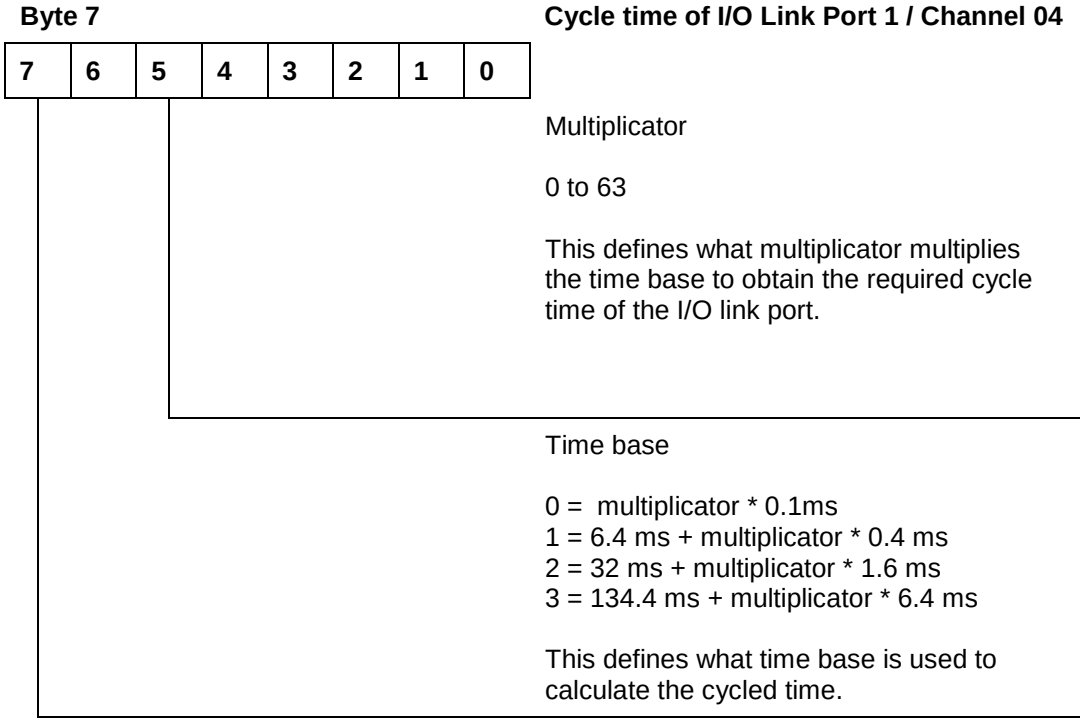
0 (reserved)

Bit assignment of parameter byte 6



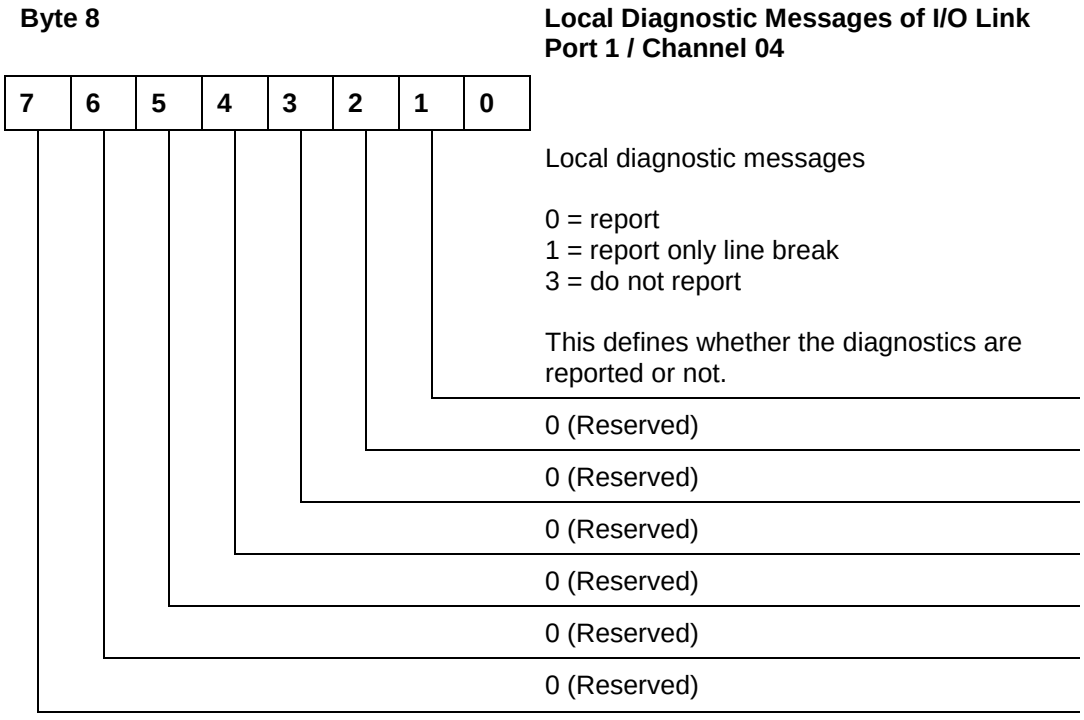
Fig, 59 Parameter byte 6 Art. No. 56765

Bit assignment of parameter byte 7



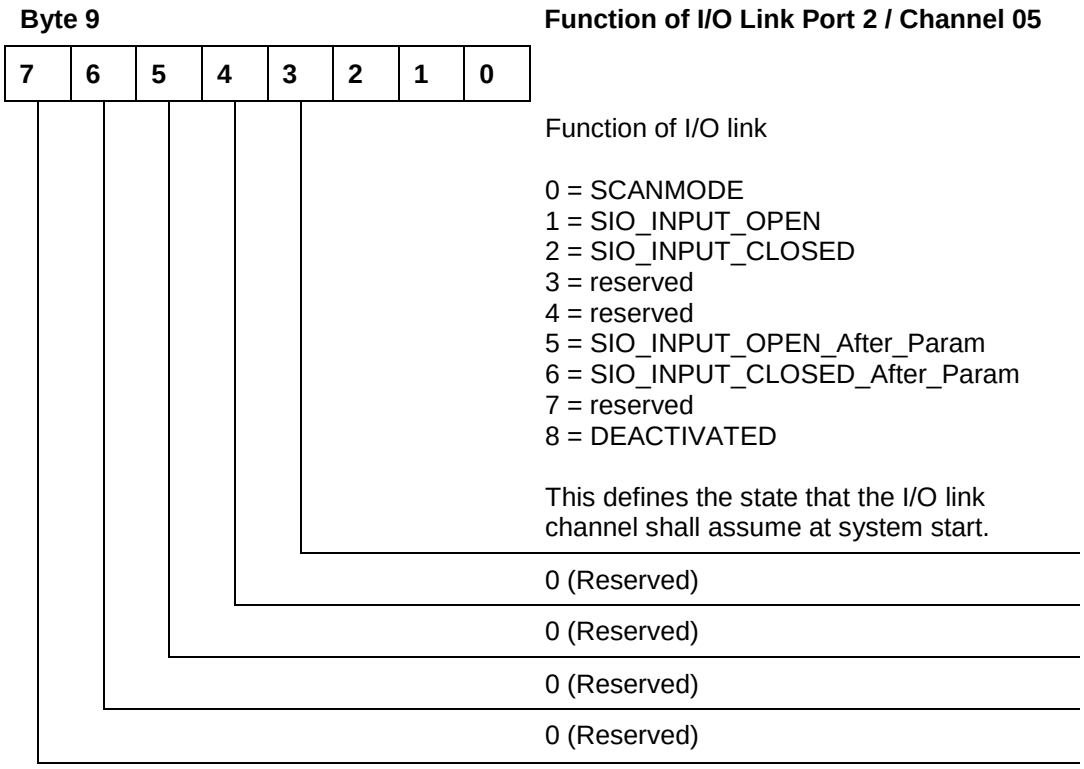
Fig, 60 Parameter byte 7 Art. No. 56765

Bit assignment of parameter byte 8



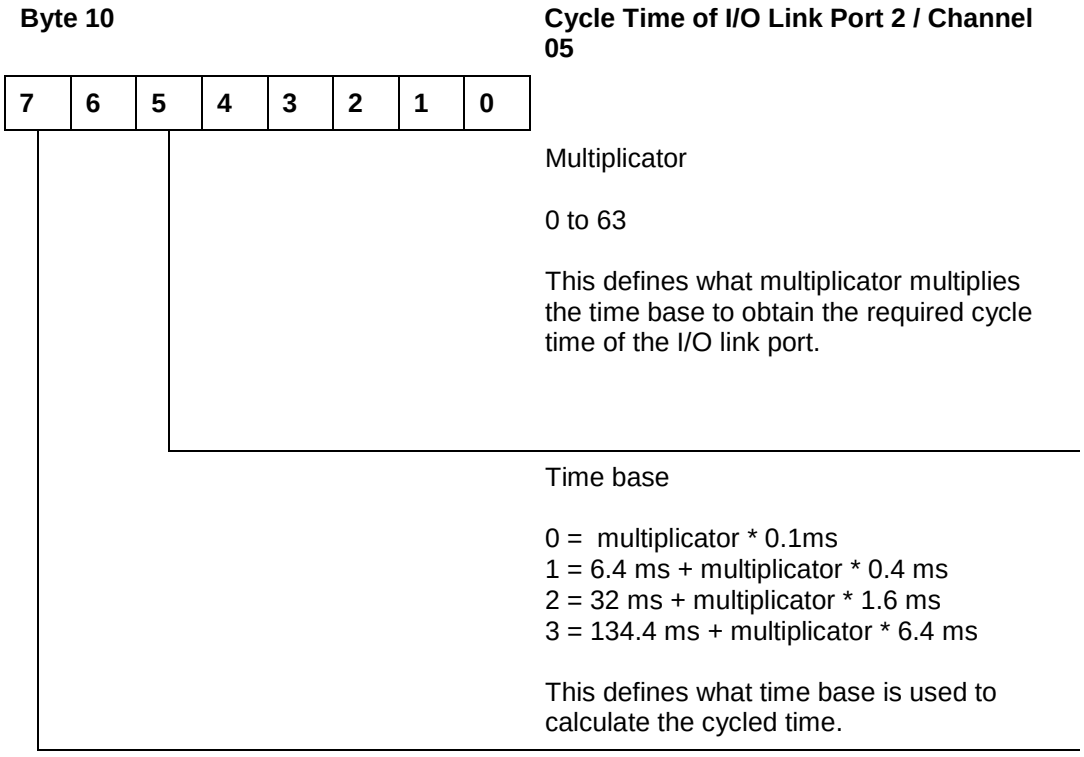
Fig, 61 Parameter byte 8 Art. No. 56765

Bit assignment of parameter byte 9



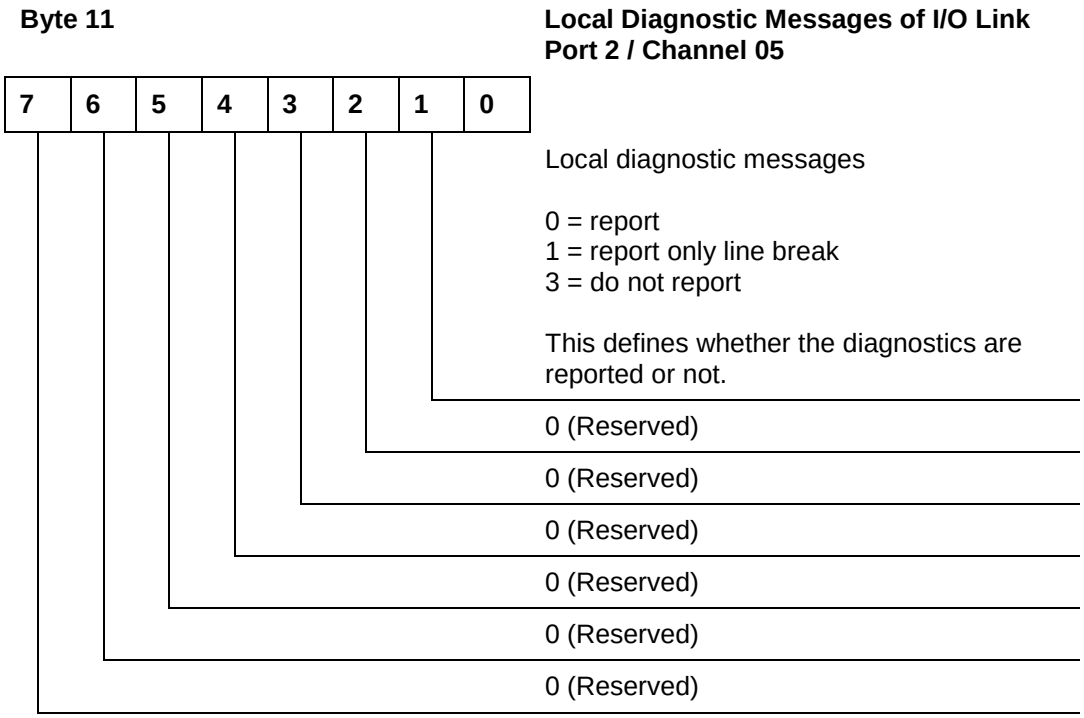
Fig, 62 Parameter byte 9 Art. No. 56765

Bit assignment of parameter byte 10



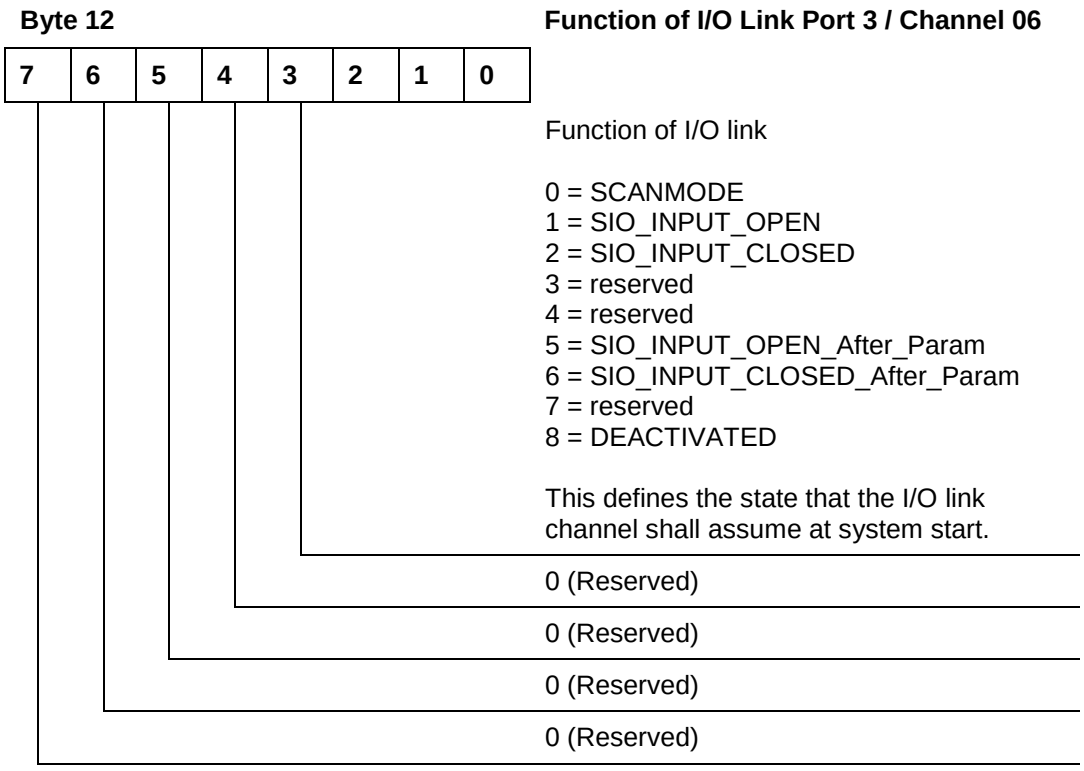
Fig, 63 Parameter byte 10 Art. No. 56765

Bit assignment of parameter byte 11



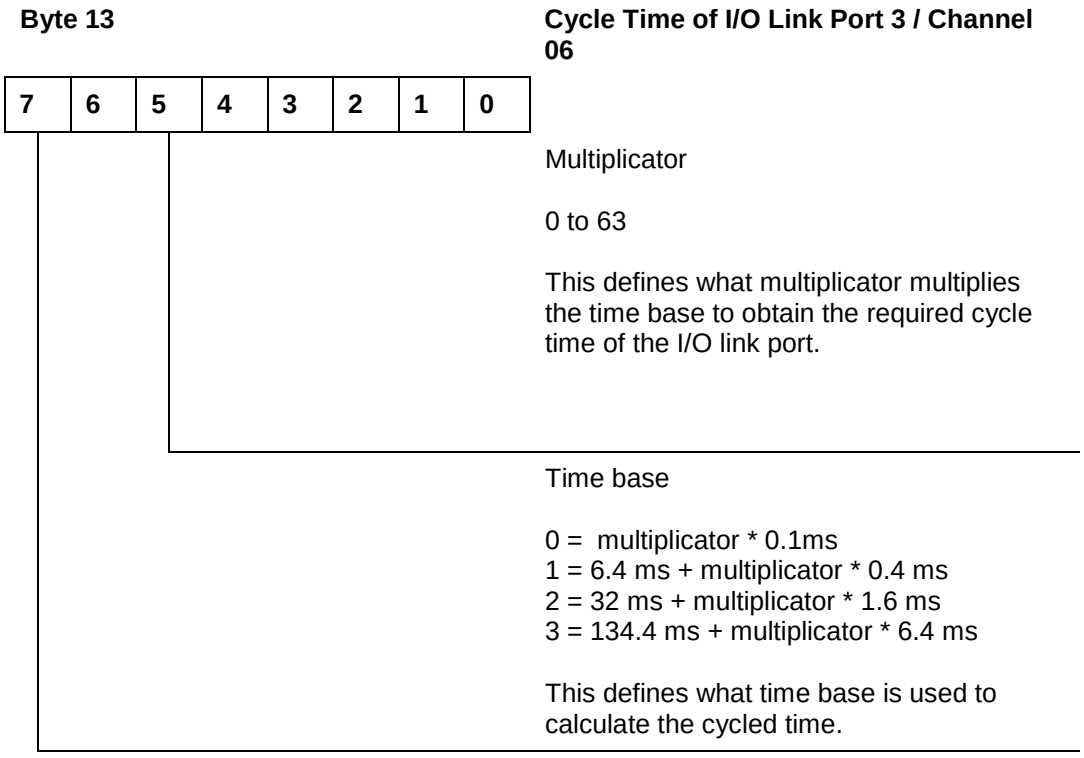
Fig, 64 Parameter byte 11 Art. No. 56765

Bit assignment of parameter byte 12



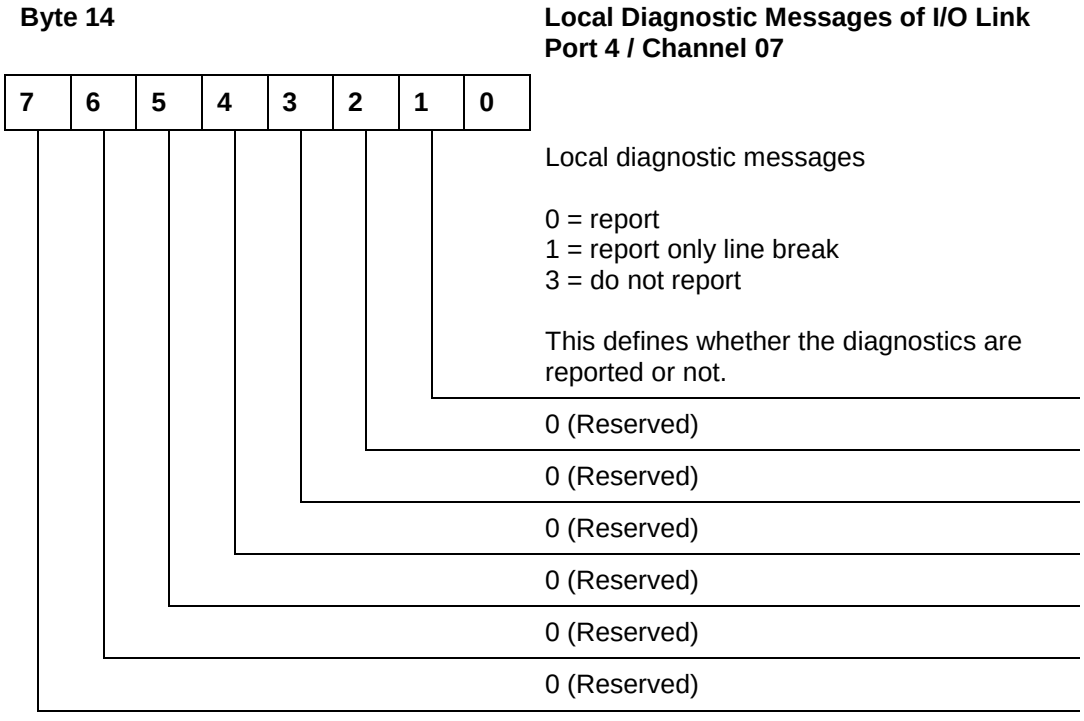
Fig, 65 Parameter byte 12 Art. No. 56765

Bit assignment of parameter byte 13



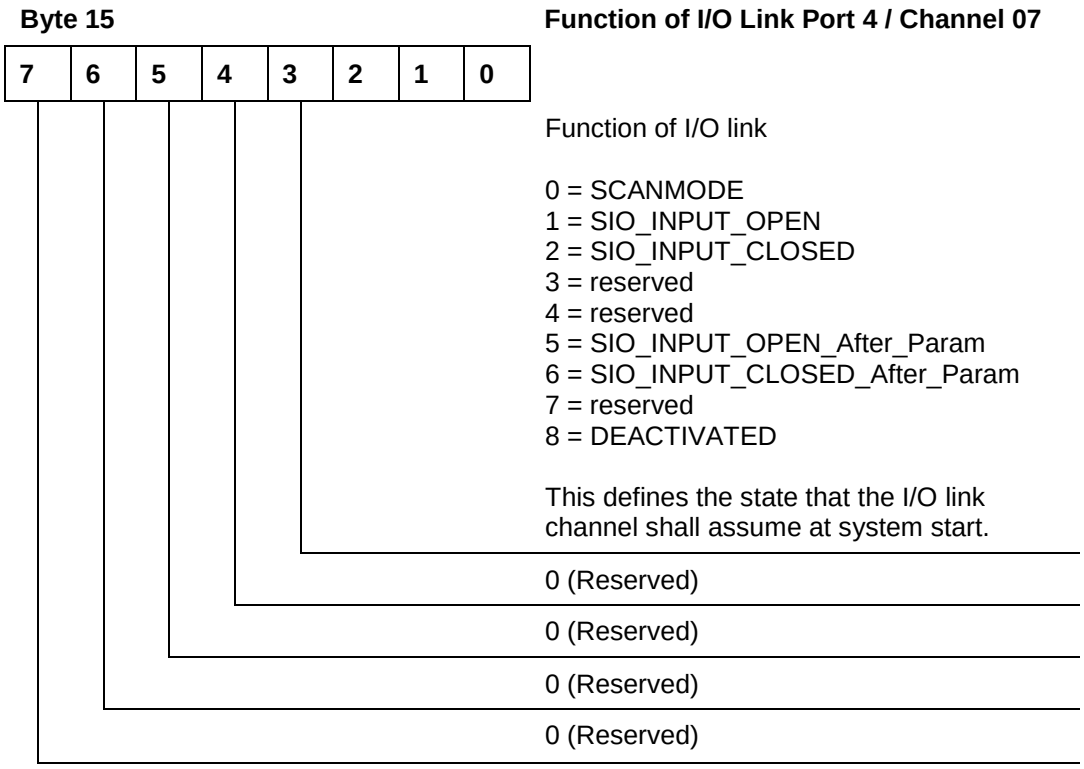
Fig, 66 Parameter byte 13 Art. No. 56765

Bit assignment of parameter byte 14



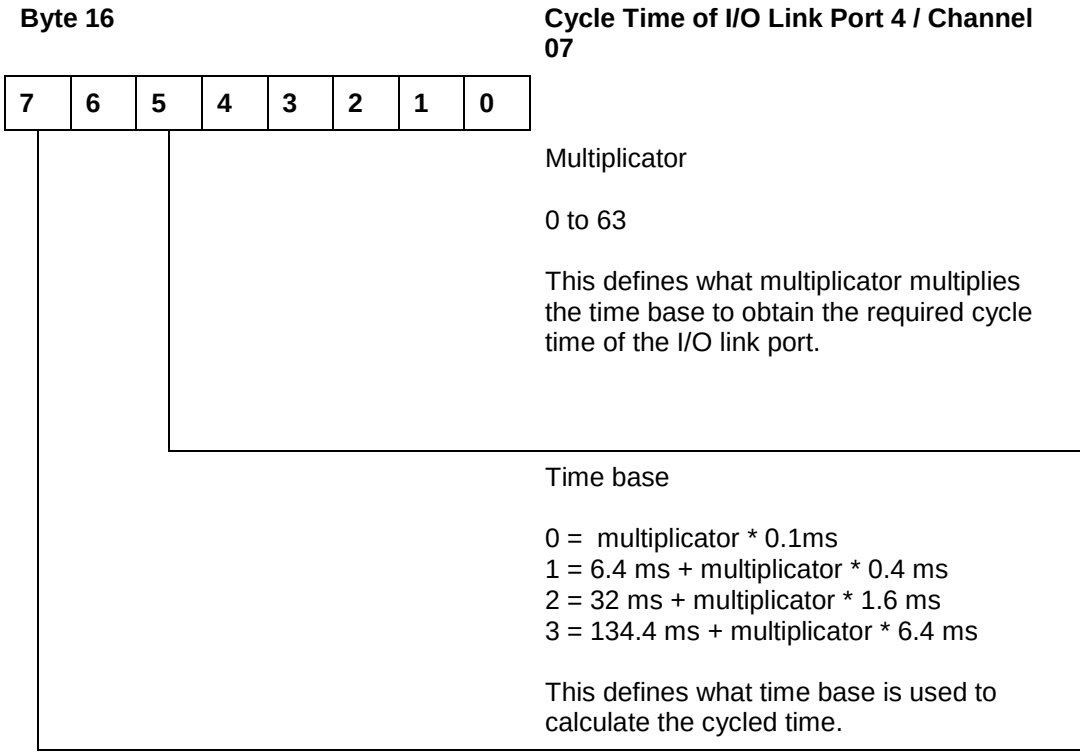
Fig, 67 Parameter byte 14 Art. No. 56765

Bit assignment of parameter byte 15



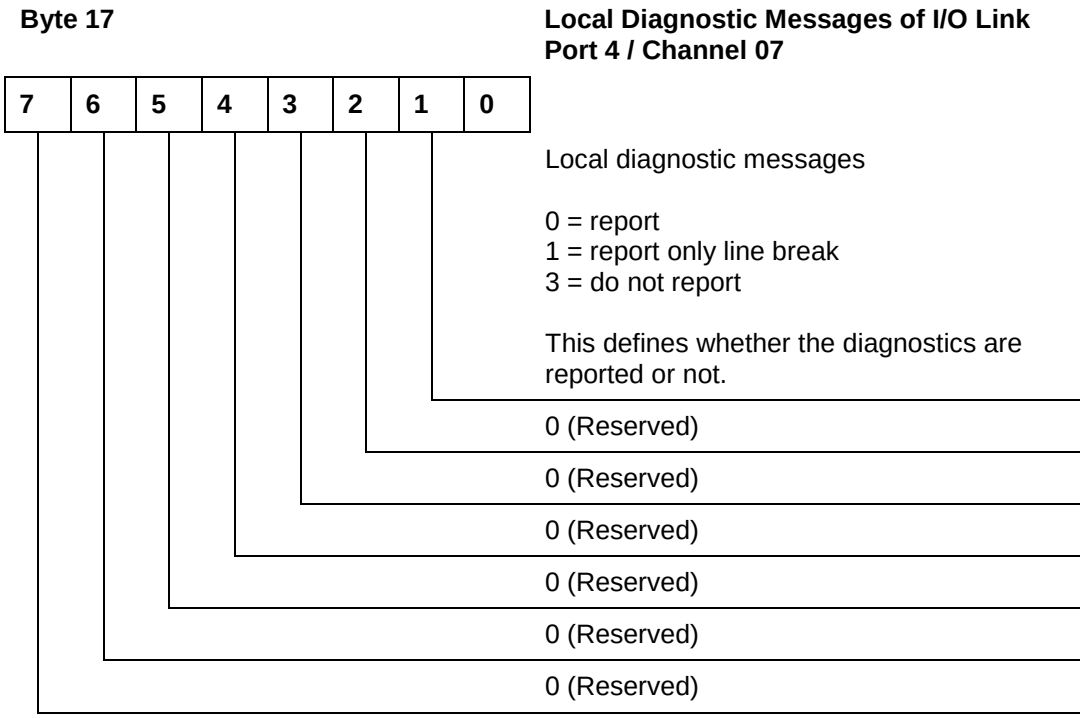
Fig, 68 Parameter byte 15 Art. No. 56765

Bit assignment of parameter byte 16



Fig, 69 Parameter byte 16 Art. No. 56765

Bit assignment of parameter byte 17



Fig, 70 Parameter byte 17 Art. No. 56765

7.3.2 Data of Cube67+ DIO12 IOL4 E 8xM12

Bit assignment of I/O data – input data PAE

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 27: PAE data byte 1 Art. No. 56765

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 28: PAE data byte 2 Art. No. 56765

Bit assignment of I/O data – output data PAA

Byte 1								
Bit	7	6	5	4	3	2	1	0
Pin 4 Socket	7	6	5	4	3	2	1	0

Tab. 29: PAA data byte 1 Art. No. 56765

Byte 2								
Bit	7	6	5	4	3	2	1	0
Pin 2 Socket	7	6	5	4	3	2	1	0

Tab. 30: PAA data byte 2 Art. No. 56765

In addition to the 2 bytes for PAE and PAA each, the configured I/O Link PAE and PAA bytes are transmitted. The data length in each case depends on the virtual modules used.

7.3.3 I&M Functions of Cube67+ DIO12 IOL4 E 8xM12

For communication with the I/O link sensors, the Cube67+ DIO12 IOL4 E 8xM12 also supports I&M functions. They are used for communication with the I/O link devices as well as to represent module-specific information.

Index 0xAFF0 read = IM0 of Cube67+ DIO12 IOL4 E 8xM12

Index 0xB000 read = I/O link MM as per specification

Index 0xB001 read = IM17 information of I/O link port 1

Index 0xB002 read = IM18 information of I/O link port 2

Index 0xB003 read = IM19 information of I/O link port 3

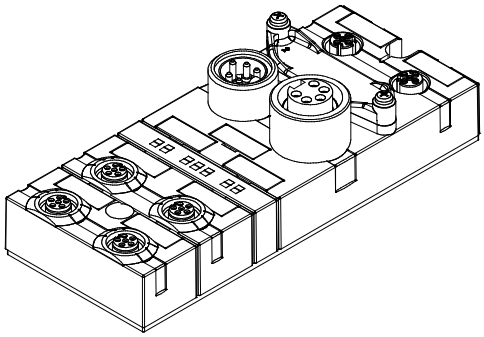
Index 0xB004 read = IM20 information of I/O link port 4

Index 0xB062 read and write = communication channel to connected I/O link devices

Index 0xB063 read = I/O link master directory

8 Technical Data

PROFINET Device IP67



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
EN 61000-4-5 Surge ..... asym./sym. ± 500 V (DC input)
..... asym. ± 1 kV (Signal connections)
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

Normal operating temperature ..... 0°C to +55°C
Storage temperature ..... -25°C to +85°C
Enclosure type according to EN 60529 ..... IP 67

Please note:

The Cube67 field bus system is very robust and, due to the high protection class IP67, it is protected from dust, dirt, and most liquids without an additional housing. Cube 67 is specially designed for tough industrial applications directly in machines and plants.

The field bus system is not suitable for outdoor use, continuous operation in liquids, or high pressure washdowns.

Mechanical Ambient Conditions

Oscillation according to EN 60068 Part 2-6 ..... 5 – 70 Hz; const. amplitude 0.75 mm
..... 70 – 500 Hz; const. acceleration 15 g
Shock according to EN 60068 Part 2-27 ..... Amplitude 50 g, 11 ms duration

Connection Possibilities

Supply cable ..... Plug connector 7/8"
Bus connection..... 2 x M12 female connector
..... 4-pin D-code
Internal system connection..... 4 x 6-pin M12 plug connector

Miscellaneous

Dimensions (LxWxH) in mm ..... 151x62x40.5 mm
Weight ..... Approx. 360 g

Bus Data

Transfer protocol ..... ProfiNet IO
Transfer rates ..... 100 MBit/s
Addressing ..... via DCP

Power Supply

Operation voltage U_S and sensor power supply 24 VIN..... 24 VDC (must always be connected)
Actuator power supply 24 V ..... 24 VDC
Current per PIN ..... Max 8A
Operation voltage range ..... 18 to 30 VDC
Current consumption ..... <= 200 mA
Sensor supply..... 24 VDC (not switchable)
Operating voltage range sensor supply..... 18 to 30 VDC
Actuator power supply..... 24 VDC (switchable)
Operating voltage range actuator supply ..... 18 to 30 VDC
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)

International System Connection

Rated current sensor power supply ..... 4 A for each module plug-in location
Rated current actuator power supply ..... 4 A for each module plug-in location

Overload/short-circuit ..... electronic short-circuit recognition
..... Time of liberation < 10 ms

Accessories

A list of Cube67+ accessories is contained in the Cube67+ System Manual Art. No. 56974.

Information on accessories is available in our catalog and our online shop at:

onlineshop.murrelektronik.com

Glossary

Abbreviation/Term	Description
Actuator short-circuit	Short-circuit or overload at an output results in output switchoff.
PN	PROFINET IO
Byte	Equivalent to 8 bits.
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
Drag & Drop	A method of operating graphic user interfaces on computers by moving graphic elements by means of a pointer device.
I/O	Input/Output
EC Directive 2004/108/EC	EMC Directive.
EMC	Electromagnetic Compatibility.
EN	European Standard
ESD	Electrostatic Discharge
EEC	European Economic Community
FE	Function ground/earth.
GSD	"The Device Data Base file describes the technical features of a PROFINET product. This file is required to configure a PROFINET system and is provided by the device manufacturer.
IEC	International Electrotechnical Commission
IP67	Ingress Protection, protection degree as per DIN EN 60529 1st code digit = Contact and foreign body protection 6: Dustproof, protection against access with a wire 2ng code digit = water protection 7: Protection against temporary immersion
ISO	International Standard Organization
LED	Light Emitting Diode
PELV	Protective Extra Low Voltage.
PNO	Profibus Nutzerorganisation e.V. (German Profibus User Organization)
SELV	Safety Extra Low Voltage.
Sensor short-circuit	Short-circuit or overload at Terminal US
Simatic Manager	Programming software for program-logic controllers made by Siemens.

Abbreviation/Term	Description
PLC	Program-logic controller
UA	Actuator Power Supply
UI	Module and sensor power supply.
US	Sensor power supply.
VDMA	Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Industrial Equipment Manufacturers)
VZ	Sign (+ or -)
ZVEI	Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (German Electrical and Electronic Manufacturers' Association).

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