



stay connected

MANUAL ENGLISH

for devices of the MVK-MPNIO series
Art.-No. 55530 | 55531 | 55532

This document is valid for the following products:

Name	Art.-No.
MVK-MPNIO DIO16 IRT	55530
MVK-MPNIO DIO14 IOL2 IRT	55531
MVK-MPNIO DIO12 IOL4 IRT	55532

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Murrelektronik GmbH
Falkenstraße 3
71570 Oppenweiler
GERMANY
Phone +49 7191 47-0
Fax +49 7191 47-491000
info@murrelektronik.com

NOTE

Translation of the original instructions

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1 Introduction

1.1 Service and support

Sales and distribution	Our sales employees in the indoor and outdoor service and our technicians will support you at any time.
CONNECTIVITY-System advisors	<p>Our system advisors are your competent contact persons if you want to develop CONNECTIVITY solutions. They cooperate with you to find the best solutions for your electrical installations.</p> <p>Our CONNECTIVITY system advisors find ways that help you to permanently improve the competitiveness of your machines and plants.</p>
Customer Service Center (CSC)	<p>Our staff of the Customer Service Center will help you with all questions concerning installation and start-up. They support you, for example, if you have problems with combining hardware and software products from different manufacturers with Murrelektronik products.</p> <p>A number of support tools and measurement facilities are available for field bus systems and EMC interferences.</p> <p>Please do not hesitate to call us at +49 (0) 7191 47-2050 or send an e-mail to support@murrelektronik.com</p>
Service addresses	Murrelektronik GmbH has a policy of customer proximity, both at national and international level. Please visit our website to find your contact person: www.murrelektronik.com

1.2 Scope of delivery

The scope of delivery includes:

- 1x MVK device, assembled, with housing cover and ground strap
- 1x Operating instructions – A3 leaflet, multilingual
- 15x Designation label

1.3 Applicable documents

Document	Art.-No.
Operating instruction	55530
Operating instruction	55531
Operating instruction	55532
Product Data	55530
Product Data	55531
Product Data	55532

The applicable documents can be found in the scope of delivery or on the Internet at shop.murrelektronik.com

1.4 Environmentally friendly disposal

Comply with country-specific waste disposal regulations!

Only qualified persons may sort scrap materials.



→ Always dispose of scrap devices in compliance with the applicable country-specific regulations on waste disposal (e.g., the European Waste Code 16 02 14).

→ Proceed with caution when dismantling the device since you could injure yourself.

→ Sort the separated components into the correct recycling line.

Disposal

The product can be returned to Murrelektronik GmbH free of charge for disposal. The same is true for the original packaging and any batteries or power packs. Any units that have been contaminated with hazardous substances will not be accepted for repair or disposal.

Returns

→ Label the product and the packaging with **“For disposal”**.

→ Package the product.

→ Send the package to:

Murrelektronik GmbH

Falkenstraße 3

71570 Oppenweiler | GERMANY

We will make sure that the items are disposed of in accordance with German legislation. The most recent owner is responsible for transport to the return point until items arrive at their destination.

1.5 About this manual

Scope

This document describes the use of the devices:

Name	Art.-No.
MVK-MPNIO DIO16 IRT	55530
MVK-MPNIO DIO14 IOL2 IRT	55531
MVK-MPNIO DIO12 IOL4 IRT	55532

Hardware / Firmware

Version	
Hardware (HW)	Firmware (FW)
2.0	1.10 and higher

Information

This document contains information on

- fitting and electrical installation
- startup and parameterization
- circuit examples
- fault diagnosis and troubleshooting
- conformity and approval
- ➔ Read this chapter carefully before you start working with the documentation or the device.
- ➔ Read the documentation carefully before starting up the device.
- ➔ Store the manual in a place that is accessible to all users at all times for the entire service life of the device.

You will need general knowledge about automation engineering in order to understand this manual. In addition, planning and using automation systems requires technical knowledge which is not contained in this manual.

Purpose of this document

This document instructs the technical staff of the machine manufacturer or machine operator on the safe use of the described devices.

It does not include instructions on the safe use of the machine in which the devices are integrated. For such information, please refer to the operating instructions of the machine.

1.5.1 Symbols

This document includes information and notes that must be observed for your own safety and to avoid injuries and equipment damage. They are marked as follows:



DANGER!

Immediate danger.

→ Failure to observe this warning involves an imminent risk of death or serious injuries.



WARNING!

Possible danger.

→ Failure to observe this warning can lead to death or serious injuries.



CAUTION!

Low-risk danger.

→ Failure to observe this warning can lead to mild or moderate injuries.

NOTICE

Possible material damage.

→ Failure to observe the warning may cause damage to the device and/or the system.



NOTE

Other technical information and notes of Murrelektronik GmbH.



RECOMMENDATION

Notes with this symbol are recommendations of Murrelektronik GmbH.



PRODUCTS AND ACCESSORIES

This symbol indicates accessories or product recommendations.

Instruction for use

- An arrow marks instructions.
- Read and observe the instructions.
- 1 | If they are numbered, it is absolutely necessary to follow them in the correct order.
- 2 | Read and observe the instructions.

1.5.2 Trademarks

Trademarks of the following companies and institutions are used in this documentation:

PROFINET/PROFINET IO	PROFIBUS Nutzerorganisation e.V. (PNO)
IO-Link	c/o PROFIBUS Nutzerorganisation e.V. (PNO)

1.5.3 Specifications

Specification	Link
PROFINET V2.3	www.profibus.com
PROFenergy Version 1.2	www.profibus.com
IO-Link	www.io-link.com

1.5.4 Software tools

Software tool	Link
Siemens AG TIA Portal V15	new.siemens.com

1.5.5 Murrelektronik software tools

Software tool
Murrelektronik IO-Link Device Tool 4.0.30

1.5.6 Glossary



An explanation of terms is given in chap. 11.2 "Glossary".

2 For your safety

- ➔ Read this chapter carefully.
- ➔ Only after that you may work with the fieldbus device.

2.1 General safety instructions



DANGER!

High electrical voltage in the machine / system.

Death or severe injuries resulting from electric shock

- ➔ When working on the machine / the devices, comply with the five safety rules of electrical engineering.

Protection of persons and material assets

- ➔ According to DIN VDE 0105-100 - Operation of electrical systems - Part 100: General definitions

The five safety rules

Protect against high electrical voltage

- 1 | Disconnect.
- 2 | Secure against switching on again.
- 3 | Make sure that there is no voltage on all poles.
- 4 | Ground and short-circuit.
- 5 | Cover or block off neighboring parts that are live or energized.

Qualified personnel

Only qualified and safety-trained personnel may assemble, commission and operate the device.

Target group

This document is intended for specialists in automation technology.

They are qualified if they meet the following requirements:

- they have undergone suitable electrical engineering training,
- they were trained by the machine operator to operate the machine and instructed on the related safety regulations,
- they have access to the Operating Instructions and this manual,
- they are familiar with the safety standards which are common practice in automation engineering,
- they are familiar with the basic and technical standards related to the specific application.

Using the unit

- ➔ Comply with all safety and accident prevention regulations when conducting project engineering, installation, commissioning, operation, and testing of the device.

- ➔ Check material resistance if aggressive media are used.



NOTE

Work on the hardware and software may only be performed by qualified personnel of Murrelektronik GmbH, with the exception of firmware updates.



NOTE

Use only a power supply unit that allows max. 60 V DC or 25 V AC under single-fault conditions. The power supply must comply with SELV or PELV.

Protective measures by the machine operator

- ➔ Follow the instructions in this manual.
- ➔ Pay attention to the specifications and the operating instructions of all connected components.

2.2 Intended purpose

MVK-MPNIO is a decentralized device. It can be used in harsh industrial environments up to degree of protection IP67.

Operation of the device in accordance with its designated use and the degree of protection IP67 are only guaranteed if open male and female connectors are closed using screw plugs.

Designated use also includes EMC-compliant electrical installation. The device is designated for use in industrial environments. Radio interference may occur if used in domestic or mixed environments.

→ If the device is used in domestic or mixed environments, the applicable standards must be observed.

2.2.1 Foreseeable misuse

Warnings

- Do **not** alter the design, engineering, or electrical features of the device.
- Do **not** use the device outside the applications described in this manual, the Technical Data or in the operating instructions.
- Do **not** use the device as a safety-related device. It does not meet the relevant standards. Safety functions of the system are not ensured!
- Do **not** use the Off state of the device outputs for safety-related requirements of the system/machine!
- Do **not** use the device outdoors or for continuous operation in liquids.
- Do **not** clean the device with a high-pressure cleaner.
- Do **not** use the device as a climbing aid.

2.2.2 Warranty and liability

Warranty and liability claims

Warranty and liability claims become void if

- the device is not used according to its designated use,
- damage is caused because the manual and the operating instructions have not been observed,
- the personnel was/is not qualified.

3 Description

3.1 Device

The **MVK** is a fully encapsulated fieldbus device in a metal case. It is particularly robust and designed for use in rough environments.

Property	Description
Robust	Versatile applications under very high loads due to: <ul style="list-style-type: none">■ Robust metal housing■ no formation of water of condensation due to fully encapsulated case;■ resistant to weld spatter in combination with rugged metal case
Resistant	Long service life despite exposure to aggressive media due to a high-quality surface finish.
Tight	Tight up to degree of protection IP67 (EN 60529)

3.1.1 Device overview

Fieldbus device MVK PROFINET metal version

- POWER IN and POWER OUT, 7/8", 5-pin
- Ethernet port 1 and port 2, M12 D-coded
- 16 digital inputs and digital outputs, M12 A-coded
- PROFlenergy, FSU (Fast Start-Up), MRP (Media Redundancy Protocol), Shared Device, Conformance Class C (IRT)
- Non-galvanically isolated potentials

Art.-No. 55530 MVK-MPNIO DIO16 IRT



Fieldbus device MVK PROFINET metal version

- POWER IN and POWER OUT, 7/8", 5-pin
- Ethernet port 1 and port 2, M12 D-coded
- 16 digital inputs and 16 digital outputs, M12 A-coded
- 2 IO-Link class B, M12 A-coded
- PROFlenergy, FSU (Fast Start-Up), MRP (Media Redundancy Protocol), Shared Device, Conformance Class C (IRT)
- Non-galvanically isolated potentials

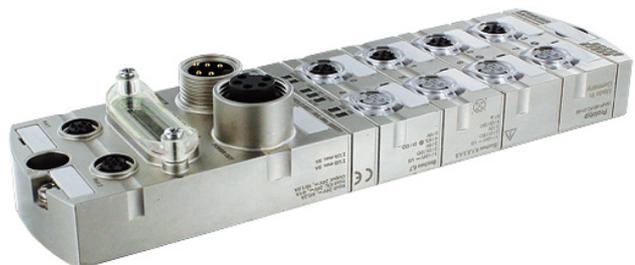
Art.-No. 55531 MVK-MPNIO DIO14 IOL2 IRT



Fieldbus device MVK PROFINET metal version

- POWER IN and POWER OUT, 7/8", 5-pin
- Ethernet port 1 and port 2, M12 D-coded
- 16 digital inputs and 16 digital outputs, M12 A-coded
- 4 IO-Link class B, M12 A-coded
- PROFlenergy, FSU (Fast Start-Up), MRP (Media Redundancy Protocol), Shared Device, Conformance Class C (IRT)
- Non-galvanically isolated potentials

Art.-No. 55532 MVK-MPNIO DIO12 IOL4 IRT



3.1.2 Structure of the device designation

The designation is based on a scheme that indicates the product's function.

MVK	Product family
M	Metal
PNIO	Function ■ PROFINET IO
DIO IOL	I/O channels ■ D = Digital ■ I = Input ■ O = Output ■ IOL = IO-Link
DIO16 DIO14 IOL2 DIO12 IOL4	Number of channels ■ 16 digital inputs and outputs (DIO) ■ 16 digital inputs and outputs (DIO) 2 IO-Link ■ 16 digital inputs and outputs (DIO) 4 IO-Link
IRT	Special function PROFINET IRT (Isochronous R eal T ime)

3.1.3 Device structure

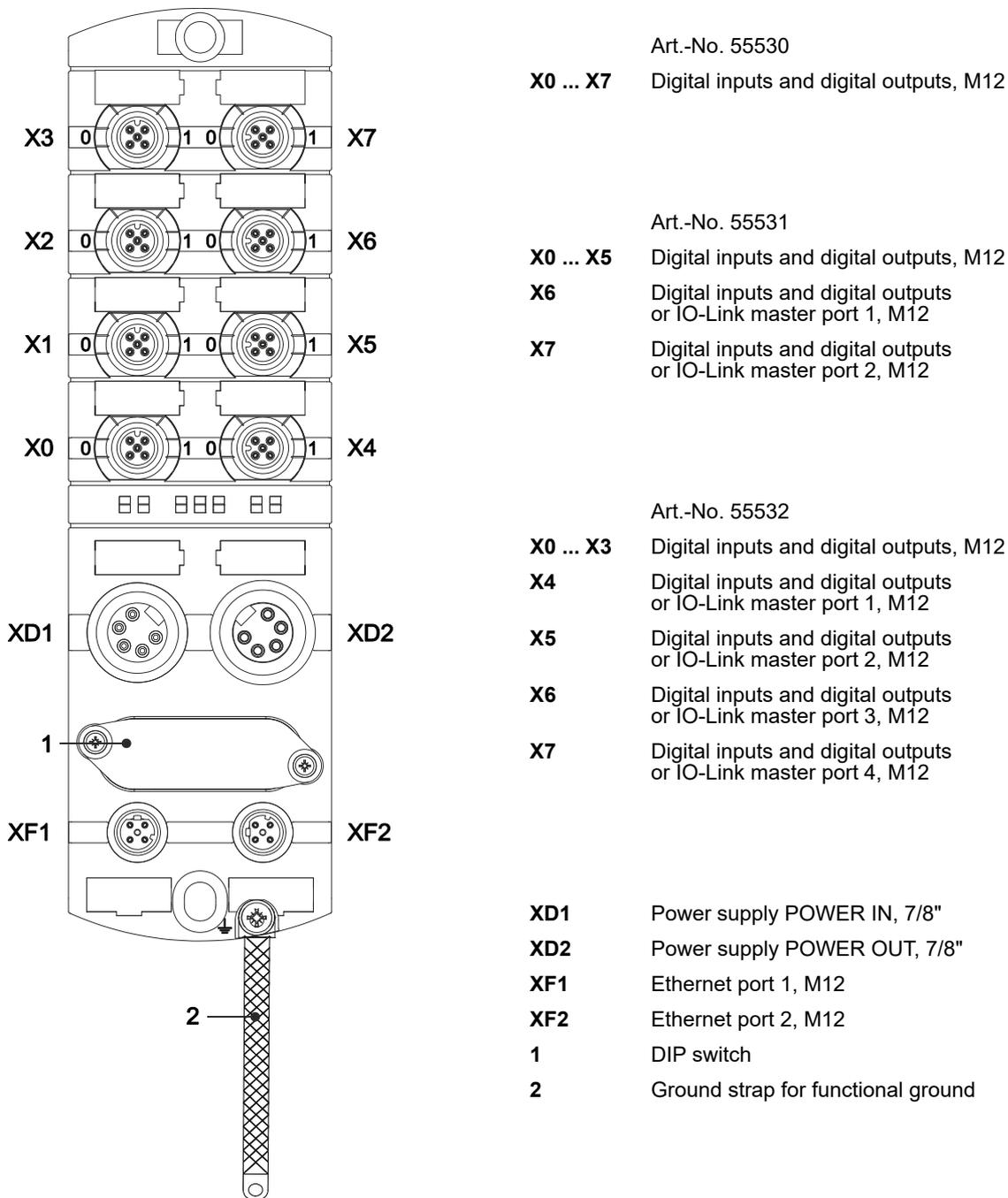


Fig. 3-1: Device structure

NOTICE

Material damage caused by male and female connectors that have not been sealed.

The degree of protection IP67 is only guaranteed if all connections are sealed with connectors, screw plugs or sealing caps.

➔ Seal unused male and female connectors.

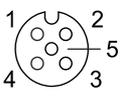
3.1.4 Connections

Overview

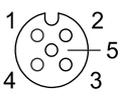
Art.-No.	DIO	IO-Link Class B
55530	X0 ... X7	-
55531	X0 ... X5	X6, X7
55532	X0 ... X3	X4 ... X7

3.1.4.1 Pin assignment

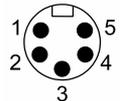
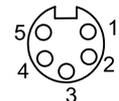
DIO
Digital inputs and outputs
M12 port A-coded

M12 port A-coded		
	Pin 1	24 V $\overline{\text{---}}$
	Pin 2	DI/DO
	Pin 3	0 V
	Pin 4	DI/DO
	Pin 5	\perp

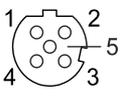
IO-Link Class B
M12 port A-coded

M12 port A-coded		
	Pin 1	24 V $\overline{\text{---}}$
	Pin 2	DI/DO
	Pin 3	0 V
	Pin 4	DI/DO/IO-Link
	Pin 5	0 V

POWER
7/8" male connector
7/8" female connector
5-pin

XD1			XD2
	Pin 1	0 V	
	Pin 2	0 V	
	Pin 3	\perp	
	Pin 4	24 V $\overline{\text{---}}$ US/9 A	
	Pin 5	24 V $\overline{\text{---}}$ UA/9 A	

M12 female connector
D-coded
Port 1 / Port 2

XF1 / XF2		
	Pin 1	TD +
	Pin 2	RD +
	Pin 3	TD -
	Pin 4	RD -
	Pin 5	n.c.

3.1.5 Display elements

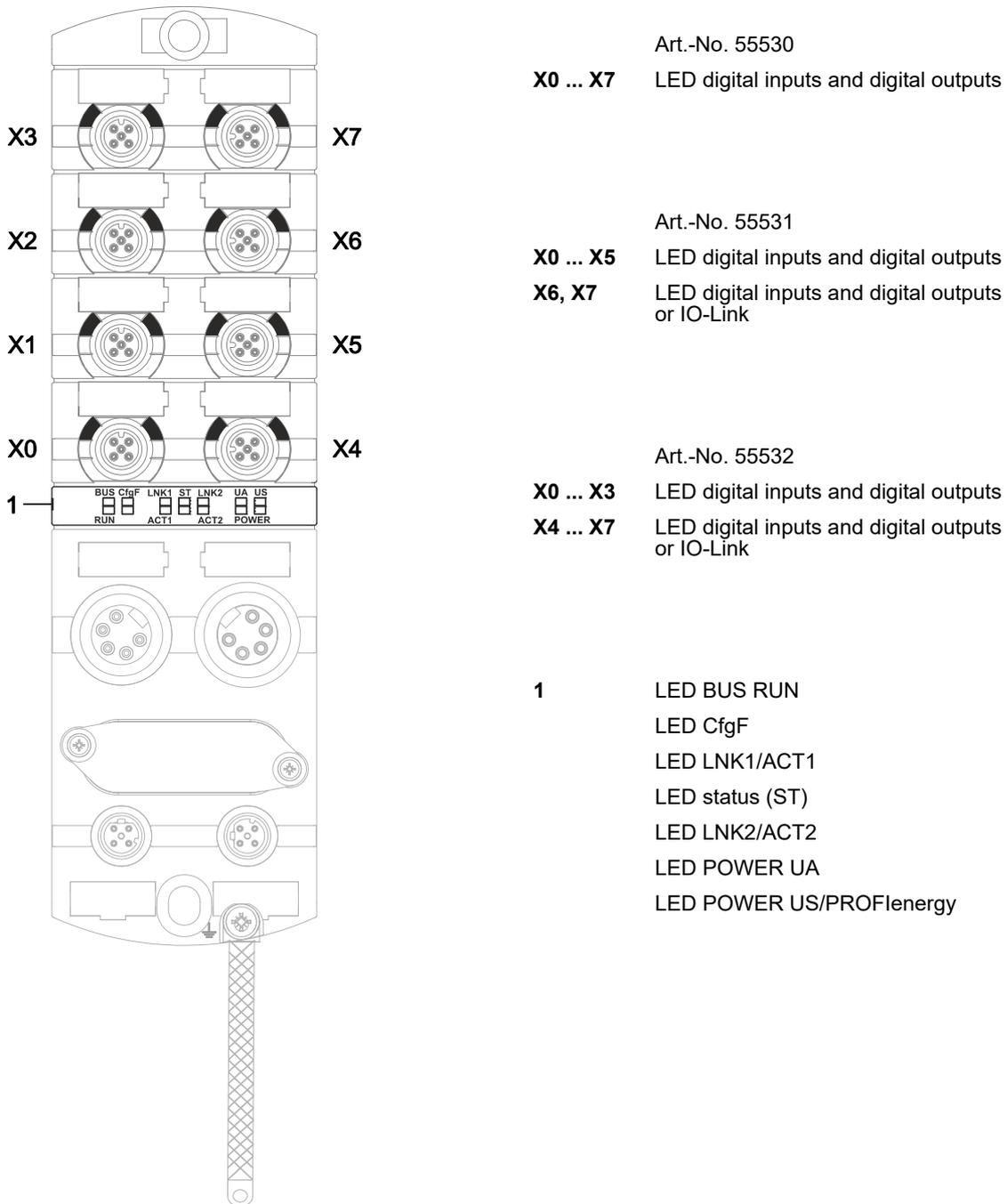


Fig. 3-2: Display elements



For further information on the behavior of the LEDs, please refer to chap. 9.1 "LED indication".

3.1.6 DIP switch settings



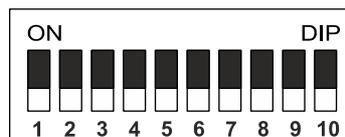
NOTE

As-delivered: all switches are in the OFF position.

DIP switch

Set the DIP switch to the desired function:

10-bit DIP switch



Function/bit	Switch position	Description
Deactivate web server		
9	ON	Web server off
	OFF	Web server on
Operating mode		
10	ON	Reset to factory settings
	OFF	Normal operation
1 ... 10	ON	Extended Factory Reset (supported from software version V1.19)

3.2 IO-Link

IO-Link is a standardized link that enables connection of intelligent devices of the sensor and actuator level to an automation system.

The communication takes place between a master and a device. A master device includes one or several ports. A device can be connected to each port. IO-Link is a point-to-point communication and does not represent a fieldbus.

The IO-Link master device builds the interface between the higher fieldbus level and the IO-Link system.

The IO-Link device converts the data of the sensors/actuators into the IO-Link format and passes the data on to the master. The device can be implemented either directly into the sensor/actuator or as separate device.

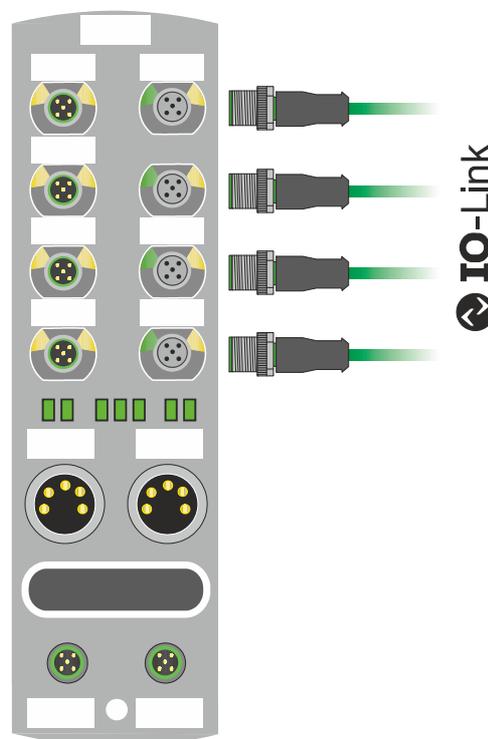


Fig. 3-3: IO-Link



For further information, refer to chap. 8.3 "IO-Link device parameterization".

3.2.1 Data storage



NOTE

Data storage is only available for IO-Link devices that comply with IO-Link version V1.1 and higher.

- Data storage offers scope for replacing IO-Link devices without reconfiguration.
- The IO-Link master and the IO-Link device save the set device parameters of the previous parameterization.
- In data storage, the parameter data storage facilities of the IO-Link master and IO-Link device are synchronized.
- Following the replacement of a device, the master writes the saved device parameters to the new device whenever data storage is enabled in the IO-Link master.
The application can be restarted without reparameterization.
- After having replaced the IO-Link master, the master reads the IO-Link device parameters and stores them. For this, the data storage option “Save and restore” must be active.
The application can be restarted without reparameterization.
- To use data storage, the vendor ID and the device ID of the connected IO-Link device must be entered additionally for each IO-Link master port in the validation settings.
The IO-Link port mode must be set to “Manual”.
- To store the modified IO-Link device parameters again in the master, device parameterization must be done via block parameterization.

After this, the device sends an upload request to the master.

Block parameterization can be carried out via the IO-Link device tool in the “Parameter” window and with the “Block Write Mode”.

Optionally, block parameterization can also be done via the web server or a PLC block, e.g. Siemens IOL_Call.

In this case, block parameterization must always be completed with the command “Parameter Download Store” ISDU index 0x02 subindex 0 value 05.

CMD	P OP	102.82103	WRITE_INDEX	2	✓	COM2	Standard Command=[Parameter Download Start]	03
	P OP	102.90306	WRITE_INDEX	74	✓	COM2		01
	P OP	102.96578	WRITE_INDEX	161	✓	COM2		01
	P OP	103.02850	WRITE_SUBINDEX	75	1	✓	COM2	01
	P OP	103.09122	WRITE_SUBINDEX	86	1	✓	COM2	00 1E
	P OP	103.16843	WRITE_SUBINDEX	80	1	✓	COM2	00 1E
	P OP	103.24563	WRITE_SUBINDEX	81	1	✓	COM2	00 32
	P OP	103.70399	SINGLESHOT			COM2	0xFF91: DS Upload Request	
	P OP	103.32285	WRITE_INDEX	2	✓	COM2	Standard Command=[Parameter Download Store]	05

- In the validation/backup mode “no Device check”, the saved device parameter content in the IO-Link master is deleted.

3.3 PROFINET IO

3.3.1 PROFINET IO Communication

IEC 61784-2	PROFINET IO is an open communication protocol that complies with IEC 61784-2. The communication protocol is based on Ethernet.
Data exchange	Data is exchanged between the control unit, referred to as the PROFINET IO controller, and connected users which are called PROFINET IO devices.
Communication	<p>Communication is based on a full-duplex Ethernet network running at 100 Mbit/s respectively 1 Gbit/s. IO controllers and IO devices communicate by means of Ethernet telegrams. Devices exchange data cyclically based on the provider-consumer principle. Devices function as receiver (consumer) and transmitter (provider) at the same time.</p> <p>The IO controller sends output data to the IO devices and receives input data from the IO devices. The IO devices send input data and receive output data.</p> <p>Other components of the communication protocol include telegrams in form of acyclic communication for parameter transfer and read/write access to the I&M data or manufacturer-specific features.</p>

3.3.2 Structure of the conformance classes

Structure

The scope of functions of PROFINET IO is clearly classified in “Conformance Classes” (CC). These classes give a clear overview of the various minimum properties. There are three conformance classes:

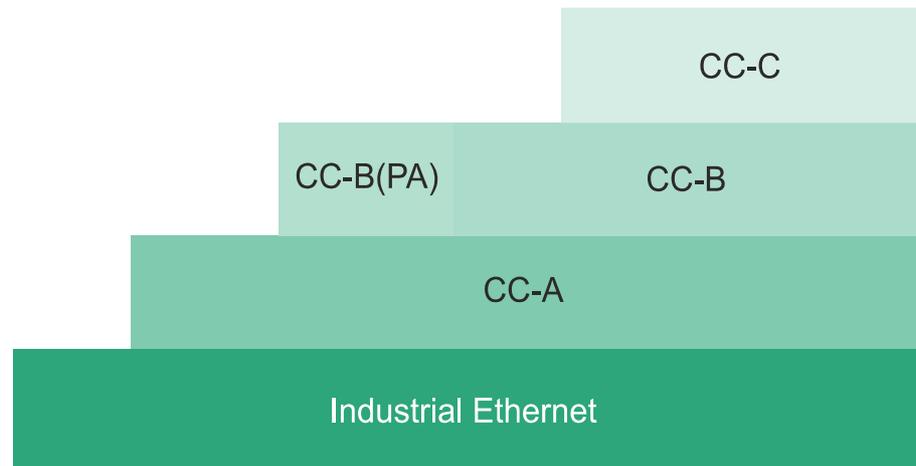


Fig. 3-4: Structure of the conformance classes

CC-A

CC-A offers basic functions for PROFINET IO with RT communication. Typical cycle time starting from 2 ms. In this case, unmanaged switches can also be used. Wireless communication is possible only in this class. All **MVK-MPNIO** comply with the **CC-A** class. All MURRELEKTRONIK switches (unmanaged and managed) TREE, Xentera and Xelity can be used.

CC-B

CC-B expands the concept by the inclusion of network diagnostics and topology information. Typical cycle time starting from 2 ms. The topology information and projected device names enable easy device exchange. The defective device can be easily exchanged for a new device with factory settings. All **MVK-MPNIO** comply with the **CC-B** class.

CC-C

CC-C describes the basic functions for devices with hardware-supported bandwidth reservation and synchronization (RT communication) and therefore forms the basis for isochronous applications. The implementation of Isochronous Real Time (IRT) in Ethernet controllers makes it possible to reach update times of 31.25 μ s and a jitter accuracy of less than 1 μ s.

3.3.3 PROFIenergy

PROFIenergy is an additional profile for PROFINET.

It represents a standardized way of achieving and managing energy savings in production networks.

Using special commands, scheduled saving functions can be performed via PROFIenergy. These are implemented in the devices and require no additional hard-wired systems.

The device supports the PROFIenergy standard version and provides a large number of commands.

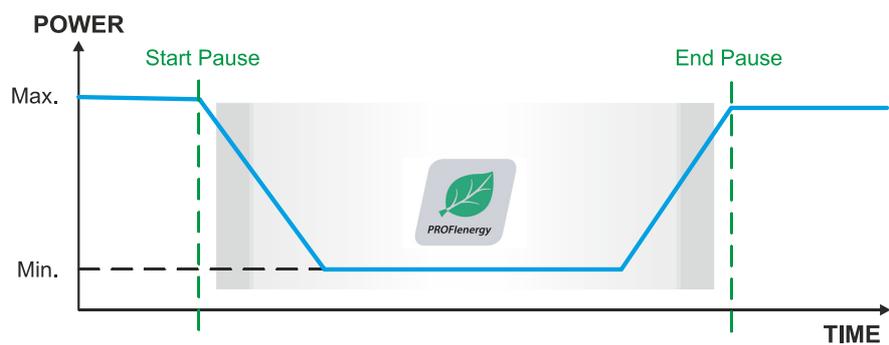


Fig. 3-5: PROFIenergy Power consumption



For further information, refer to chap. 8.10 "PROFIenergy configuration".

3.3.4 Shared Device (SD)

Shared Device is a PROFINET IO function which enables access to an IO device from two IO controllers. A special advantage is the use of Shared Device in systems with standard and failsafe control units.

The module gives the second standard IO controller read access to the input and output data. This data is summarized in a subslot.

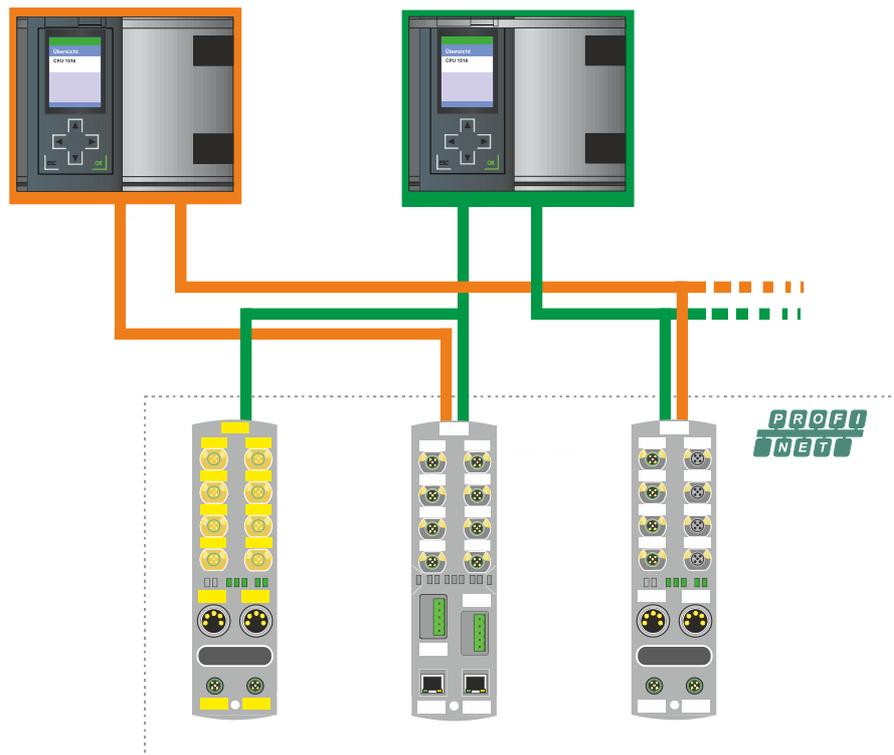


Fig. 3-6: Device in Shared Device



For further information, refer to chap. 8.9 "Shared Device (SD) configuration".

3.3.5 Isochronous Real Time (IRT)

For PROFINET, an isochronous data exchange by the transmission of data packages in regular time intervals of a few hundred milliseconds up to four milliseconds is defined by the IRT (Isochronous Real Time) concept.

The beginning of a bus cycle is adhered to with the highest precision (jitter $\leq 1 \mu\text{s}$). Each of the individual time intervals during the IRT communication is split into an IRT interval and an open standard interval which requires the use of special IRT switches.

Communication cycle with IRT and RT

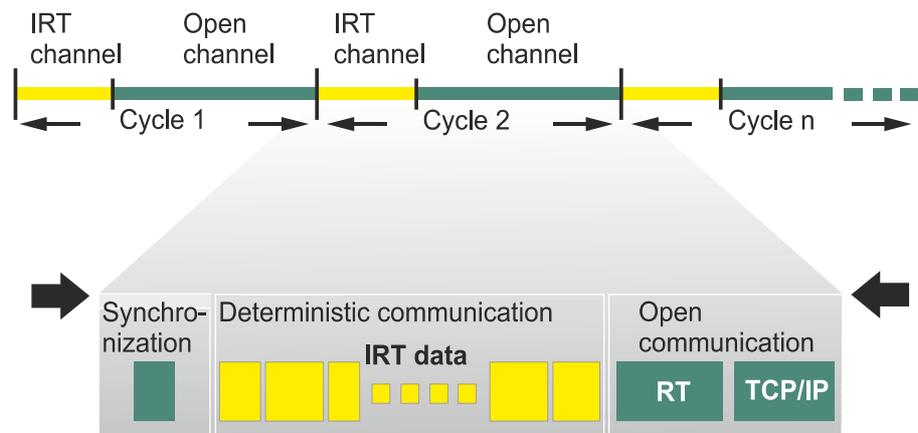


Fig. 3-7: Division of communication cycle into IRT and RT



For further information, refer to chap. 8.8 "Isochronous real time (IRT) configuration".

3.3.6 Media redundancy (MRP)

The Media Redundancy Protocol (MRP) according to IEC 62439 describes the PROFINET redundancy with a typical reconfiguration time of <200 ms for the communication lines with TCP / IP and RT frames after an error. The fault-free operation of an automation system implies a Media Redundancy Manager (MRM) and several Media Redundancy Clients (MRC) arranged in a ring.

Function of a Media Redundancy Manager (MRM)

The function of a Media Redundancy Manager (MRM) is to check the operability of the ring structure specified by the configuration.

This is done by sending cyclic test telegrams. As long as the test telegrams are received again by the MRM, the ring structure is intact.

An MRM uses this behavior to prevent circulation of telegrams and to convert a ring structure into a line structure.

A **Media Redundancy Client (MRC)** is a switch that functions only as a so-called “forwarder” of telegrams and does normally not play an active role.

MRC must have two switch ports in order to connect to other MRCs or the MRM in a single ring. The devices can be configured as MRCs.

When interrupted from the ring, PROFINET communication will continue after reconfiguration.

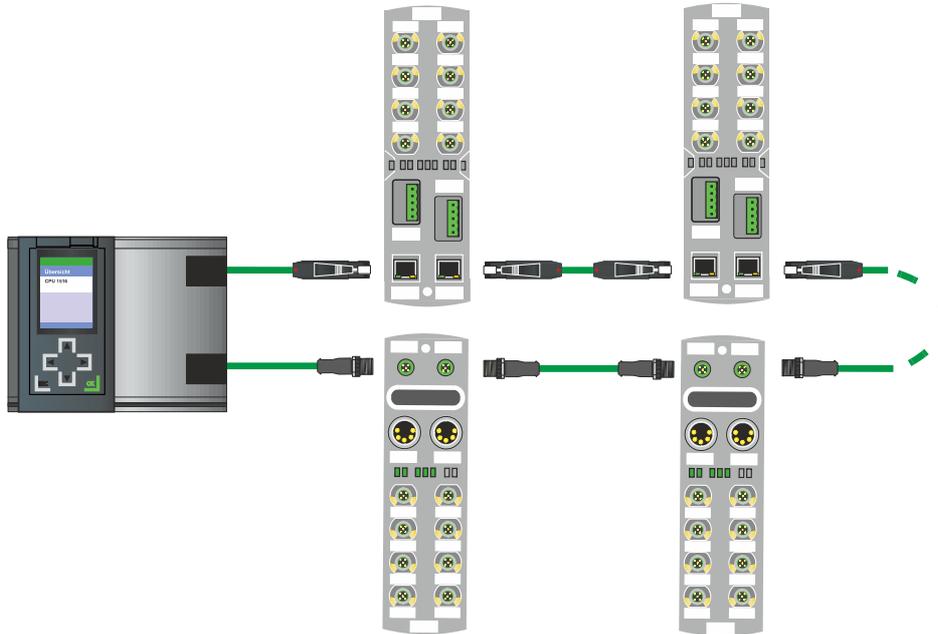


Fig. 3-8: Normal operation

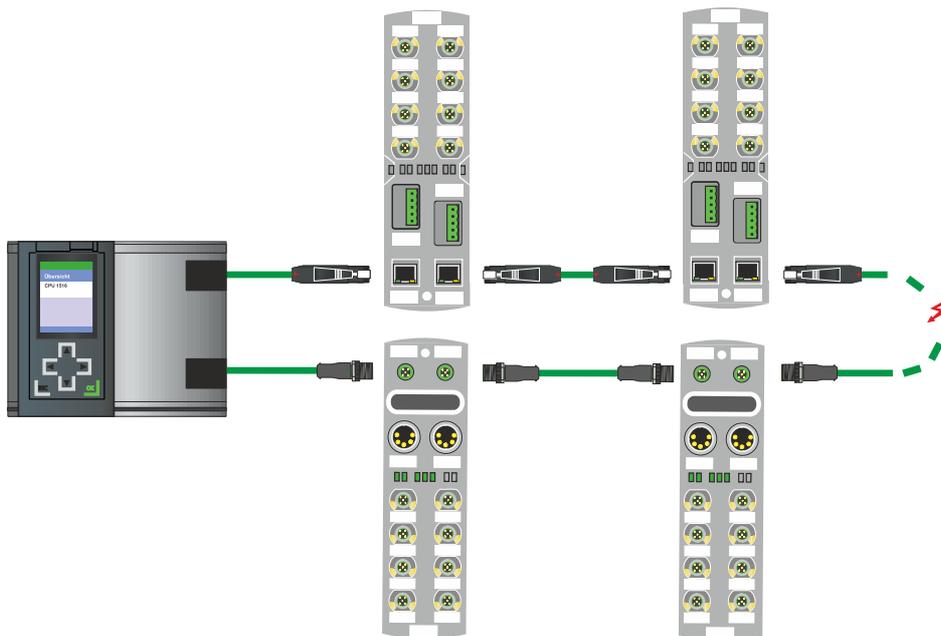


Fig. 3-9: Malfunction



For further information, refer to chap. 8.7 "Media redundancy (MRP) configuration".

3.4 Simple Network Management Protocol (SNMP)

SNMP is a simple network protocol with a variety of objects for monitoring the following:

- a | Network components,
- b | Remote control and remote configuration of network components,
- c | Error detection and error messaging.

TCP/IP-based network components are based on the RFC 1213 standard. This standard describes the access options and structure of the corresponding objects.

4 Technical Data

4.1 Art.-No. 55530 MVK-MPNIO DIO16 IRT

4.1.1 Electrical data

Bus data		
Fieldbus protocol		PROFINET
FSU (fast start-up)		≤500 ms
Shared device/input	For 2 controllers	Yes
Specification		V2.3, Conformance Class C (IRT)
PROFINET Netload Class		III
Transfer rate		100 Mbit/s
PROFINET addressing		Via DCP
Cycle time		≥1 ms
IRT (isochronous real time)	Network communication	Yes
	Application	No
MRP (media redundancy)	Client	Yes
PROFIenergy		V1.2

Supply		
Operating voltage US		24 V ---
Voltage range US		18 ... 30 V ---
Operating voltage UA		24 V ---
Voltage range UA		18 ... 30 V ---
Max. sensor current US		9 A
Max. actuator current UA		9 A
Current consumption	In idle state	≤0.18 A
Cross-section of 7/8" connector		≤1.5 mm ²
Reverse polarity protection for US and UA		Yes
Reverse polarity protection		Yes
Galvanic isolation		None

Input		
Filter time		1 ms
Processing time for signal change		2 ... 5 ms
Input characteristic		EN 61131-2, type 3
Sensor power supply port DIO		≤0.2 A load Automatic start
Short circuit protection		High-side switch with overload protection
Connection		M12
Conductor cross-section M12		≤0.75 mm ²

Output		
DIO port output current		≤1.6 A per channel
Switching frequency		≤50 Hz

Output		
Short circuit protection		High-side switch with overload protection
Connection/female connector		M12
Conductor cross-section M12		≤0.75 mm ²

Derating

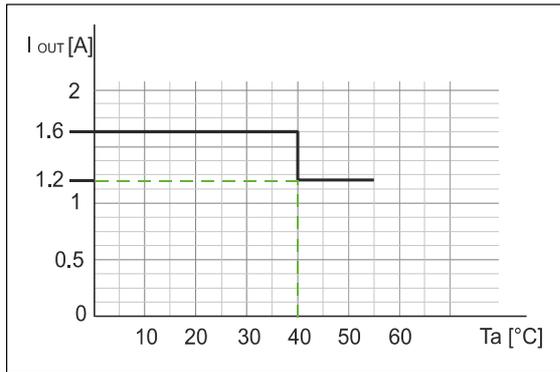


Fig. 4-1: Derating DO output current

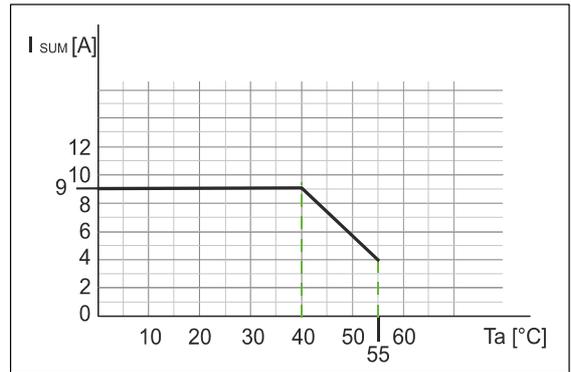


Fig. 4-2: Derating actuator supply total current

4.1.2 Environmental characteristics

Climatic		
Operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Transport temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Relative humidity		≤95 %
Installation height	Above sea level	≤2000 m

Mechanical		
Vibration test	EN 60068 Parts 2-6	10 ... 58 Hz, amplitude 0.35 mm, 58 ... 150 Hz; 20 g
Shock test	EN 60068 Parts 2-27	50 g, duration 11 ms

Electrical safety		
Degree of protection	EN 60529	IP67
Protection class	When using an SELV or PELV power supply	III
Degree of pollution		2

Emitted EMC interference		
Radio interference field strength of housing	EN 55016-2-3	
Interference voltage	EN 55016-1-2	

EMC immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	
High-frequency electrical fields	EN 61000-4-3	
Fast transient burst	EN 61000-4-4	
Voltage surges	EN 61000-4-5	
Conducted HF	EN 61000-4-6	
Magnetic field 50/60 Hz	EN 61000-4-8	
Voltage dips	EN 61000-4-11	

4.1.3 Protection

Device protection		
Overvoltage protection		Yes
Overload protection of device supply	To be ensured through load circuit monitoring	Yes
Reverse polarity protection of device supply		Yes
Short circuit protection input		Electronic
Short circuit protection output		Electronic
Protective circuit for input	Internal	Suppressor diode

4.1.4 Mechanical data

Materials		
Housing material		Zinc die-casting
Flame resistance	IEC 60695-2-1	

Assembly data		
Dimensions	L x W x H	225 x 63 x 43 mm
Weight	Net	966 g

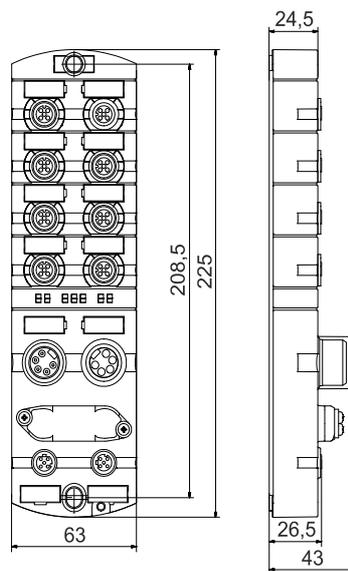


Fig. 4-3: Dimensions in mm

4.1.5 Product reliability

Product reliability		
MTTF	SN 29500 (at 40 °C and rated data)	71 years

4.1.6 Conformity, Approvals

Conformity, Approvals		
Product standard	EN 61131-2 Programmable logic controllers, Part 2	
CE	2014/30/EU 2011/65/EU	
UKCA	Electromagnetic Compatibility Regulations 2016, The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equip- ment Regulations 2012	
EMV	2014/30/EU	
RoHS	2011/65/EU & 2015/863	Exception 6c&7a&7c1
China RoHS	SJ/T 11364-2014	"25" EPUP
REACH	No. 1907/2006	SVHC List
WEEE	2012/19/EU	Category 5
ULc	CSA C22.2 No. 61010-2-201 CSA C22.2 No. 61010-1	E201820
ULus	UL 61010-2-201 UL 61010-1	E201820

Hazardous substance (有害物質)							
	Part Name 零件名稱	Lead	Mercury	Cadmium	Hexavalent	Polybrominated	Polybrominated
		(Pb) 鉛	(Hg) 汞	(Cd) 鎘	Chromium (Cr (VI)) 六价铬	biphenyls (PBB) 多溴联苯	diphenyl ethers (PBDE) 多溴联苯醚
	Component part PCB 组件部分 印刷电路板	X	O	O	O	O	O
	Connection Terminal/ Screws 接线端子 / 拧	X	O	O	O	O	O
O: Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit defined in GB/T 26572. O: 表明該有害物質在組成部分的所有均質材料的含量低於按GB/ T26572定義的限制。 X: Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit defined in GB/T 26572. X: 表示該有害物質在組成部分中的至少一個均質材料的含量超過按GB / T26572定義的限制。							

4.2 Art.-No. 55531 MVK-MPNIO DIO14 IOL2 IRT

4.2.1 Electrical data

Bus data		
Fieldbus protocol		PROFINET
FSU (fast start-up)		≤500 ms
Shared device/input	For 2 controllers	Yes
Specification		V2.3, Conformance Class C (IRT)
PROFINET Netload Class		III
Transfer rate		100 Mbit/s
PROFINET addressing		Via DCP
Cycle time		≥1 ms
IRT (isochronous real time)	Network communication	Yes
	Application	No
MRP (media redundancy)	Client	Yes
PROFenergy		V1.2

Supply		
Operating voltage US		24 V $\overline{\text{---}}$
Voltage range US		18 ... 30 V $\overline{\text{---}}$
	When using IO-Link	20.3 ... 30 V $\overline{\text{---}}$
Operating voltage UA		24 V $\overline{\text{---}}$
Voltage range UA		18 ... 30 V $\overline{\text{---}}$
Max. sensor current US		9 A
Max. actuator current UA		9 A
Current consumption	In idle state	≤0.18 A
Cross-section of 7/8" connector		≤1.5 mm ²
Reverse polarity protection for US and UA		Yes
Reverse polarity protection		Yes
Galvanic isolation		None

Input		
Filter time		1 ms
Processing time for signal change		2 ... 5 ms
Input characteristic		EN 61131-2, type 3
Sensor power supply port DIO		≤0.2 A load Automatic start
Sensor power supply IO-Link port		≤1 A load Automatic start
Short circuit protection		High-side switch with overload protection
Connection		M12
Conductor cross-section M12		≤0.75 mm ²

Output		
DIO port output current		≤1.6 A per channel
IO-Link port output current	From HW 2.0	≤1.6 A per channel
Switching frequency		≤50 Hz

Output		
Short circuit protection		High-side switch with overload protection
Connection / female connector		M12
Conductor cross-section M12		≤0.75 mm ²

Derating

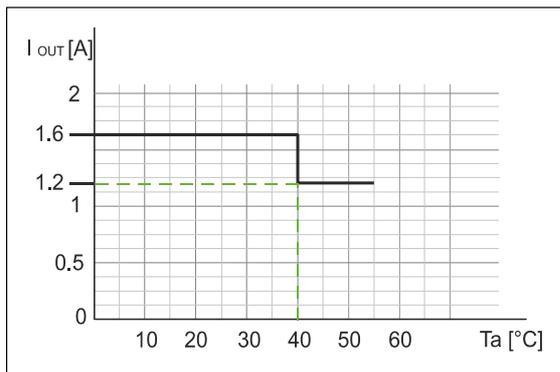


Fig. 4-4: Derating DO output current

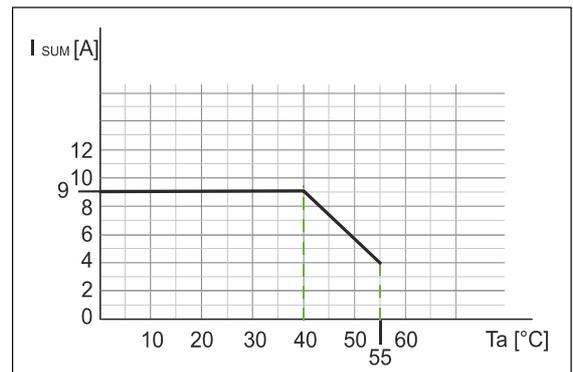


Fig. 4-5: Derating actuator supply total current

IO-Link		
IO-Link devices operating voltage		24 V ---
IO-Link devices voltage range		20 ... 30 V ---
Specification		V1.1.2
Transfer rate		Com 1/Com 2/Com 3
Transfer rate recognition		Automatic
Input characteristic		EN 61131-2, type 1

4.2.2 Environmental characteristics

Climatic		
Operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Transport temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Relative humidity		≤95 %
Installation height	Above sea level	≤2000 m

Mechanical		
Vibration test	EN 60068 Parts 2-6	10 ... 58 Hz, amplitude 0.35 mm, 58 ... 150 Hz; 20 g
Shock test	EN 60068 Parts 2-27	50 g, duration 11 ms

Electrical safety		
Degree of protection	EN 60529	IP67
Protection class	When using an SELV or PELV power supply	III
Degree of pollution		2

Emitted EMC interference		
Radio interference field strength of housing	EN 55016-2-3	
Interference voltage	EN 55016-1-2	

EMC immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	
High-frequency electrical fields	EN 61000-4-3	
Fast transient burst	EN 61000-4-4	
Voltage surges	EN 61000-4-5	
Conducted HF	EN 61000-4-6	
Magnetic field 50/60 Hz	EN 61000-4-8	
Voltage dips	EN 61000-4-11	

4.2.3 Protection

Device protection		
Overvoltage protection		Yes
Overload protection of device supply	To be ensured through load circuit monitoring	Yes
Reverse polarity protection of device supply		Yes
Short circuit protection input		Electronic
Short circuit protection output		Electronic
Protective circuit for input	Internal	Suppressor diode

4.2.4 Mechanical data

Materials		
Housing material		Zinc die-casting
Flame resistance	IEC 60695-2-1	

Assembly data		
Dimensions	L x W x H	225 x 63 x 43 mm
Weight	Net	966 g

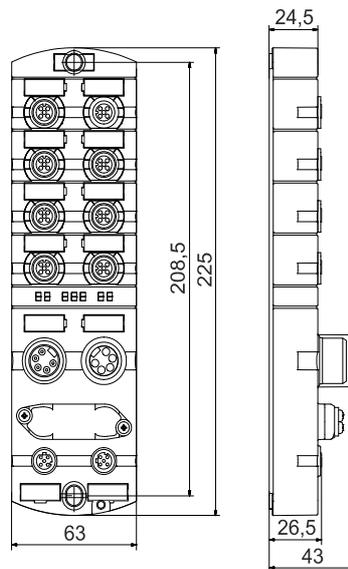


Fig. 4-6: Dimensions in mm

4.2.5 Product reliability

Product reliability		
MTTF	SN 29500 (at 40 °C and rated data)	68 years

4.2.6 Conformity, Approvals

Conformity, Approvals		
Product standard	EN 61131-2 Programmable logic controllers, Part 2	
CE	2014/30/EU 2011/65/EU	
UKCA	Electromagnetic Compatibility Regulations 2016, The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equip- ment Regulations 2012	
EMV	2014/30/EU	
RoHS	2011/65/EU & 2015/863	Exception 6c&7a&7c1
China RoHS	SJ/T 11364-2014	"25" EPUP
REACH	No. 1907/2006	SVHC List
WEEE	2012/19/EU	Category 5
ULc	CSA C22.2 No. 61010-2-201 CSA C22.2 No. 61010-1	E201820
ULus	UL 61010-2-201 UL 61010-1	E201820

Hazardous substance (有害物質)							
	Part Name 零件名稱	Lead	Mercury	Cadmium	Hexavalent	Polybrominated	Polybrominated
		(Pb) 鉛	(Hg) 汞	(Cd) 鎘	Chromium (Cr (VI)) 六价铬	biphenyls (PBB) 多溴联苯	diphenyl ethers (PBDE) 多溴联苯醚
	Component part PCB 组件部分 印刷电路板	X	O	O	O	O	O
	Connection Terminal/ Screws 接线端子 / 拧	X	O	O	O	O	O
O: Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit defined in GB/T 26572. O: 表明該有害物質在組成部分的所有均質材料的含量低於按GB/ T26572定義的限制。 X: Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit defined in GB/T 26572. X: 表示該有害物質在組成部分中的至少一個均質材料的含量超過按GB / T26572定義的限制。							

4.3 Art.-No. 55532 MVK-MPNIO DIO12 IOL4 IRT

4.3.1 Electrical data

Bus data		
Fieldbus protocol		PROFINET
FSU (fast start-up)		≤500 ms
Shared device/input	For 2 controllers	Yes
Specification		V2.3, Conformance Class C (IRT)
PROFINET Netload Class		III
Transfer rate		100 Mbit/s
PROFINET addressing		Via DCP
Cycle time		≥1 ms
IRT (isochronous real time)	Network communication	Yes
	Application	No
MRP (media redundancy)	Client	Yes
PROFenergy		V1.2

Supply		
Operating voltage US		24 V $\overline{\text{---}}$
Voltage range US		18 ... 30 V $\overline{\text{---}}$
	When using IO-Link	20.3 ... 30 V $\overline{\text{---}}$
Operating voltage UA		24 V $\overline{\text{---}}$
Voltage range UA		18 ... 30 V $\overline{\text{---}}$
Max. sensor current US		9 A
Max. actuator current UA		9 A
Current consumption	In idle state	≤0.18 A
Cross-section of 7/8" connector		≤1.5 mm ²
Reverse polarity protection for US and UA		Yes
Reverse polarity protection		Yes
Galvanic isolation		None

Input		
Filter time		1 ms
Processing time for signal change		2 ... 5 ms
Input characteristic		EN 61131-2, type 3
Sensor power supply port DIO		≤0.2 A load Automatic start
Sensor power supply IO-Link port		≤1 A load Automatic start
Short circuit protection		High-side switch with overload protection
Connection		M12
Conductor cross-section M12		≤0.75 mm ²

Output		
DIO port output current		≤1.6 A per channel
IO-Link port output current	From HW 2.0	≤1.6 A per channel
Switching frequency		≤50 Hz

Output		
Short circuit protection		High-side switch with overload protection
Connection / female connector		M12
Conductor cross-section M12		≤0.75 mm ²

Derating

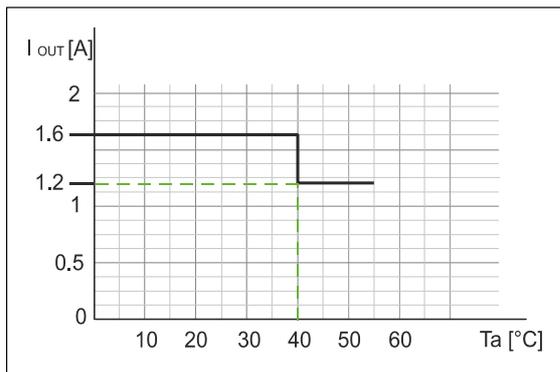


Fig. 4-7: Derating DO output current

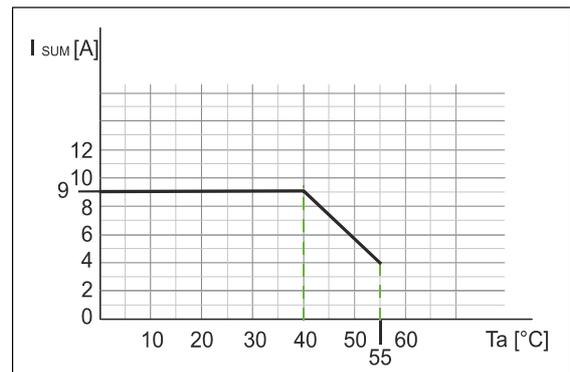


Fig. 4-8: Derating actuator supply total current

IO-Link		
IO-Link devices operating voltage		24 V ---
IO-Link devices voltage range		20 ... 30 V ---
Specification		V1.1.2
Transfer rate		Com 1/Com 2/Com 3
Transfer rate recognition		Automatic
Input characteristic		EN 61131-2, type 1

4.3.2 Environmental characteristics

Climatic		
Operating temperature		-25 °C ... +55 °C
Storage temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Transport temperature		-25 °C ... +70 °C provide acclimatization for commissioning
Relative humidity		≤95 %
Installation height	Above sea level	≤2000 m

Mechanical		
Vibration test	EN 60068 Parts 2-6	10 ... 58 Hz, amplitude 0.35 mm, 58 ... 150 Hz; 20 g
Shock test	EN 60068 Parts 2-27	50 g, duration 11 ms

Electrical safety		
Degree of protection	EN 60529	IP67
Protection class	When using an SELV or PELV power supply	III
Degree of pollution		2

Emitted EMC interference		
Radio interference field strength of housing	EN 55016-2-3	
Interference voltage	EN 55016-1-2	

EMC immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	
High-frequency electrical fields	EN 61000-4-3	
Fast transient burst	EN 61000-4-4	
Voltage surges	EN 61000-4-5	
Conducted HF	EN 61000-4-6	
Magnetic field 50/60 Hz	EN 61000-4-8	
Voltage dips	EN 61000-4-11	

4.3.3 Protection

Device protection		
Overvoltage protection		Yes
Overload protection of device supply	To be ensured through load circuit monitoring	Yes
Reverse polarity protection of device supply		Yes
Short circuit protection input		Electronic
Short circuit protection output		Electronic
Protective circuit for input	Internal	Suppressor diode

4.3.4 Mechanical data

Materials		
Housing material		Zinc die-casting
Flame resistance	IEC 60695-2-1	

Assembly data		
Dimensions	L x W x H	225 x 63 x 43 mm
Weight	Net	966 g

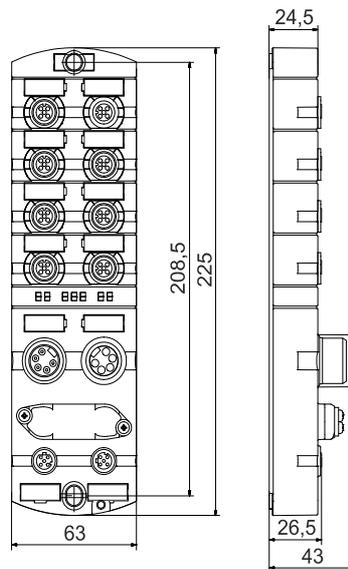


Fig. 4-9: Dimensions in mm

4.3.5 Product reliability

Product reliability		
MTTF	SN 29500 (at 40 °C and rated data)	63 years

4.3.6 Conformity, Approvals

Conformity, Approvals		
Product standard	EN 61131-2 Programmable logic controllers, Part 2	
CE	2014/30/EU 2011/65/EU	
UKCA	Electromagnetic Compatibility Regulations 2016, The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equip- ment Regulations 2012	
EMV	2014/30/EU	
RoHS	2011/65/EU & 2015/863	Exception 6c&7a&7c1
China RoHS	SJ/T 11364-2014	"25" EPUP
REACH	No. 1907/2006	SVHC List
WEEE	2012/19/EU	Category 5
ULc	CSA C22.2 No. 61010-2-201 CSA C22.2 No. 61010-1	E201820
ULus	UL 61010-2-201 UL 61010-1	E201820

Hazardous substance (有害物質)							
	Part Name 零件名稱	Lead	Mercury	Cadmium	Hexavalent	Polybrominated	Polybrominated
		(Pb) 鉛	(Hg) 汞	(Cd) 鎘	Chromium (Cr (VI)) 六价铬	biphenyls (PBB) 多溴联苯	diphenyl ethers (PBDE) 多溴联苯醚
	Component part PCB 组件部分 印刷电路板	X	O	O	O	O	O
	Connection Terminal/ Screws 接线端子 / 拧	X	O	O	O	O	O
O: Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit defined in GB/T 26572. O: 表明該有害物質在組成部分的所有均質材料的含量低於按GB/ T26572定義的限制。 X: Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit defined in GB/T 26572. X: 表示該有害物質在組成部分中的至少一個均質材料的含量超過按GB / T26572定義的限制。							

5 Mounting

5.1 Requirements

- Conditions for mounting:
 - Even mounting surface to avoid mechanical tension.
 - Provide suitable grounding.
 - Suitable installation site in terms of vibration and shock load, temperature and humidity (see chap. 4 "Technical Data").
 - Protected to avoid tearing off the connecting cables by personnel or device.

5.2 Dimensions

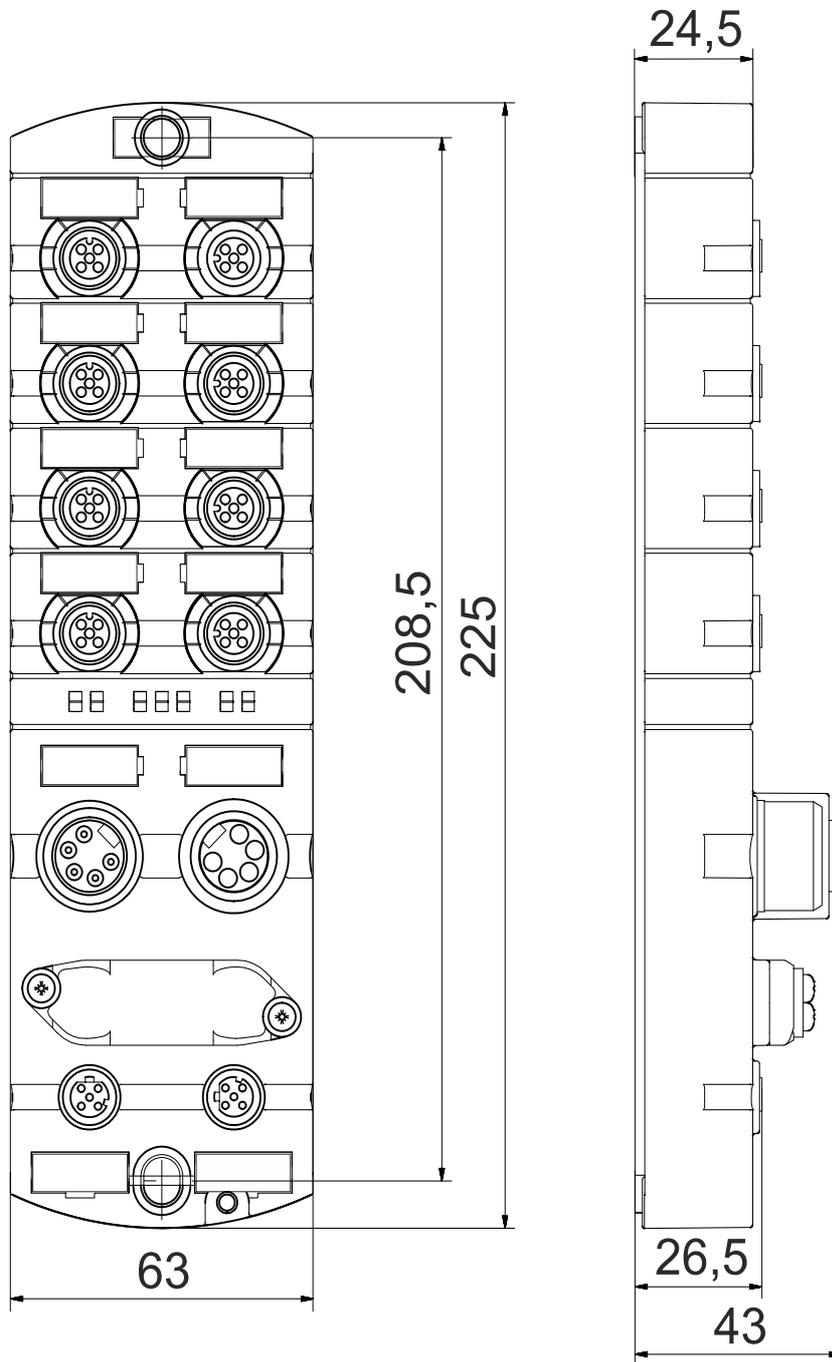


Fig. 5-1: Dimensions in mm

5.3 Mounting distance

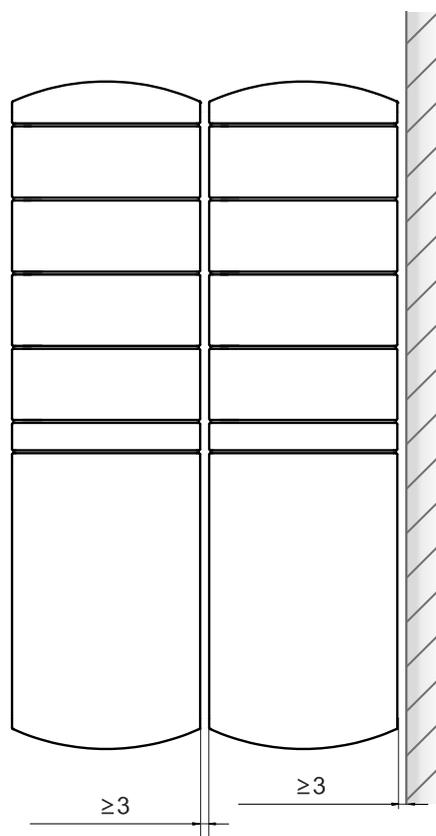


Fig. 5-2: Distance in mm



NOTE

→ For correct installation and improved heat dissipation, we recommend keeping a minimum distance of 3 mm when mounting the **MVK-MPNIO**.



NOTE

→ If angled male connectors are used, a minimum distance of 50 mm is required.

5.4 Mounting the device

NOTICE

Material damage due to incorrect installation.

The fastening screws and tightening torques depend on the surface of the installation site.

- Use fastening screws that are suitable for the mounting surface structure.
- Carefully tighten the screws. The indicated tightening torques must be adhered to.

NOTICE

Material damage through improper use.

Do not use the devices as climbing aids. Improper use can cause the devices to break off or to be damaged otherwise.

- Install the devices in such a way that they cannot be used as climbing aid.



NOTE

The grounding strap is pre-installed. Screws are not included in scope of delivery.

5.4.1 Fasten device

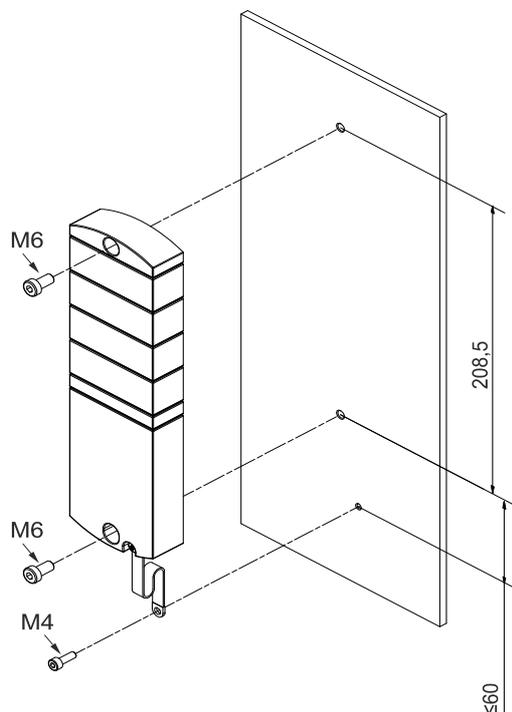


Fig. 5-3: Fasten device. Dimensions in mm (figure similar)

M6	3 Nm		Art.-No. 7000-98001-0000000
----	------	---	--------------------------------

Mount the device in the order indicated below:

- 1 | Slightly tighten the top M6 bolt.
- 2 | Align housing.
- 3 | Slightly tighten the lower M6 bolt.
- 4 | Tighten screws M6 according to the torque.
- 5 | **Grounding the device:** Attach the grounding strap (see chap. 5.4.2 "Functional ground").

5.4.2 Functional ground

With grounding strap



NOTE

Use a conductive screw to attach the grounding strap.

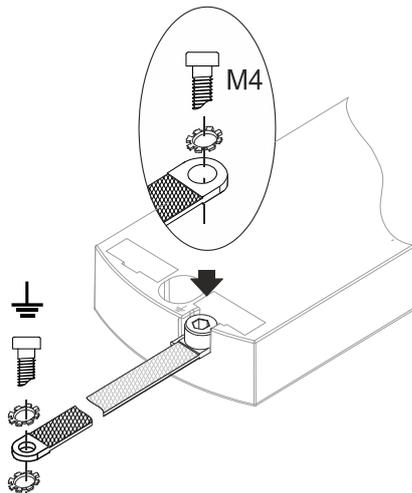


Fig. 5-4: Attach the grounding strap

M4	1,2 Nm		Art.-No. 7000-98001-0000000
----	--------	--	--------------------------------

Without grounding strap



NOTE

Remove the grounding strap and secure the device to the metal substrate with a conducting screw.

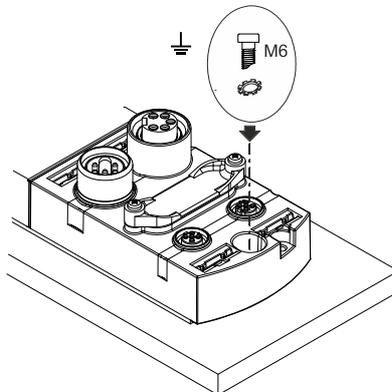


Fig. 5-5: Grounding directly to metal substrate MVK 7/8"

M6	3 Nm		Art.-No. 7000-98001-0000000
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5.4.3 Fasten addressing lid

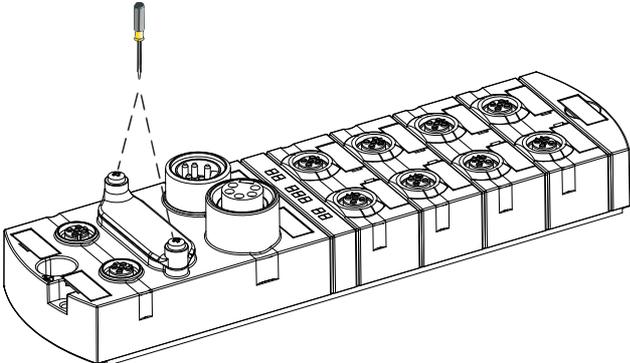


Fig. 5-6: Fasten addressing lid

M3	0,8 Nm		Art.-No. 7000-98001-000000
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6 Installation

6.1 Electrical Installation of the device



DANGER!

High electrical voltage in the machine / system.

Death or severe injuries resulting from electric shock

→ When working on the machine / the devices, comply with the five safety rules of electrical engineering.

Protection of persons and material assets

→ According to DIN VDE 0105-100 - Operation of electrical systems - Part 100: General definitions



WARNING!

Risk of fire due to short circuit.

Damaged supply lines and/or devices may short circuit when damaged which may result in overheating and fire.

→ Provide intelligent current monitoring or fuse. The fuse must be designed for max. 9 A.



CAUTION!

Loss of function due to improper installation.

When disregarding, injuries and/or damage to property may occur.

→ Only install cables and accessories that meet the requirements and regulations for safety, electromagnetic compatibility and, if required, telecommunication terminal equipment specifications as well as the specification data.

**CAUTION!****Hot surface.**

Minor injuries and damage to devices caused by contact with the surface.

- Wear thermally suitable gloves.
- Use thermally suitable connecting cables only.

NOTICE**Damage to the machine/system due to improper switching on of the voltage sources.**

When the device is switched on with separate actuator and sensor voltage, the function of the digital inputs and outputs cannot be guaranteed unless the proper power-on order is performed.

- Always switch on voltage sources in the following order:

- 1 | Switch on sensor voltage.
- 2 | Switch on actuator voltage.

**NOTE**

Use only a power supply unit that allows max. 60 V DC or 25 V AC under single-fault conditions. The power supply must comply with SELV or PELV.

6.1.1 Sensors and actuators

Connecting the M12 ports

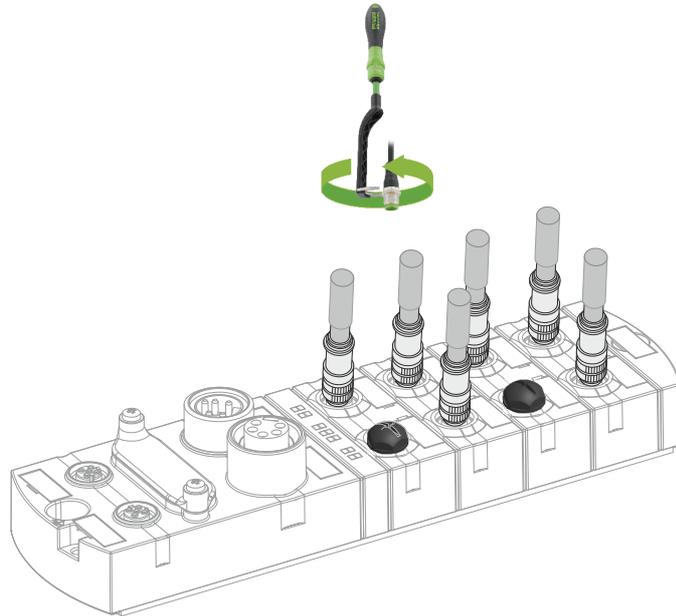
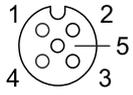


Fig. 6-1: Example of M12 connection digital inputs and outputs

M12	0,6 Nm		Art.-No. 7000-99102-0000000
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NOTE

Feeding in an external ground via M12 female connectors can lead to faults.

→ Do not feed external ground to the device via M12 female connectors.



You will find a wide range of connecting wires in the catalog or in the online shop of Murrelektronik GmbH at shop.murrelektronik.com

Sensor power supply**Please note:**

- Sensors can be supplied via **pin 1** (24 V) and **pin 3** (0 V) of the M12 female connectors.
- The maximum permissible current for the power supply of the sensors is **0.2 A** for the digital I/O port and **1.0 A** for the IO-Link port.
- In case of overcurrent or short circuit, the connected cable or sensor must be **disconnected** from the M12 female connector.

Supported IO-Link communication

The device supports the IO-Link communication using the following speeds:

- 4,800 baud (COM 1)
- 38,400 baud (COM 2)
- 230,400 baud (COM 3)

**NOTE**

The device automatically selects the appropriate communication speed for the IO-Link device.

**NOTE**

Maximum cable length is limited to 20 m for IO-Link connection.

6.1.2 Connecting the Ethernet bus

Connecting the M12 port

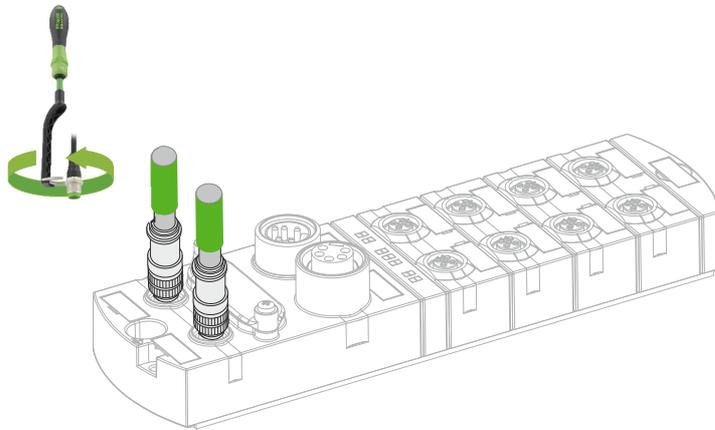
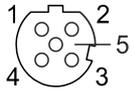


Fig. 6-2: Example of M12 connection Ethernet bus

M12	0,6 Nm		Art.-No. 7000-99102-0000000
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6.1.3 Power supply connection

Connecting 7/8" male connector POWER IN XD1

Connecting 7/8" male connector POWER OUT XD2

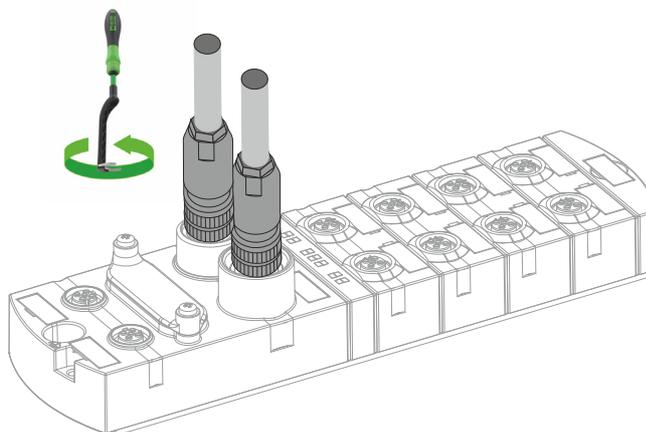


Fig. 6-3: Example of 7/8" connection POWER IN / POWER OUT

7/8"	1,5 Nm		Art.-No. 7000-99104-0000000
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You will find a wide range of connecting wires in the catalog or in the online shop of Murrelektronik GmbH at shop.murrelektronik.com

6.2 Ensuring Tightness (IP67)



CAUTION!

Leaky housing.

Risk of personal injury and material damage due to failure caused by ingress of conductive liquids.

➔ Seal unused male and female connectors.



You will find suitable sealing connectors/screw plugs for the ports in our onlineshop shop.murrelektronik.com

Connecting cables

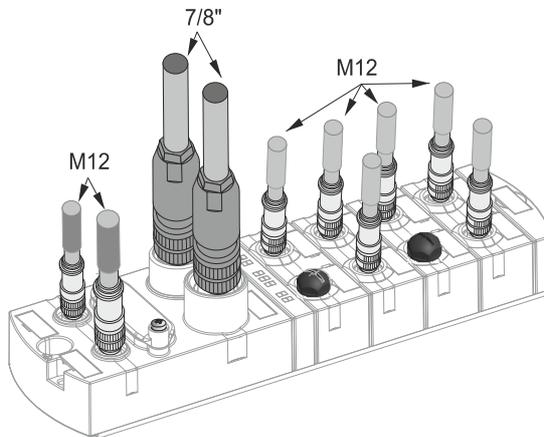


Fig. 6-4: Connecting cables

M12	0,6 Nm		Art.-No. 7000-99102-0000000
-----	--------	---	--------------------------------

7/8"	1,5 Nm		Art.-No. 7000-99104-0000000
------	--------	---	--------------------------------



PRODUCTS AND ACCESSORIES

You will find a wide range of products in our catalog or in our Murrelektronik online shop: shop.murrelektronik.com

7 Start-up



WARNING!

Risk of burns.

It is prohibited to separate or establish electrical connections during operation. Failure to observe this warning may result in electric arcs that can cause burns.

→ Disconnect the device from the power supply.



CAUTION!

Uncontrolled processes.

Personal injury and material damage due to incorrectly performed start-up phases (e.g. first start-up, restart and configuration changes).

→ Always perform the start-up in this sequence:

- 1 | Mount and connect cables to the device.
- 2 | System check and approval by an expert.
- 3 | Put it into operation.

NOTICE

Functional errors in residential areas.

Devices of EMC Class A may cause interference in residential areas.

→ The system operator must take appropriate measures.

7.1 Loading GSDML Files

GSDML files

Install GSDML files or install device description file

The import procedure for the GSDML files is described in your engineering software manual. In the engineering software, this is referred to as "Install GSDML files" or "Install device description file".



NOTE

You can find the GSDML file in the Online Shop of Murrelektronik GmbH under the device article number in the download area under configuration file.

Hardware catalog

➔ Scan the GSDML file of the **MVK-MPNIO** into the hardware catalog of the hardware configuration program.

When using **TIA** this device can then be found in the hardware catalog in the directory structure:

Other field devices | PROFINET IO | I/O | Murrelektronik | MVK-MPNIO | V5.0

If the engineering software supports the folder structure, the device is displayed in a similar way to that shown in Fig. "Hardware catalog".

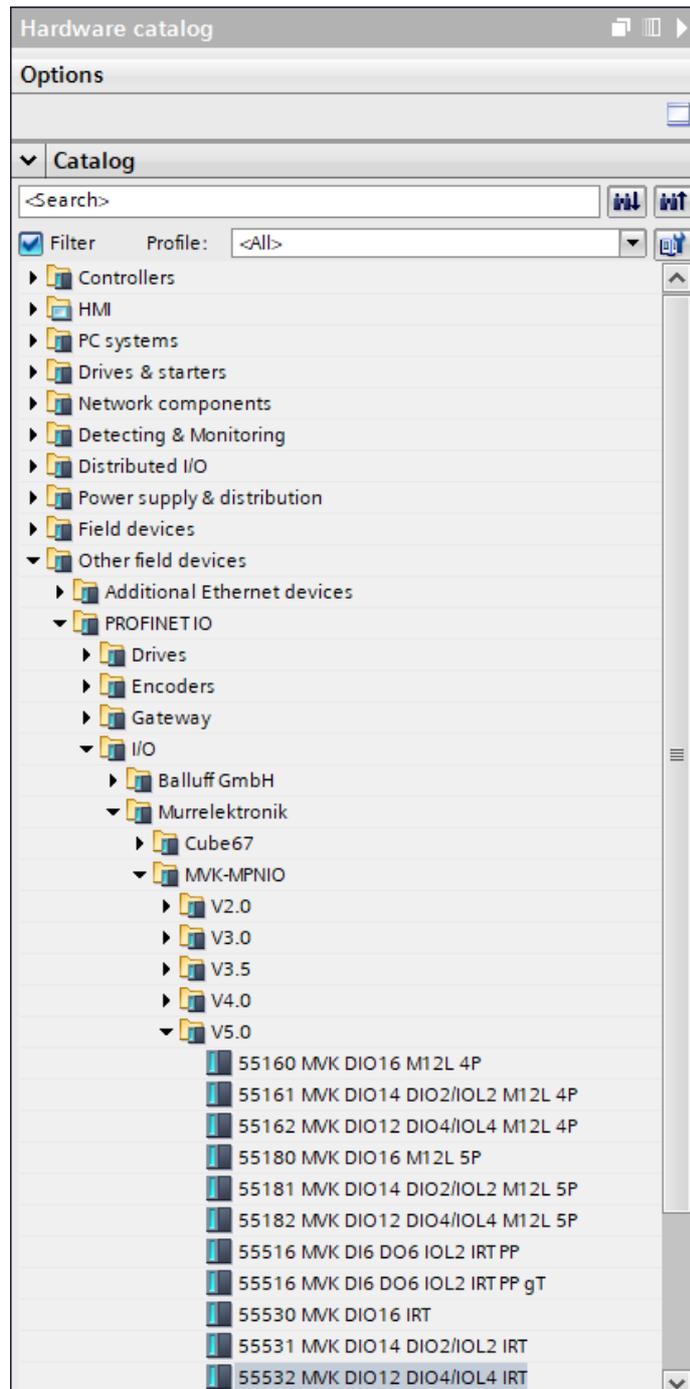


Fig. 7-1: Hardware catalog

The **MVK-MPNIO** is located in the **TIA Portal** in the folder structure of the hardware catalog under

Field devices | PROFINET IO | IO | Murrelektronik | MVK-MPNIO | V5.0

- ➔ In the hardware catalog, mark the **MVK-MPNIO** device.
- ➔ Drag and drop the entry to an empty area in the “**Devices & networks**” window.

Assign the device to a new IO controller

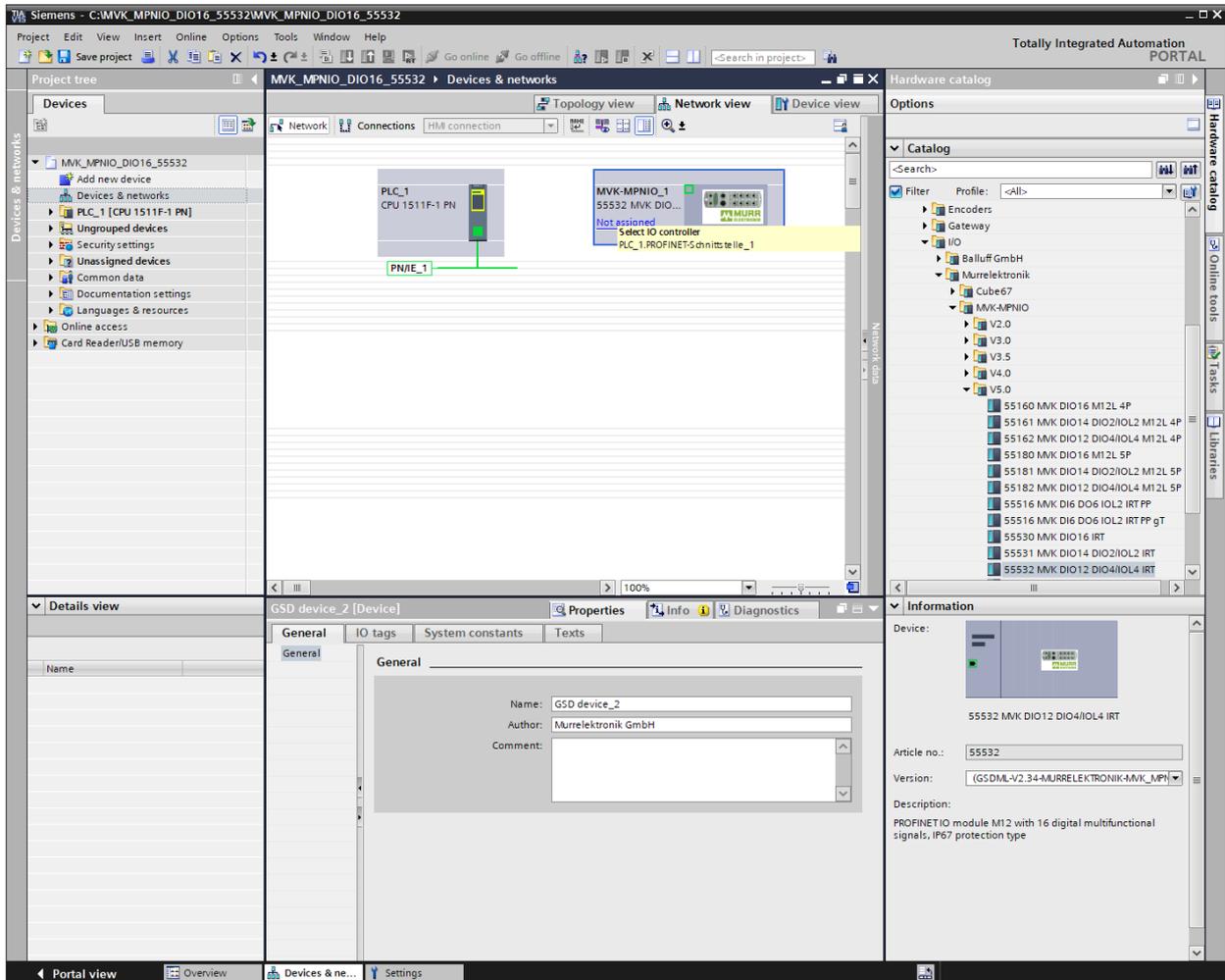


Fig. 7-2: Assign the device to a new IO controller

- 1 | On the device symbol, click **Not assigned**.
- 2 | Select **PLC_1.PROFINET-Schnittstelle_1**.
The device is assigned to an IO controller.
- 3 | For further configuration, **double-click the device** to select it.

8 Configuration and parameterization

8.1 Module configuration

The hardware catalog allows you to paste and configure the individual IO-Link ports *and* the virtual modules.

The **device** supports IO-Link integration version V1.0 Edition 2.

Standard modules	
Device	<ul style="list-style-type: none"> ■ Parameterization of the module ■ Read and write access to the digital IOs ■ Access to the system status
IO-Link master	<ul style="list-style-type: none"> ■ Read and write access to the IO-Link Devices/Ports

Tab. 8-1: Module configuration_standard modules

Shared Device modules	
State	<ul style="list-style-type: none"> ■ Reading access to the digital IOs only ■ Access to the system status
IO-Link state	<ul style="list-style-type: none"> ■ Read access to the IO-Link devices/ports only

Tab. 8-2: Module configuration_Shared Device modules



IO-Link master and IO-Link state only for Art.-No. 55531, 55532.

Module configuration

- In the device overview in TIA portal, the device will be presented as:
- PROFINET user with a pre-configured digital IO port for universal IO channels,
 - virtual parameter/diagnostic module,
 - IO-Link master with 4 IO-Link ports.

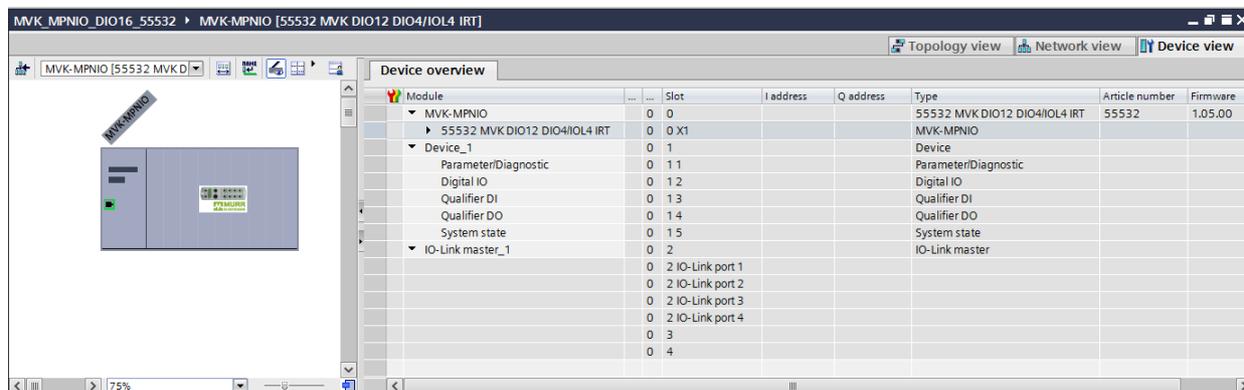


Fig. 8-1: Module configuration

The ports created can optionally be occupied by defined virtual submodules. Virtual modules serve to map the different items of diagnostic and status information to the process image on the IO-Link master. Allocation of submodules to the ports is pre-defined by GSDML file.

Device

- Parameterization of the module
- Read and write access to the digital IOs.
- Access to the system status

Standard submodules

Parameter/Diagnostic	Parameterization of the module <ul style="list-style-type: none"> ■ Diagnostic behavior ■ Threshold values for undervoltage ■ LED behavior ■ Availability of the Murrelektronik IO-Link Tool ■ Data layout ■ Input delay
Digital IO	2 bytes In <ul style="list-style-type: none"> ■ Value of the inputs as individual bits. ■ Layout according to parameter settings (port/pin-based). 2 bytes Out <ul style="list-style-type: none"> ■ Value for setting the outputs as individual bits. ■ Layout according to parameter settings

Tab. 8-3: Standard submodules for device

8.1.1 Basic configuration

Art.-No. 55530

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module.

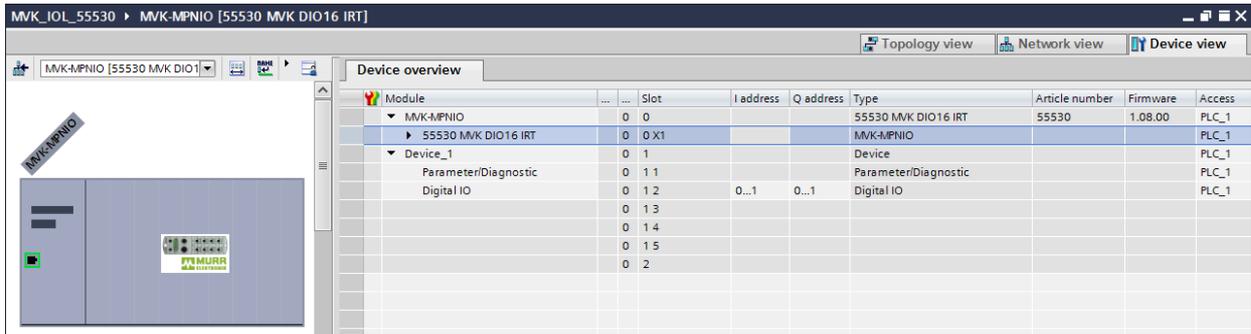


Fig. 8-2: Basic configuration Art.-No. 55530

Art.-No. 55531

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module,
- IO-Link master with 2 IO-Link ports (SIO).

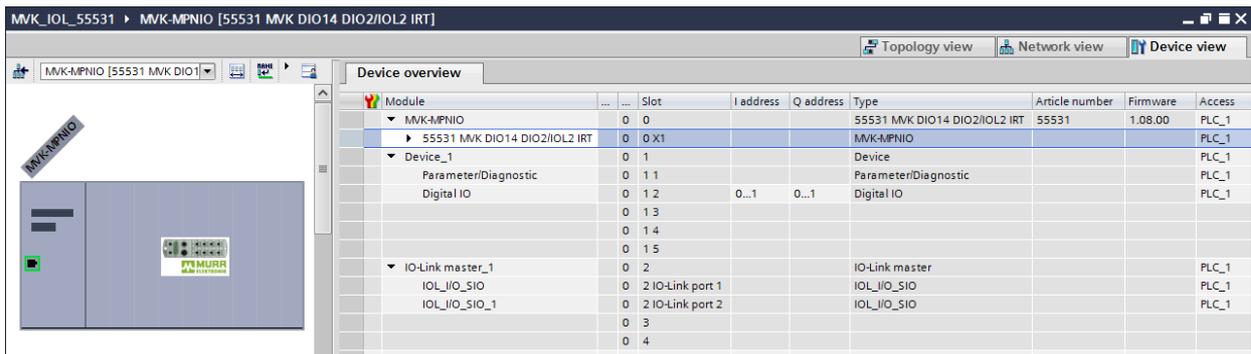


Fig. 8-3: Basic configuration Art.-No. 55531

Art.-No. 55532

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module,
- IO-Link master with 4 IO-Link ports (SIO).

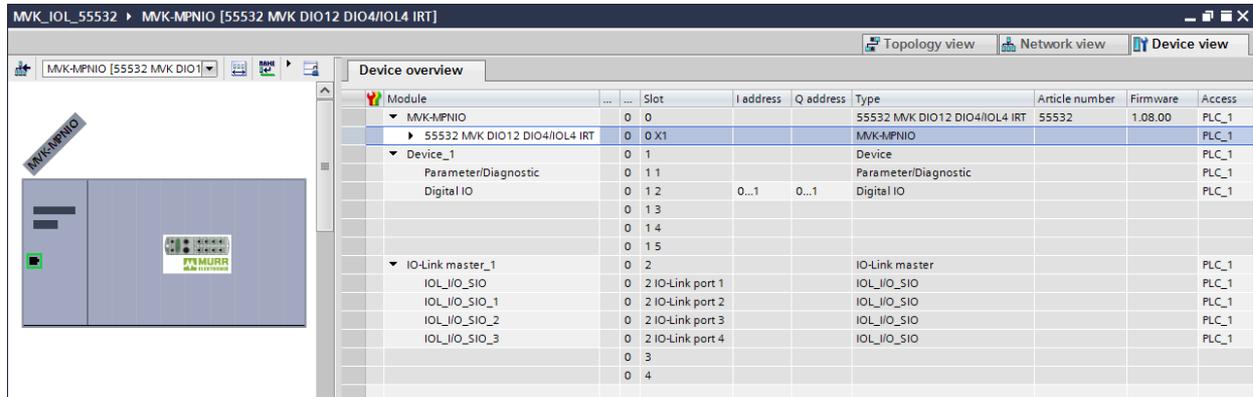


Fig. 8-4: Basic configuration Art.-No. 55532

Device

Submodules diagnostic

Qualifier DI	<p>2 bytes In</p> <ul style="list-style-type: none"> ■ Diagnostic status of the individual bits of the inputs in "Digital IO" or "Digital Input". <ul style="list-style-type: none"> □ 0: invalid □ 1: valid ■ Layout according to parameter settings
Qualifier DO	<p>2 bytes In</p> <ul style="list-style-type: none"> ■ Diagnostic status of the individual bits of the outputs in "Digital IO" or "Digital Output". <ul style="list-style-type: none"> □ 0: invalid □ 1: valid ■ Layout according to parameter settings
System state	<p>4 bytes In</p> <ul style="list-style-type: none"> ■ Summary of the current system state. For further information, please refer to Tab. 8-19: "System state IO layout".

Tab. 8-4: Submodules diagnostic for device

Qualifier DI, qualifier DO and system state are diagnostic information. Diagnostic information is available to the user program via the process image of the inputs (PII).

Each qualifier bit is allocated to a channel and provides information about the validity of the value (0 = value is invalid).

The system state provides the error value corresponding to the active diagnostic.

Example: if there is a sensor short circuit on a digital input, the reference data signal is logically "0".

Due to the short circuit diagnostic, the module also sets the relevant bit in the qualifier to "0" and, in the system state, the value to 0x0010 (sensor short circuit on at least one channel).

By querying the values, you can establish which channel (qualifier) it is and why the data are invalid (system state).



For further information on diagnostic reports in Tab. 9-21: "Device-specific diagnostic messages - error types, meaning and action"

8.1.2 Basic configuration with submodules for diagnostic

Art.-No. 55530

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module,
- virtual qualifier DI module,
- virtual qualifier DO module.



Fig. 8-5: Basic configuration with submodules for diagnostic Art.-No. 55530

Art.-No. 55531

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module,
- virtual qualifier DI module,
- virtual qualifier DO module,
- IO-Link master with 2 IO-Link ports (SIO).

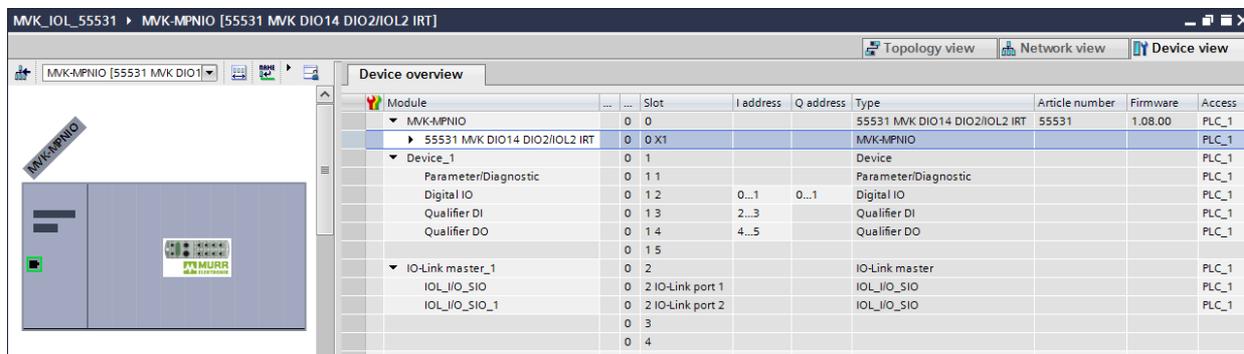


Fig. 8-6: Basic configuration with submodules for diagnostic Art.-No. 55531

Art.-No. 55532

In the device overview in TIA portal, the device is configured as:

- PROFINET user with a pre-configured digital IO port for universal IO channels,
- virtual parameter/diagnostic module,
- virtual qualifier DI module,
- virtual qualifier DO module,
- IO-Link master with 4 IO-Link ports (SIO) .

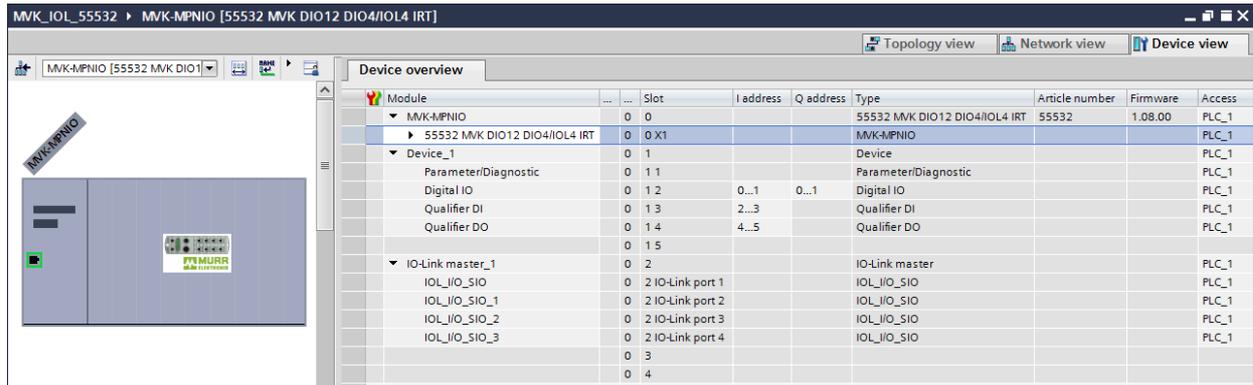


Fig. 8-7: Basic configuration with submodules for diagnostic Art.-No. 55532

Module configuration addresses

Module	Slot	I address	Q address	Type	Article number	Firmware
MVK-MPNI0	0			55532 MVK DIO12 DIO4/IOL4 IRT	55532	1.05.00
55532 MVK DIO12 DIO4/IOL4 IRT	0	0 X1		MVK-MPNI0		
Device_1	0			Device		
Parameter/Diagnostic	0	1		Parameter/Diagnostic		
Digital IO	0	12	10...11	Digital IO		
Qualifier DI	0	13	20...21	Qualifier DI		
Qualifier DO	0	14	30...31	Qualifier DO		
System state	0	15	40...43	System state		
IO-Link master_1	0	2		IO-Link master		
IOL_I/O_ 4/ 4 Byte	0	2 IO-Link port 1	100...103	IOL_I/O_ 4/ 4 Byte		
IOL_L_ 4 Byte	0	2 IO-Link port 2	104...107	IOL_L_ 4 Byte		
IOL_I/O_ 4/ 4 Byte_1	0	2 IO-Link port 3	108...111	IOL_I/O_ 4/ 4 Byte		
IOL_I/O_ 2/ 2 Byte	0	2 IO-Link port 4	112...113	IOL_I/O_ 2/ 2 Byte		
	0	3				
	0	4				

Fig. 8-8: Module configuration addresses

Once the IO-Master has been allocated to the IO-Controller, the I/O addresses are assigned to the project in accordance with the address allocation.

IO-Link master

The **IO-Link master** has **2 or 4 IO-Link ports** that can be allocated specific IO-Link devices or can be set in SIO mode.

- Read and write access to the IO-Link devices/ports.

Submodules

Deactivated	<ul style="list-style-type: none"> ■ The corresponding IO-Link port is disabled, i.e. the channel is neither used as a digital input or output, nor as an IO-Link port.
IOL_I/O_SI	<p>0 bytes In, 0 bytes Out</p> <ul style="list-style-type: none"> ■ IO link standard IO mode. ■ The channel is addressed as digital input. The data are read via "Digital IO".
IOL_I_x Byte	<p>x bytes In</p> <ul style="list-style-type: none"> ■ IO link device with x byte(s) input data. ■ The status can be identified via the corresponding bit in "Qualifier DI". ■ Parameterization of diagnostics and IO link properties is possible.
IOL_O_y Byte	<p>y bytes Out</p> <ul style="list-style-type: none"> ■ IO link device with y byte(s) output data. ■ The status can be identified via the corresponding bit in "Qualifier DO". ■ Parameterization of diagnostics and IO link properties is possible.
IOL_I/O_x/y Byte	<p>x bytes In, y bytes Out</p> <ul style="list-style-type: none"> ■ IO link device with x byte(s) input data and y byte(s) output data. ■ The status can be identified via the corresponding bit in "Qualifier DI" and "Qualifier DO". ■ Parameterization of diagnostics and IO link properties is possible.

Tab. 8-5: Submodules for IO-Link master

Example

Art.-No. 55518 MVP12-M DI8 DO8 IO-Link K3	
Process data length	<ul style="list-style-type: none"> ■ 3 bytes of input data ■ 1 byte of output data
Submodule	<ul style="list-style-type: none"> ■ Smallest usable IO-Link submodule = IOL_I/O_4/2 bytes

Tab. 8-6: Example with Art.-No. 55518_submodule for IO-Link master

Module configuration in the TIA portal

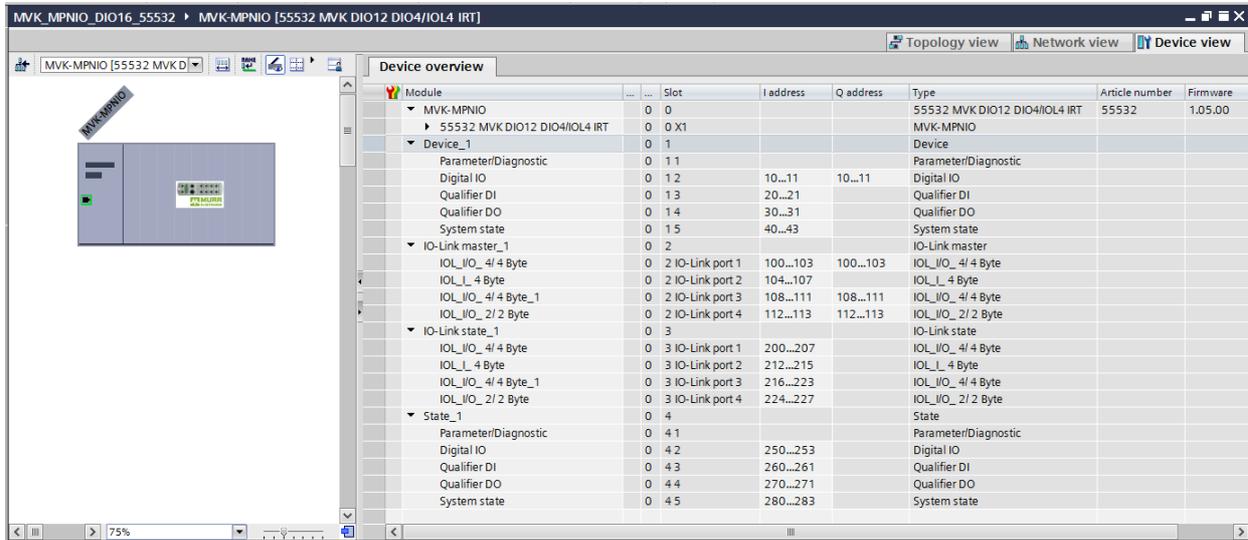


Fig. 8-9: Example of a module configuration in the TIA portal

Optionally, the virtual modules **IO-Link state** and **State** can be added to the IO-Link master.

The modules permit a read-only access to the IO-Link master modules for other IO controllers in a joint project (see chap.8.9 "Shared Device (SD) configuration").

IO-Link state

- Read-only access to the IO-Link devices/ports.

Submodules

Deactivated	<ul style="list-style-type: none"> ■ The corresponding IO link port is marked as being deactivated. However, the entry in "IO-Link master" is decisive for the actual configuration of the IO-Link device.
IOL_I/O_SI	<p>0 bytes In, 0 bytes Out</p> <ul style="list-style-type: none"> ■ IO link standard IO mode. ■ The channel is addressed as digital IO. The data are read via "Digital IO". However, the entry in "IO link master" is decisive for the actual configuration of the IO link device.
IOL_I_x Byte	<p>x bytes In</p> <ul style="list-style-type: none"> ■ IO link device with x byte(s) input data. ■ The status can be identified via the corresponding bit in "Qualifier DI". ■ It is possible to parameterize the diagnostics. ■ However, the entry in "IO link master" is decisive for the actual configuration of the IO link device.
IOL_O_y Byte	<p>y bytes In</p> <ul style="list-style-type: none"> ■ IO link device with y byte(s) output data. The current output data can be read as input data. ■ The status can be identified via the corresponding bit in "Qualifier DO". ■ It is possible to parameterize the diagnostics. ■ However, the entry in "IO link master" is decisive for the actual configuration of the IO link device.
IOL_I/O_x/y Byte	<p>x + y bytes In</p> <ul style="list-style-type: none"> ■ IO link device with x byte(s) input data and y byte(s) output data. ■ The first x byte(s) are the current input data of the IO link devices; the following y byte(s) are the current output data of the IO link device. ■ The status can be identified via the corresponding bit in "Qualifier DI" and "Qualifier DO". ■ It is possible to parameterize the diagnostics. ■ However, the entry in "IO link master" is decisive for the actual configuration of the IO link device.

Tab. 8-7: Submodules for IO-Link state

State

- Reading access to the digital IOs only.
- Access to the system status

Submodules

Parameter/Diagnostic	Parameterization of the module <ul style="list-style-type: none"> ■ Diagnostic behavior ■ Data layout
Digital IO	4 bytes In <ul style="list-style-type: none"> ■ Bytes 0 and 1 <ul style="list-style-type: none"> <input type="checkbox"/> Value of the inputs as individual bits. <input type="checkbox"/> Layout according to parameter settings ■ Bytes 2 and 3 <ul style="list-style-type: none"> <input type="checkbox"/> Currently configured value of the outputs as individual bits. <input type="checkbox"/> Layout according to parameter settings
Qualifier DI	2 bytes In <ul style="list-style-type: none"> ■ Status of individual bits of the inputs in "Digital IO" <ul style="list-style-type: none"> <input type="checkbox"/> 0: invalid <input type="checkbox"/> 1: valid ■ Layout according to parameter settings
Qualifier DO	2 bytes In <ul style="list-style-type: none"> ■ Status of individual bits of the outputs in "Digital IO" <ul style="list-style-type: none"> <input type="checkbox"/> 0: invalid <input type="checkbox"/> 1: valid ■ Layout according to parameter settings
System state	4 bytes In <ul style="list-style-type: none"> ■ Summary of the current system status. Further information can be found in the Tab. 8-19: "System state IO layout".

Tab. 8-8: Submodules for State



Further information on diagnostic messages to IO-Link ports can be found in the Tab. 9-22: "Diagnostic messages at IO-Link ports via IODD – error types, meaning and action"

8.2 Parameterization



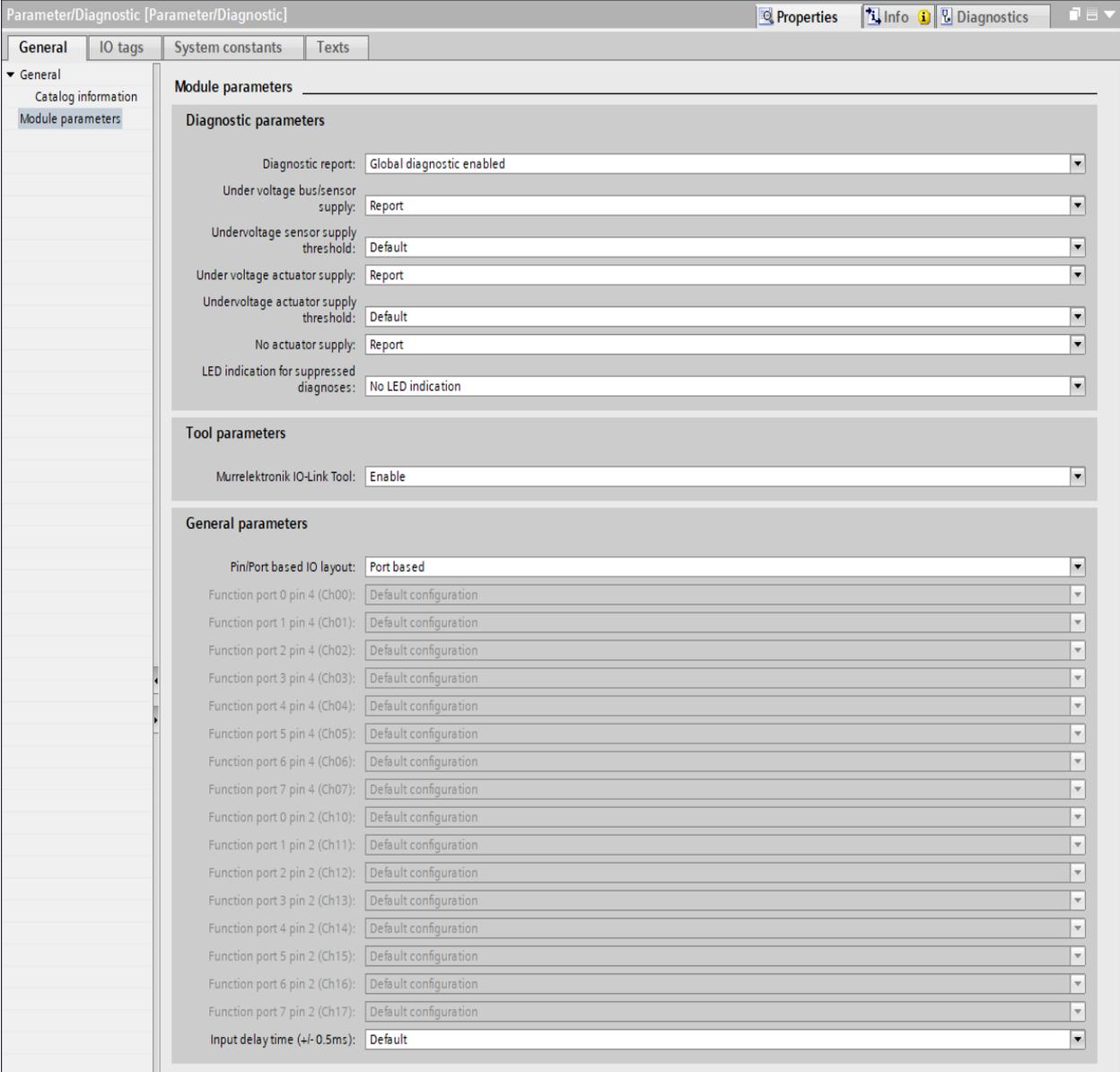
This chapter explains parameterization options.

8.2.1 Device parameters

	Parameters	Description
1	Report / do not report global diagnostics	Enables / Disables all diagnostics of the device. If these diagnostics are disabled, the settings of parameters 2, 4, 6 and 7 are then ignored.
2	Report / do not report undervoltage bus/sensor supply	Enables / disables the report about undervoltage of the bus/sensor supply.
3	Threshold value for undervoltage bus/sensor supply	Defines the threshold value for detection of undervoltage in bus/sensor power supply. Default value 16.8 ... 17.3 V
4	Report / do not report undervoltage actuator supply	Enables / Disables the report about undervoltage of the actuator supply.
5	Undervoltage actuator supply threshold value	Defines the threshold value for detection of undervoltage in the actuator supply. Default value 16.8 ... 17.3 V
6	Report / do not report power failure in the actuator supply	Enables / Disables the report about lack of actuator supply.
7	LED indication for suppressed diagnostics	Enables / Disables LED indication for suppressed diagnostics.
8	Murrelektronik IO-Link tool	Enables / Disables the use of the Murrelektronik IO-Link device configuration tool.
9	Pin/Port-based	Transmission of IO data in pin- or port-based format.
10	Input delay	The input delay acts as a filter that only recognizes input signals as high at the active time X.

Tab. 8-9: Device parameters

Device parameters



Parameter/Diagnostic [Parameter/Diagnostic] Properties Info Diagnostics

General IO tags System constants Texts

General

- Catalog information
- Module parameters

Module parameters

Diagnostic parameters

- Diagnostic report: Global diagnostic enabled
- Under voltage bus/sensor supply: Report
- Undervoltage sensor supply threshold: Default
- Under voltage actuator supply: Report
- Undervoltage actuator supply threshold: Default
- No actuator supply: Report
- LED indication for suppressed diagnoses: No LED indication

Tool parameters

- Murrelektronik IO-Link Tool: Enable

General parameters

- Pin/Port based IO layout: Port based
- Function port 0 pin 4 (Ch00): Default configuration
- Function port 1 pin 4 (Ch01): Default configuration
- Function port 2 pin 4 (Ch02): Default configuration
- Function port 3 pin 4 (Ch03): Default configuration
- Function port 4 pin 4 (Ch04): Default configuration
- Function port 5 pin 4 (Ch05): Default configuration
- Function port 6 pin 4 (Ch06): Default configuration
- Function port 7 pin 4 (Ch07): Default configuration
- Function port 0 pin 2 (Ch10): Default configuration
- Function port 1 pin 2 (Ch11): Default configuration
- Function port 2 pin 2 (Ch12): Default configuration
- Function port 3 pin 2 (Ch13): Default configuration
- Function port 4 pin 2 (Ch14): Default configuration
- Function port 5 pin 2 (Ch15): Default configuration
- Function port 6 pin 2 (Ch16): Default configuration
- Function port 7 pin 2 (Ch17): Default configuration
- Input delay time (+/- 0.5ms): Default

Fig. 8-10: Device parameters

8.2.2 Diagnostic parameters

Diagnostic report

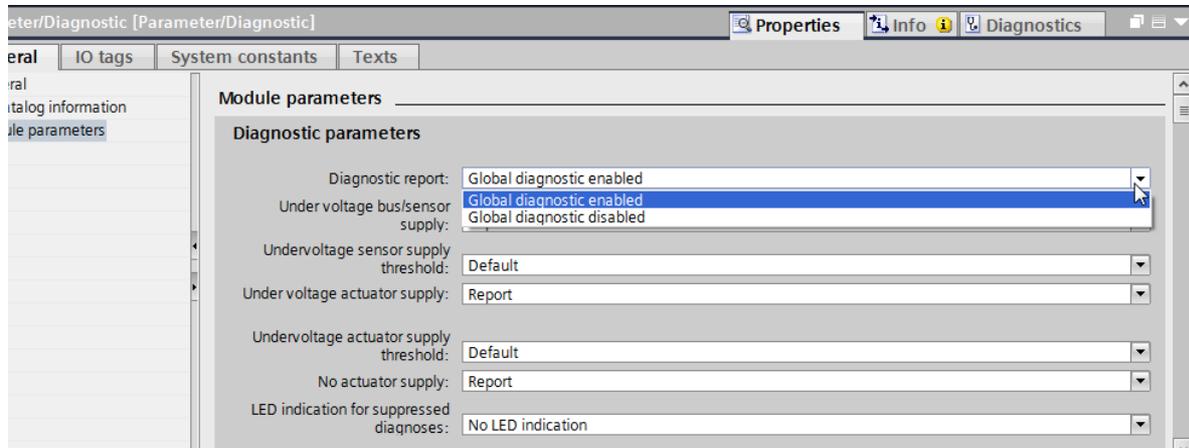


Fig. 8-11: Diagnostic report

The diagnostic report establishes:

- whether device-specific diagnostics should or should not be reported at all.

Selection	Meaning
D = Default	
Global diagnostic enabled D	The device reports all device-specific diagnostics to the controller assigned to the subplot.
Global diagnostic disabled	The device reports no device-specific diagnostics to the controller assigned to the subplot.

Tab. 8-10: Diagnostic report

Undervoltage bus and sensor supply

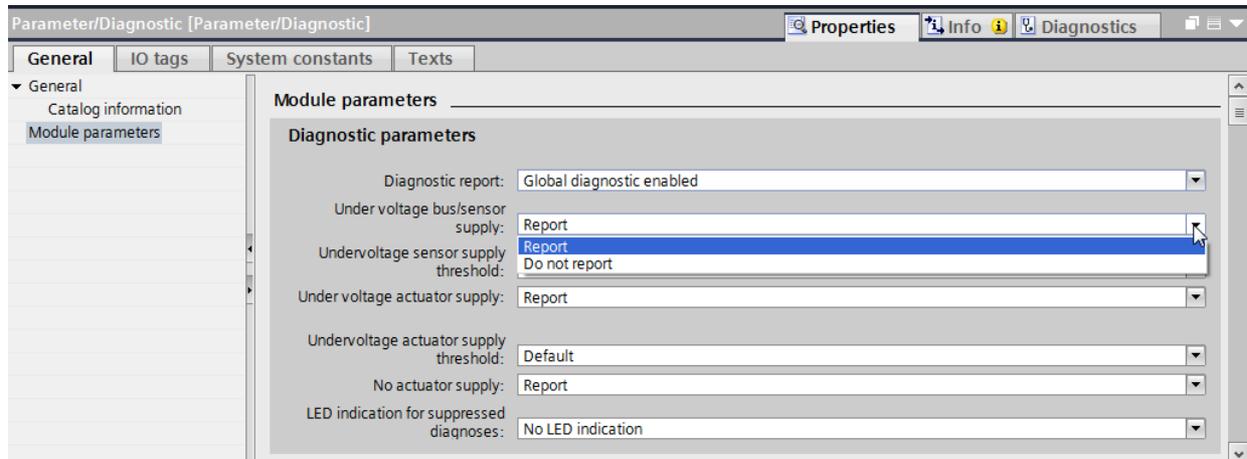


Fig. 8-12: Undervoltage bus and sensor supply

The undervoltage bus and sensor supply establishes:

- whether in case of undervoltage of the sensor supply diagnostic to that effect is reported.

Selection	Meaning
D = Default	
Report D	The Device reports the “Under voltage sensor supply” diagnostic to the controller assigned to the subslot.
Do not report	The device reports no “Under voltage sensor supply” diagnostic to the controller assigned to the subslot.

Tab. 8-11: Under voltage bus and sensor supply

Under voltage bus and sensor supply threshold

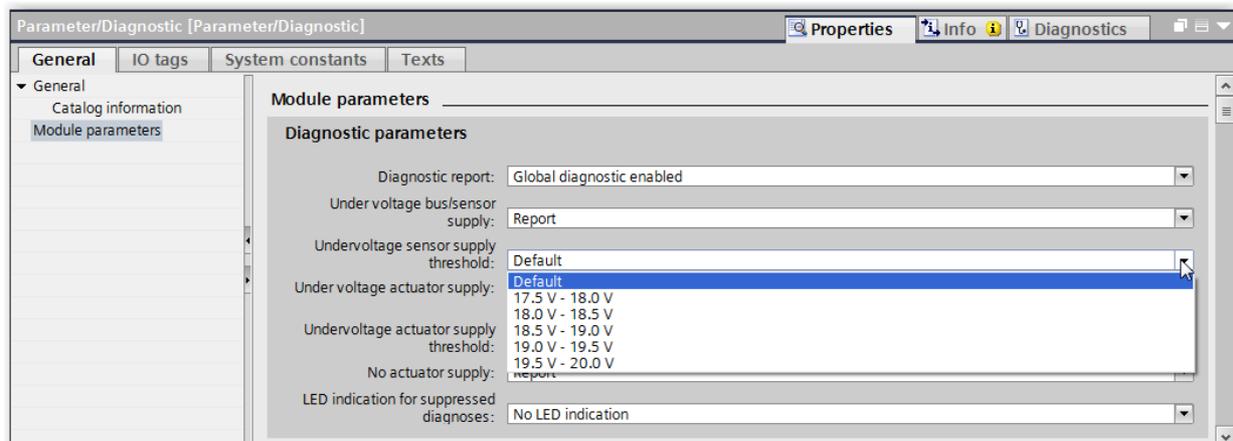


Fig. 8-13: Under voltage bus/sensor supply threshold

The under voltage bus and sensor supply threshold establishes:

- the threshold which, when values drop below it, causes the “Under voltage sensor supply” diagnostic to be reported.

When “Default” is selected, the range corresponds to 16.8 ... 17.3 V.

Under voltage actuator supply

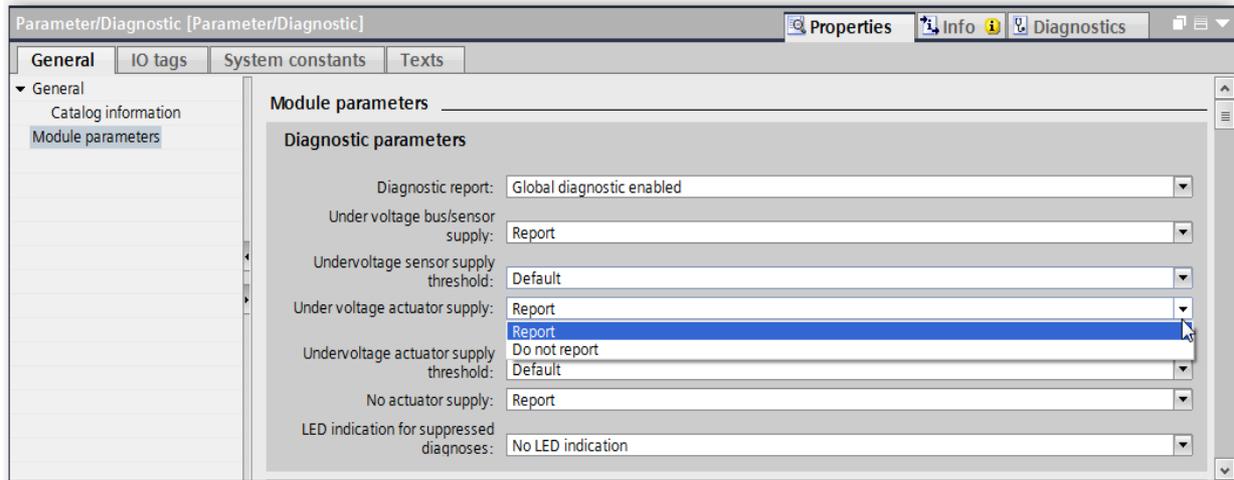


Fig. 8-14: Under voltage actuator supply

The under voltage actuator supply establishes:

- whether or not, in case of under voltage of the actuator supply, diagnostic to that effect is reported.

Selection	Meaning
D = Default	
Report D	The device reports the “Under voltage actuator supply” diagnostic to the controller assigned to the subplot.
Do not report	The device reports no “Under voltage actuator supply” diagnostic to the controller assigned to the subplot.

Tab. 8-12: Under voltage actuator supply

Undervoltage actuator supply threshold

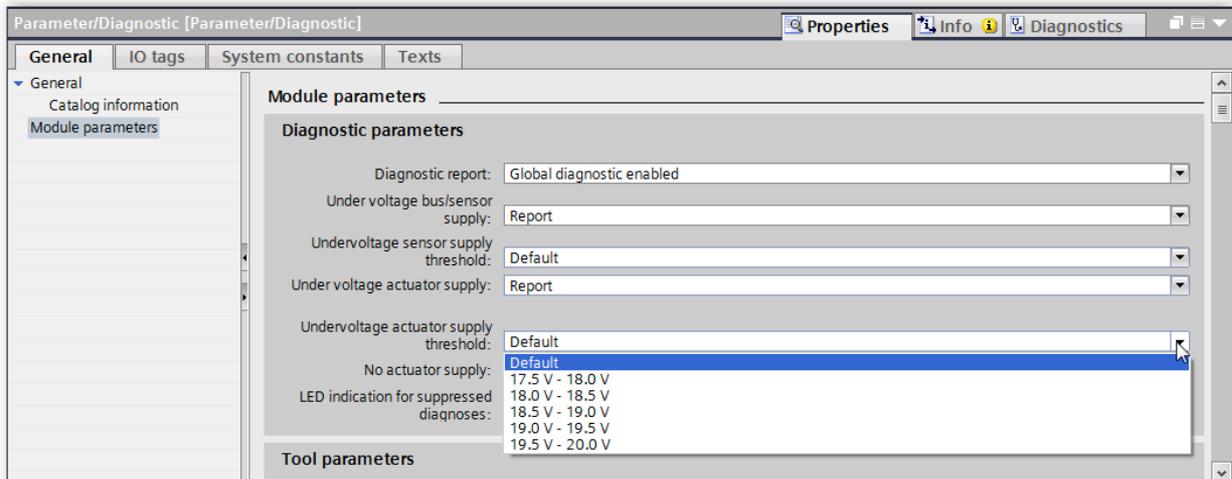


Fig. 8-15: Undervoltage actuator supply threshold

Undervoltage actuator supply threshold establishes:

- the threshold which, when values drop below it, causes the “Undervoltage actuator supply” diagnostic to be reported.
- When “Default” is selected, the range corresponds to 16.8 ... 17.3 V.

No actuator supply

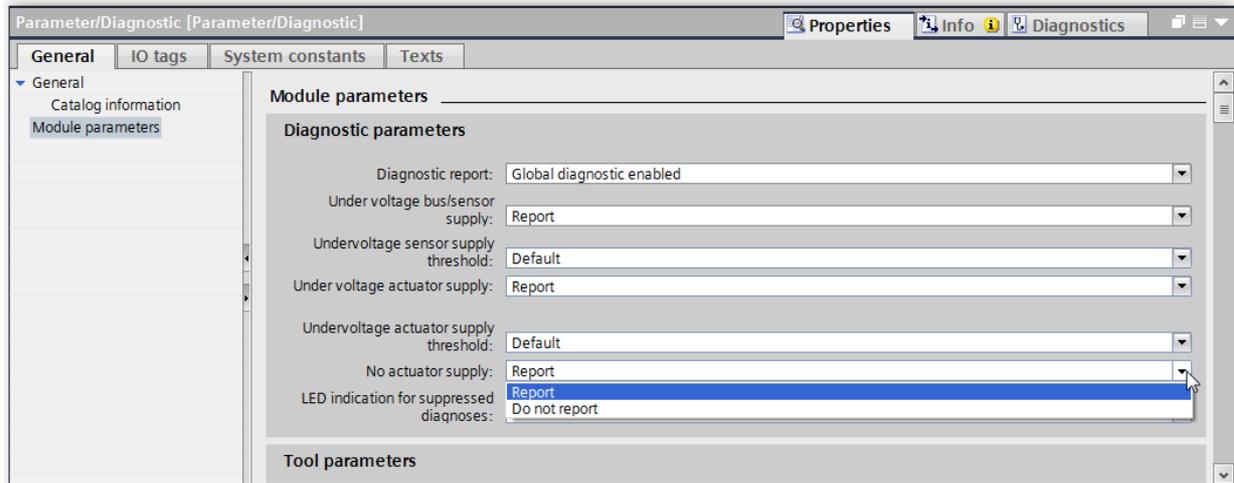


Fig. 8-16: No actuator supply

No actuator supply establishes:

- whether or not, in case of failure of the actuator supply, diagnostic to that effect is reported.

Selection	Meaning
D = Default	
Report D	The device reports the “No actuator supply” diagnostic to the controller assigned to the sub-slot.
Do not report	The device reports no “No actuator supply” diagnostic to the controller assigned to the sub-slot.

Tab. 8-13: No actuator supply

LED indication for suppressed diagnostics

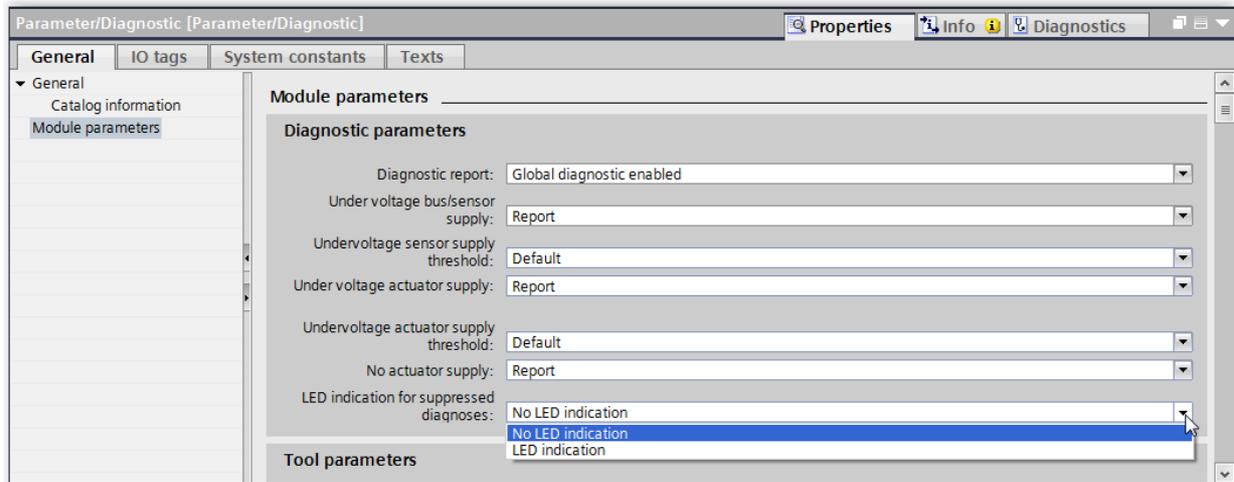


Fig. 8-17: LED indication for suppressed diagnostics

The LED indication for suppressed diagnoses defines:

- whether disabled diagnostics should still use LEDs for indicating purposes.

Selection	Meaning
D = Default	
No LED indication D	Disables the diagnostics using the corresponding parameter --> this is followed by no signal via the LEDs.
LED indication	Disable the diagnostics via the corresponding parameters --> there is a signal via the LEDs.

Tab. 8-14: LED indication for suppressed diagnostics

8.2.3 Tool parameters

Murrelektronik IO-Link tool

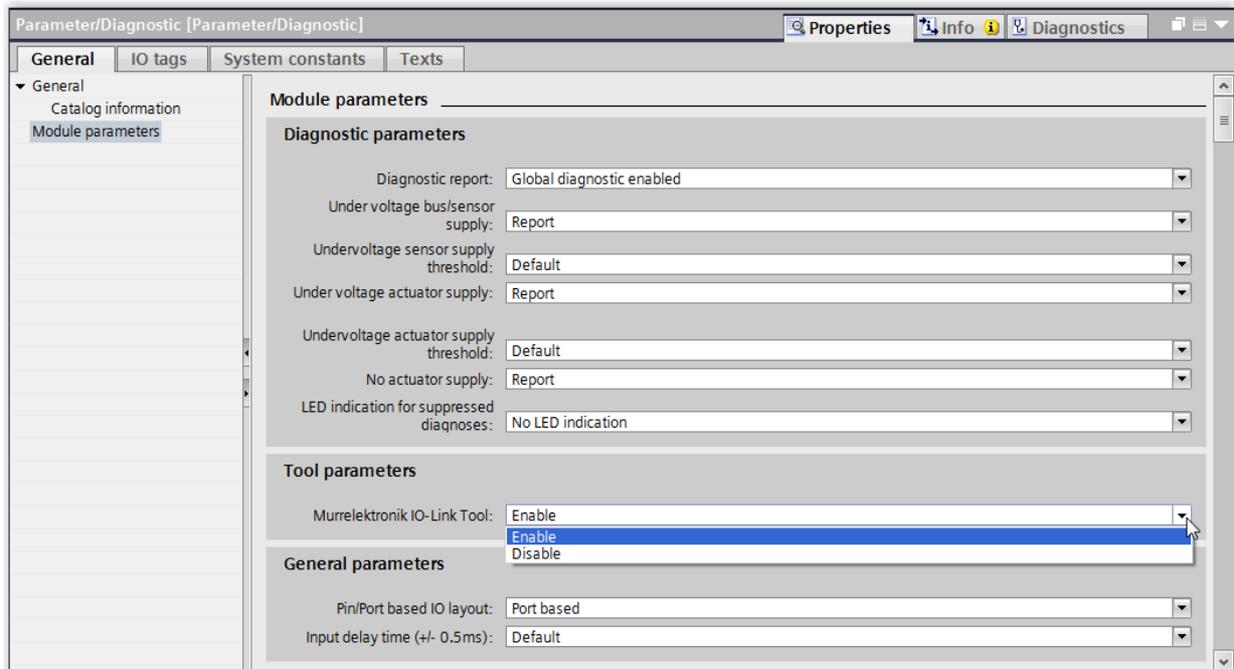


Fig. 8-18: Murrelektronik IO-Link Tool enable/disable

Murrelektronik IO-Link device tool defines

- whether the device can be accessed via the Murrelektronik IO-Link device tool.

Selection	Meaning
D = Default	
Enable D	Access to the IO-Link devices/ports via the Murrelektronik IO-Link Tool is enable.
Disable	Access to the IO-Link devices/ports via the Murrelektronik IO-Link tool is disable. The UDP port needed for communication is closed.

Tab. 8-15: Murrelektronik IO-Link Tool enable/disable

8.2.4 General parameters

Pin/Port-based IO-Layout

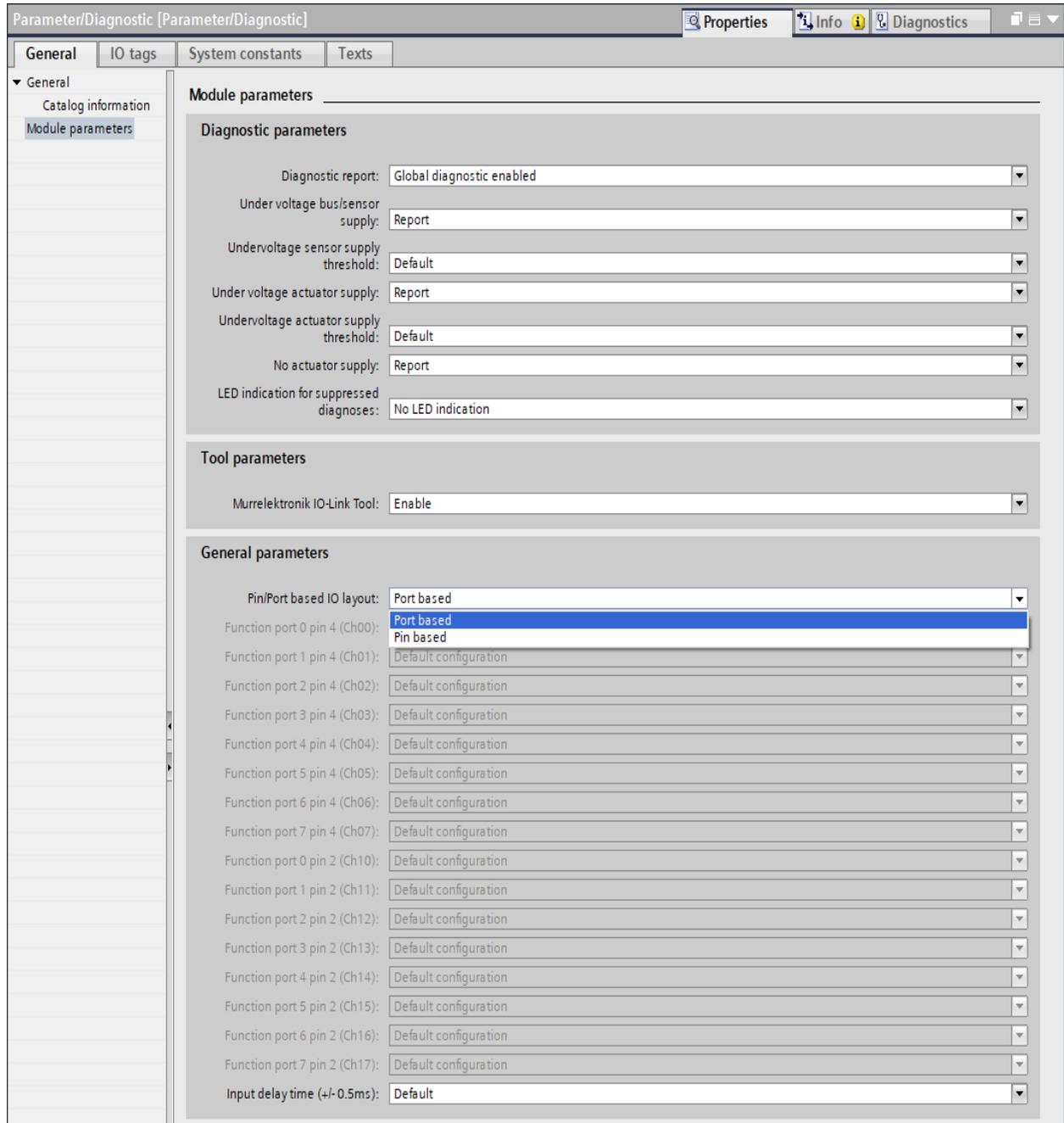


Fig. 8-19: Pin/port-based IO layout

Pin/port-based IO layout

- defines the arrangement of individual channels in the process data. This relates to inputs and outputs as well as to the associated qualifiers.

Selection	Meaning
D = Default	
Port-based D	The arrangement is sorted by ports in ascending order.
Pin-based	The arrangement is sorted by pins in ascending order.

Tab. 8-16: Pin/port-based IO layout

Port-based I/O data / Qualifier, DI/DO

I/O Byte 0							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Port X0 Pin 4	Port X0 Pin 2	Port X1 Pin 4	Port X1 Pin 2	Port X2 Pin 4	Port X2 Pin 2	Port X3 Pin 4	Port X3 Pin 2
I/O Byte 1							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Port X4 Pin 4	Port X4 Pin 2	Port X5 Pin 4	Port X5 Pin 2	Port X6 Pin 4	Port X6 Pin 2	Port X7 Pin 4	Port X7 Pin 2

Tab. 8-17: Port-based data layout

Pin-based I/O data / Qualifier, DI/DO

I/O Byte 0							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Port X0 Pin 4	Port X1 Pin 4	Port X2 Pin 4	Port X3 Pin 4	Port X4 Pin 4	Port X5 Pin 4	Port X6 Pin 4	Port X7 Pin 4
I/O Byte 1							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Port X0 Pin 2	Port X1 Pin 2	Port X2 Pin 2	Port X3 Pin 2	Port X4 Pin 2	Port X5 Pin 2	Port X6 Pin 2	Port X7 Pin 2

Tab. 8-18: Pin-based data layout



NOTE

Art.-No. 55531
Port X6 and X7 Pin 4 only in SIO mode (default I/O mode).



NOTE

Art.-No. 55532
Port X4 ... X7 Pin 4 only in SIO mode (standard I/O mode).

Input delay

The screenshot shows the configuration interface for a Murrelektronik device. The 'Parameter/Diagnostic' window is open, with the 'General' tab selected. The 'Module parameters' section is expanded, showing three sub-sections: Diagnostic parameters, Tool parameters, and General parameters. The 'Input delay time (+/-0.5ms)' parameter is selected, and its dropdown menu is open, displaying the following options: Default, 1 ms, 3 ms, 10 ms, and 15 ms. The '1 ms' option is currently selected and highlighted in blue.

Fig. 8-20: Input delay (default value 1 ms ± 0.5)

Input delay

- defines the delay for evaluation of the digital inputs. That means the time after which a signal change is detected.
- Default value for input delay: 1 ms ± 0.5

E1	Voltage at input
E2	Logical value
t1	Input delay

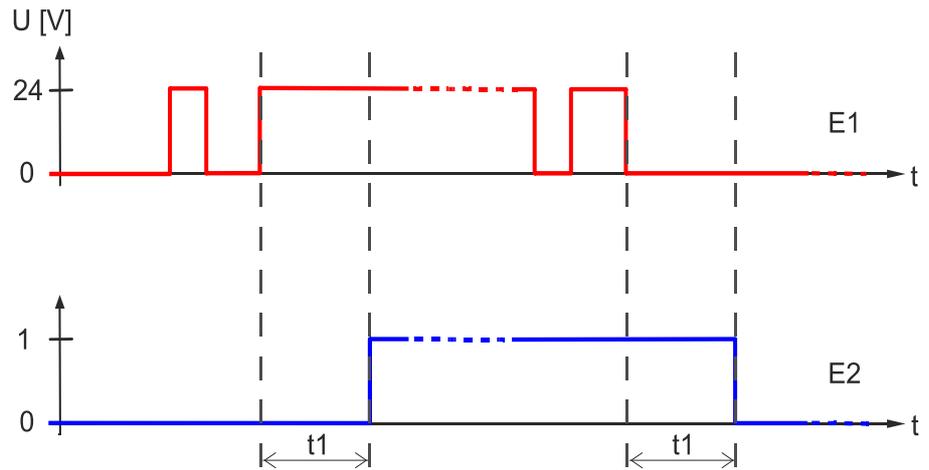


Fig. 8-21: Input delay

System status IO layout in decimal and hexadecimal format

Bit	Value in decimal (dec) format	Value in hexadecimal (hex) format	Meaning
0	1	0x0001	Sensor undervoltage
1	2	0x0002	Actuator undervoltage
2	4	0x0004	No actuator power supply
3	8	0x0008	Reserved
4	16	0x0010	Sensor short circuit on at least one channel
5	32	0x0020	Actuator short circuit on at least one channel
6	64	0x0040	Actuator warning on at least one channel
7	128	0x0080	Reserved
8	256	0x0100	Internal communication error
9	512	0x0200	IO-Link error except open circuit/communication breakdown e.g. validation failed, data storage failed
10	1024	0x0400	Sensor overvoltage
11	2048	0x0800	Actuator overvoltage
12	4096	0x1000	Open circuit/communication breakdown at IO-Link port
13 - 31			Reserved

Tab. 8-19: System state IO layout

**Bit allocation
of the system status
IO layout binary**

Byte 0

7	6	5	4	3	2	1	0
							Sensor undervoltage
							Actuator undervoltage
							No actuator power supply
							Reserved
							Sensor short circuit on at least one channel
							Actuator short circuit on at least one channel
							Actuator warning on at least one channel
							Reserved

Byte 1

15	14	13	12	11	10	9	8
							Internal communication error
							IO-Link error except open circuit/communication breakdown e.g. validation failed, data storage failed
							Sensor overvoltage
							Actuator overvoltage
							Open circuit/communication breakdown at IO-Link port
							Reserved
							Reserved
							Reserved

Byte 2 and byte 3 system status reserved

8.2.5 IO-Link port parameters

IO-Link port unit parameters

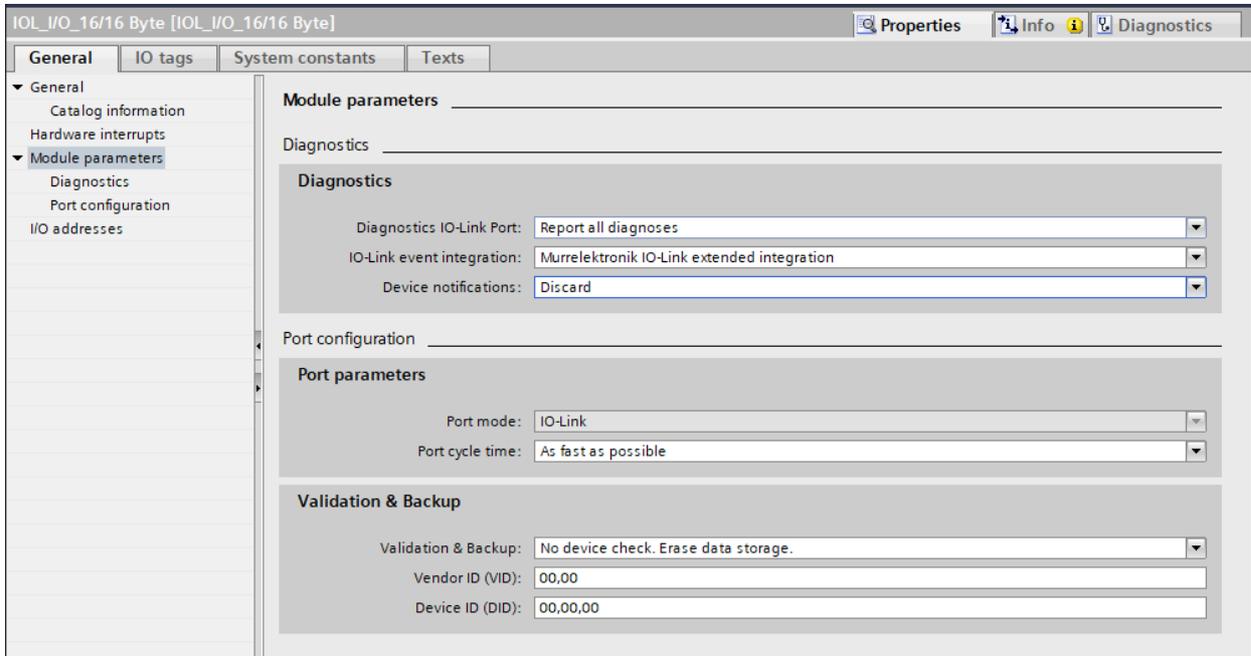


Fig. 8-22: IO-Link port unit parameters

Diagnostic IO-Link port

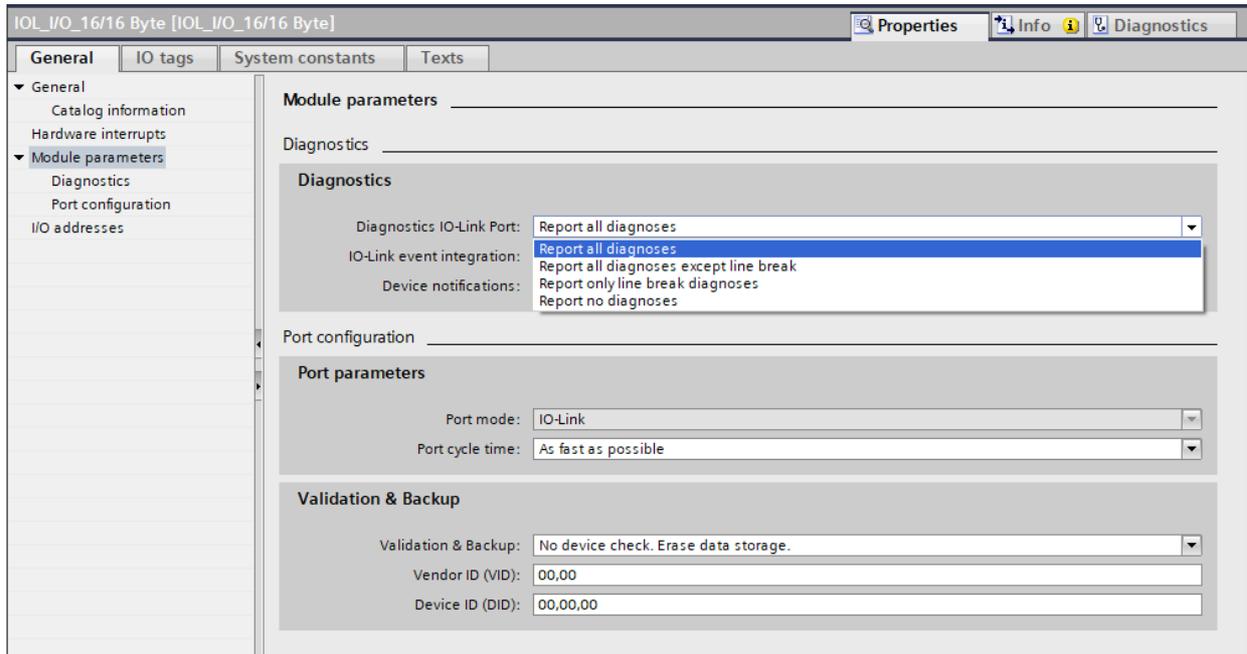


Fig. 8-23: Diagnostic IO-Link port

Diagnostics to be reported

Selection	Meaning
D = Default	
Report all diagnoses D	The device reports all diagnostics generated on the IO-Link port.
Report all diagnoses except line break	The device reports all diagnostics except communication errors generated on the IO-Link port.
Report line break diagnostics only	The device reports only communication errors generated on the port.
Report no diagnoses	The device does not report any diagnostics generated on the IO-Link port.

Tab. 8-20: Diagnostics IO-Link port

IO-Link event integration

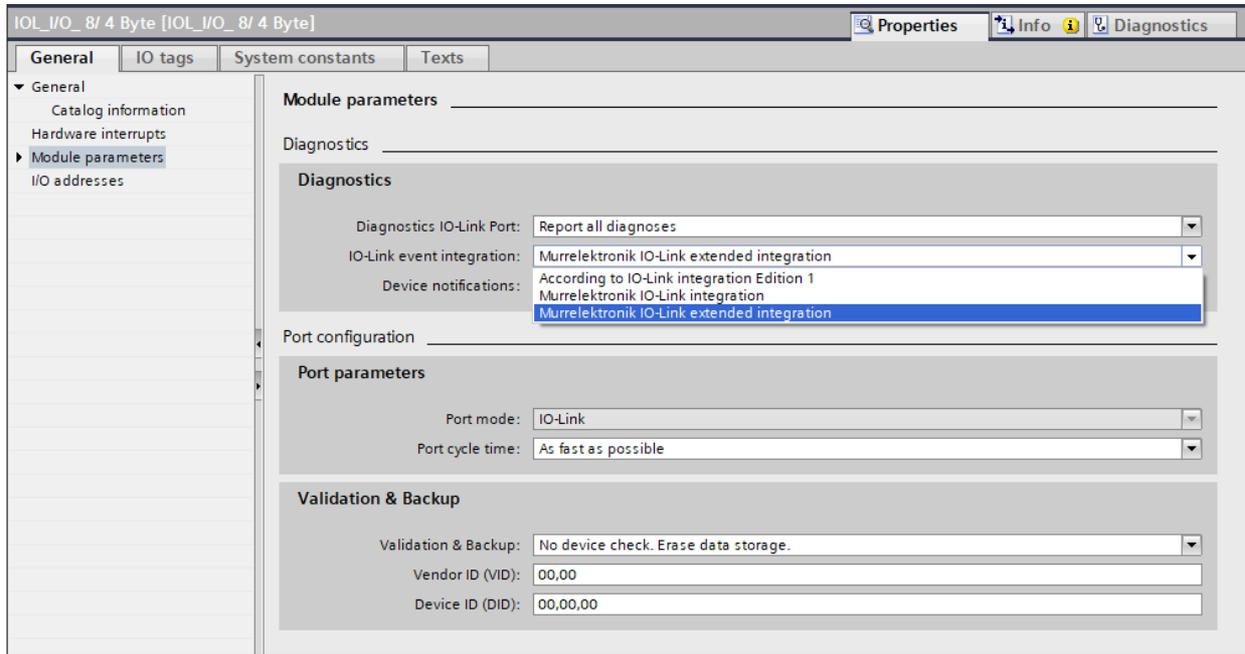


Fig. 8-24: IO-Link event integration

Type of allocation of IO-Link events to PROFINET diagnostics

Selection	Meaning
D = Default	
According to IO-Link integration guideline Edition 1	<ul style="list-style-type: none"> Standardized IO-Link events are depicted on standardized PROFINET diagnostics.
Murrelektronik IO-Link integration	<ul style="list-style-type: none"> Depiction of the IO-Link event number with the help of mathematical processes on PROFINET diagnostics. Events of Murrelektronik devices are available in plain text.
Murrelektronik IO-Link extended integration D	<ul style="list-style-type: none"> Depiction of the IO-Link event number with the help of mathematical processes on PROFINET diagnostics. Events of Murrelektronik devices are available in plain text. Channel information is available for Murrelektronik devices that supports this.

Tab. 8-21: IO-Link event integration

According to IO-Link integration guideline Edition 1

- This type of illustration only provides rudimentary diagnostic options because several different IO-Link event codes are depicted on the same PROFINET Channel Error Type.
- The PROFINET Channel Error Type therefore only occasionally permits a conclusion to be drawn about the original IO-Link event code.
- “Error”-type IO-Link events are reported as PROFINET diagnostics with “Fault” maintenance.
- IO-Link events of the “Warning” type are reported with “Maintenance demanded”.
- IO-Link events of the “Notification” type are not reported as PROFINET diagnostics but are instead handled as “Notifications from the device” parameterization.
- The diagnostics do not include any channel numbers.



NOTE

The illustration and overview of the IO-Link event codes on PROFINET diagnostics can be found in chap. 9.3.3.1 "According to IO-Link integration guideline Edition 1".

Murrelektronik IO-Link integration

- For standardized IO-Link event codes, the diagnostic text is available in clear text for all IO-Link devices.
- For IO-Link devices that support *Murrelektronik IO-Link integration* or *Murrelektronik IO-Link extended integration*, device-specific diagnostics are available in clear text.
- For other IO-Link devices, only a generic report with the corresponding IO-Link event code is available.
- “Error”-type IO-Link events are reported as PROFINET diagnostics with “Fault” maintenance. Events of the “Warning” type are reported with “Maintenance demanded”.
- Events of the “Notification” type are not reported as PROFINET diagnostics, but are instead handled as “Notifications from the device” in accordance with the parameterization.
- The diagnostics do not include any channel number.

Murrelektronik IO-Link extended integration

- This illustration also uses the same mechanisms as described for *Murrelektronik IO-Link integration*.
- In contrast to *Murrelektronik IO-Link integration*, the diagnostics also include channel numbers if:
 - The connected device supports *extended integration of the Murrelektronik IO-Link*,
 - the IO-Link event relates to a dedicated channel on the IO-Link device.



NOTE

The illustration and overview of the IO-Link event codes on PROFINET diagnostics can be found in 9.3.3.2 "Murrelektronik IO-Link - Integration and extended integration".

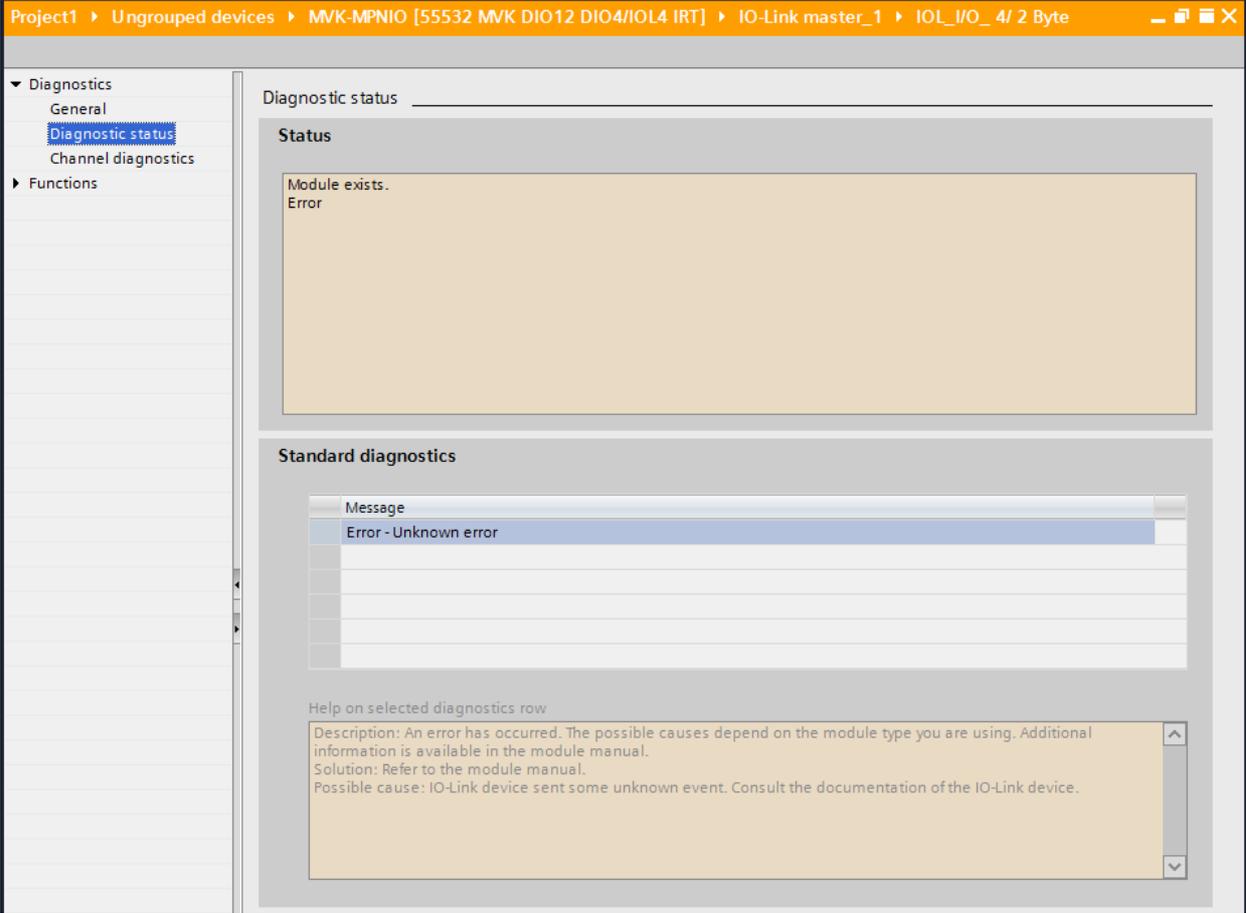


Fig. 8-25: Sensor short circuit_According to IO-Link integration guideline Edition 1

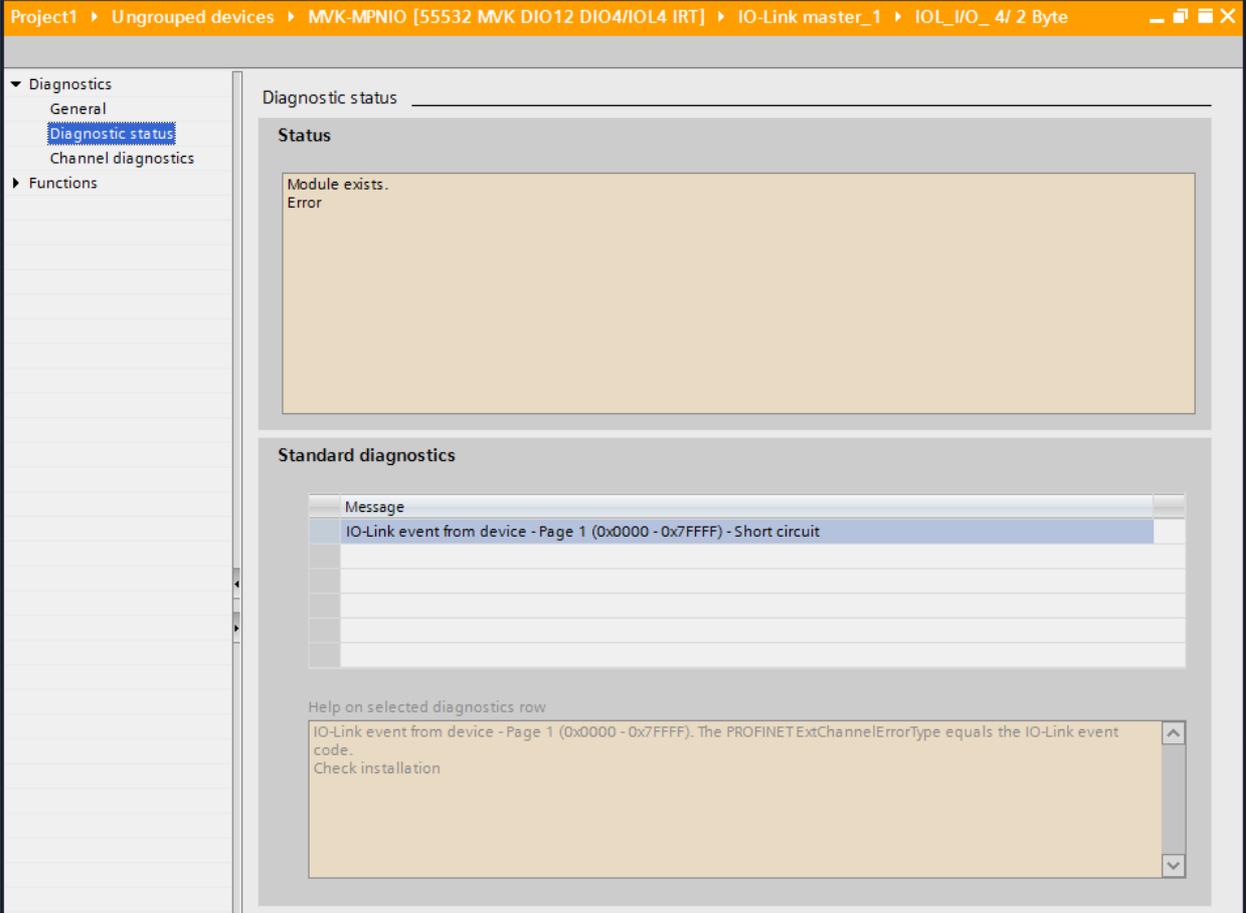


Fig. 8-26: Sensor short circuit_Murrelektronik IO-Link integration

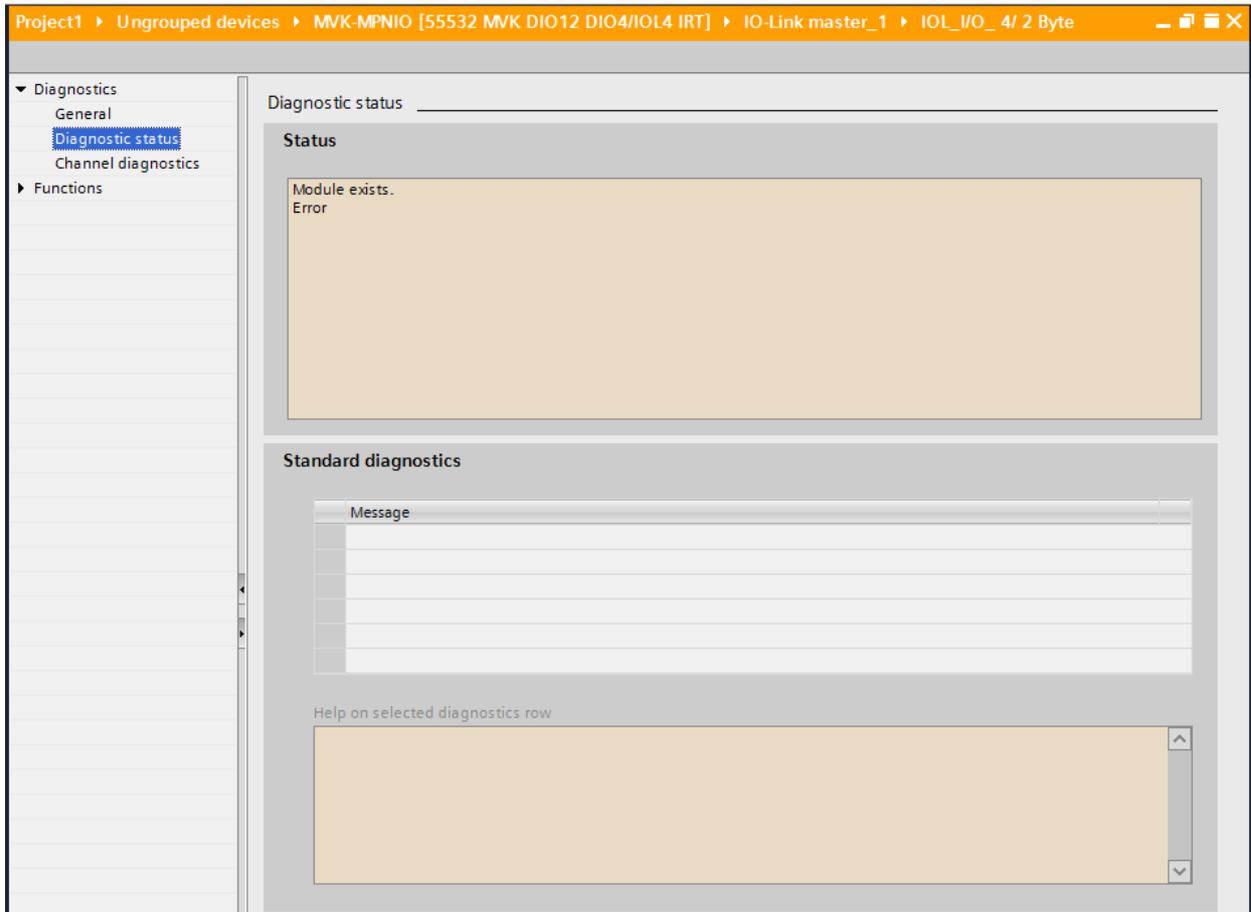


Fig. 8-27: Sensor short circuit_Murrelektronik IO-Link extended integration_Diagnostic status

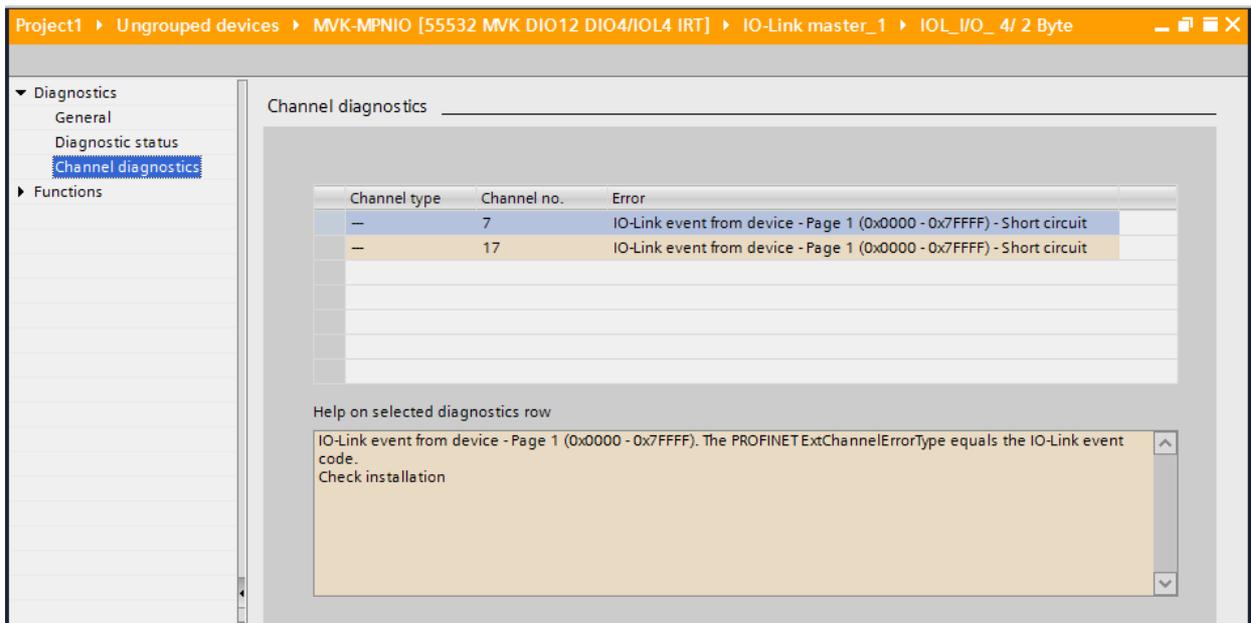


Fig. 8-28: Sensor short circuit_Murrelektronik IO-Link extended integration_Channel diagnostics

Notifications from the device

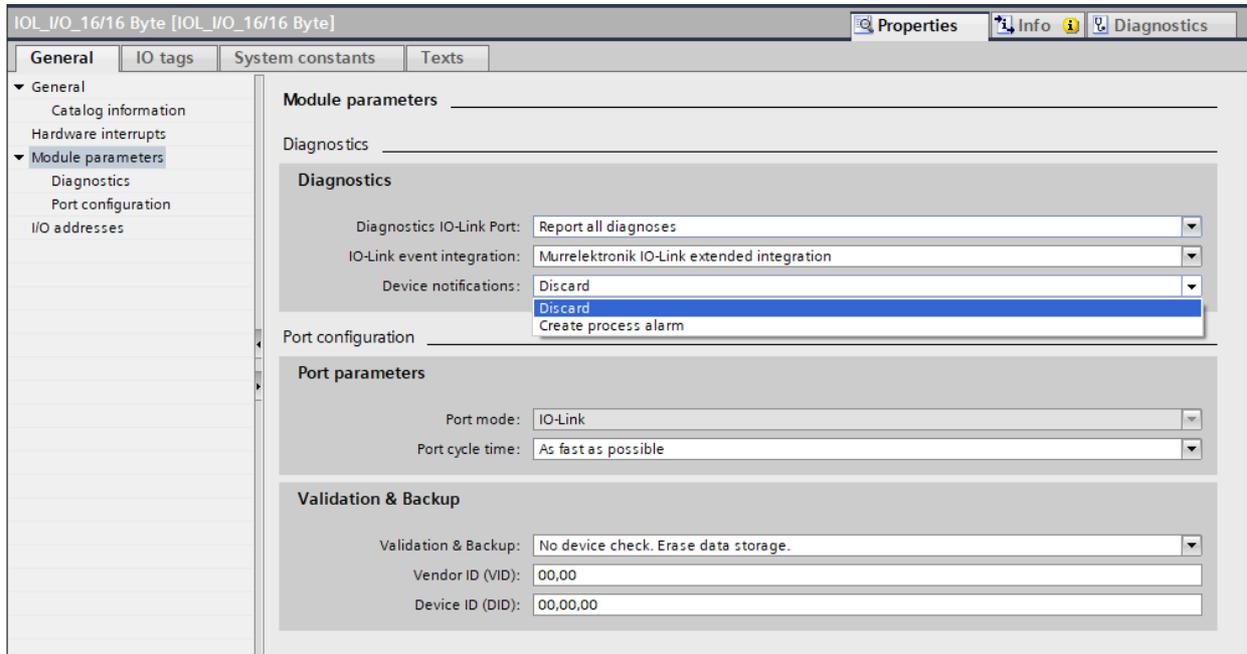


Fig. 8-29: Processing of IO-Link events of the “Notification” type

Processing of IO-Link events of the “Notification” type

Selection	Meaning
D = Default	
Discard D	IO-Link events of the “Notification” type are discarded and are not forwarded.
Generating a process alarm	For every “Notification” IO-Link event that is sent by the IO-Link device, a PROFINET process alarm is generated.

Tab. 8-22: Processing of IO-Link events of the “Notification” type

Property of the generated PROFINET process alarm:
User Structure Identifier (Format): 0x8320

Process alarm data

Byte	Meaning		Value
0	Channel number	MSB	= 0x8000: No channel information available
1		LSB	!= 0x8000: Channel number (only for parameterization of the <i>extended integration of the Murrelektronik IO-Link</i>)
2	Channel properties	MSB	0x0000
3		LSB	
4	Reason for alarm	MSB	0x9500: IO-Link event code 0x0000 (0) - 0x7FFF (32767) 0x9501: IO-Link event code 0x8000 (32768) - 0xFFFF (65535)
5		LSB	
6	Reason for alarm extended	MSB	With reason for alarm 0x9500: IO-Link event code With reason for alarm 0x9501: IO-Link event code minus 0x8000 (32768)
7		LSB	
8	Reason for alarm Additional value	MSB	0x00000000
9			
10			
11		LSB	

Tab. 8-23: Process alarm data



NOTE

Information on how a process alarm is processed in the PLC can be found in the manual of the respective control manufacturer.

Port mode



NOTE

This parameter cannot be modified and is automatically determined when selecting a certain sub-port for the IO-Link master.

Port cycle time

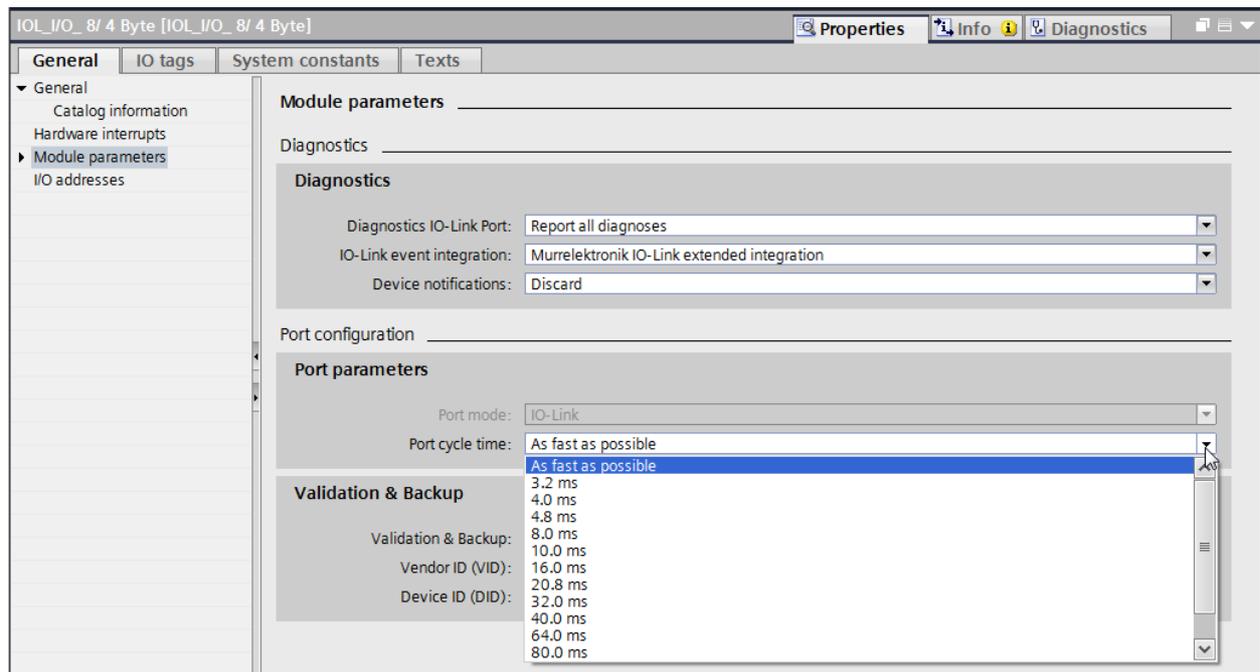


Fig. 8-30: Cycle time for communication

Cycle time for communication

Selection	Meaning
D = Default	
As fast as possible D	The Master and the IO-Link device automatically determine the quickest cycle time.
3.2 ... 128.0 ms	Setting cycle time to this value.

Tab. 8-24: Cycle time for communication

The port cycle time defines which cycle time should be used for communication between IO-Link master and IO-Link device.

For most applications, “As fast as possible” is the best choice. When establishing communication, the master and the device select the shortest possible cycle time.

Under certain circumstances (e.g. when using inductive couplers or other devices switched between the master and the IO-Link device), it may be necessary to set the cycle time manually.

In these cases, select a fixed cycle time (which both master and device must support) to remedy this problem.



NOTE

A cycle time of 10 ms is required for Art.-No. 59450 Primary and Art.-No. 59451 Secondary inductive couplers from Murrelektronik GmbH.

Validation & backup

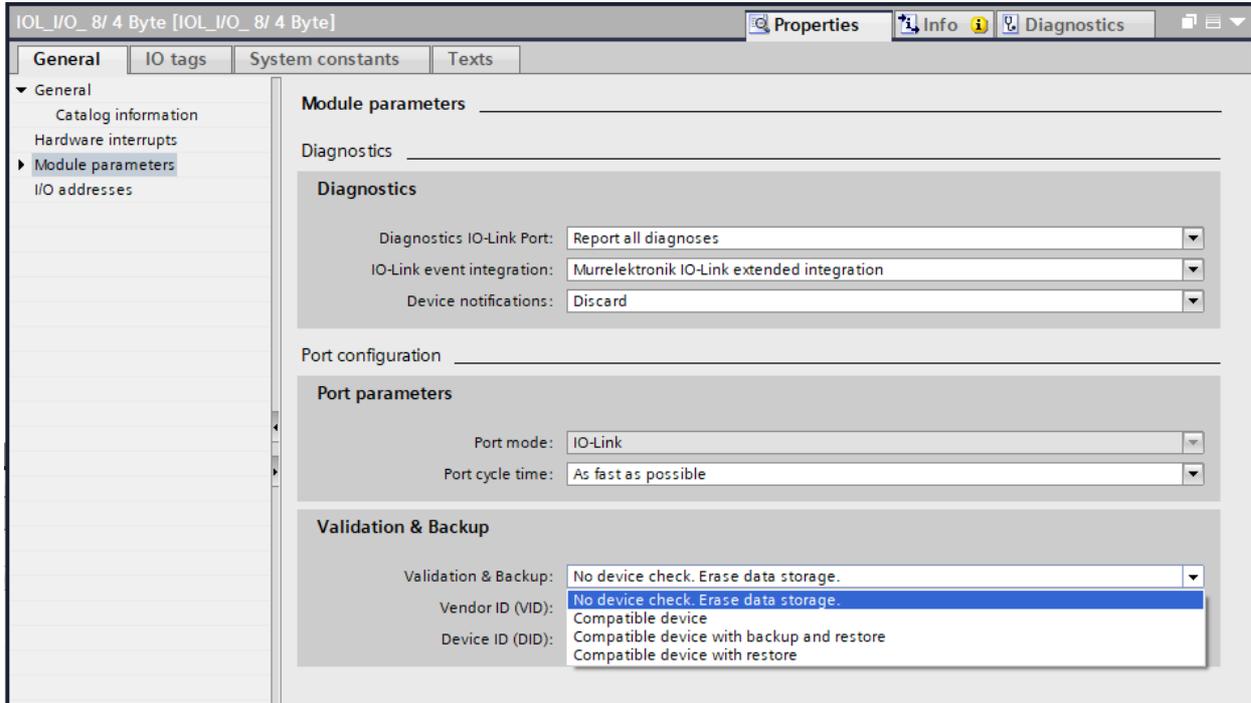


Fig. 8-31: Validation & backup

Selection	Meaning
D = Default	
No device check Erase data storage D	Manufacturer ID and Device ID of the connected device will not be verified, and device will get into operation.
Compatible device	The Manufacturer ID and Device ID of the connected device will be verified. <ul style="list-style-type: none"> ■ A compatible device is connected: <ul style="list-style-type: none"> □ The device will get into operation. ■ An incompatible device is connected: <ul style="list-style-type: none"> □ The device will not get into operation.

Tab. 8-25: Validation & backup_1

Selection	Meaning
Compatible device with backup and restore	<p>The Manufacturer ID and Device ID of the connected device will be verified.</p> <p>1 A compatible device is connected:</p> <ul style="list-style-type: none"> a) Valid data storage* data is available on the IO-Link Master port: <i>Data will be downloaded to the device and device will get into operation.</i> b) There is no data storage* data or the data is invalid on the IO-Link Master port for the connected device: <i>Data will be uploaded from the device and device will get into operation.</i> <p>2 An incompatible device is connected: No download or upload will be performed: <i>The device will not get into operation.</i></p> <p>3 A parameter on the device is changed either by local operation (e.g. buttons and display) or via an IO-Link Tool: <i>Data will be uploaded from the device.</i></p> <p>4 A parameter on the device is changed by acyclic access (IOL_Call) from the control system (PLC): <i>No upload will be performed.</i> To force an upload, you may write the valued 5 (ParamDownloadStore) to the standardized Index 2 (System Command) of the device. → Consult the IO-Link device product documentation.</p>
Compatible device with restore	<p>The Manufacturer ID and Device ID of the connected device will be verified.</p> <p>1 A compatible device is connected:</p> <ul style="list-style-type: none"> a) Valid data storage* data is available on the IO-Link Master port: <i>Data will be downloaded to the device and device will get into operation.</i> b) There is no data storage* data or the data is invalid on the IO-Link Master port for the connected device: <i>No upload will be performed, and device will get into operation.</i> <p>2 An incompatible device is connected: No download or upload will be performed: <i>The device will not get into operation.</i></p> <p>3 A parameter on the device is changed either by local operation (e.g. buttons and display) or via an IO-Link Tool: <i>No upload will be performed.</i></p> <p>4 A parameter on the device is changed by acyclic access (IOL_Call) from the control system (PLC): <i>No upload will be performed.</i></p>

Tab. 8-26: Validierung & Sicherung_2

***Data storage**

is the storage of the IO-Link device parameter in the IO-Link master.



Information on the LED display IO-Link can be found in Tab. 9-3: "LED indication IO-Link"

Vendor ID (VID)

Selection	Meaning
2-byte list, byte-wise, values separated by comma and in hexadecimal notation.	Vendor ID of the connected IO-Link device. Is used for an activated validation (compatible device).

Tab. 8-27: Vendor ID (VID)

Device ID (DID)

Selection	Meaning
3-byte list, byte-wise, values separated by comma and in hexadecimal notation.	Device ID of the connected IO-Link device. Is used for an activated validation (compatible device).

Tab. 8-28: Device ID (DID)

Validation example

Vendor ID and device ID

The parameters for validation are represented in the figure with the vendor ID and device ID of Art.-No. 55519.

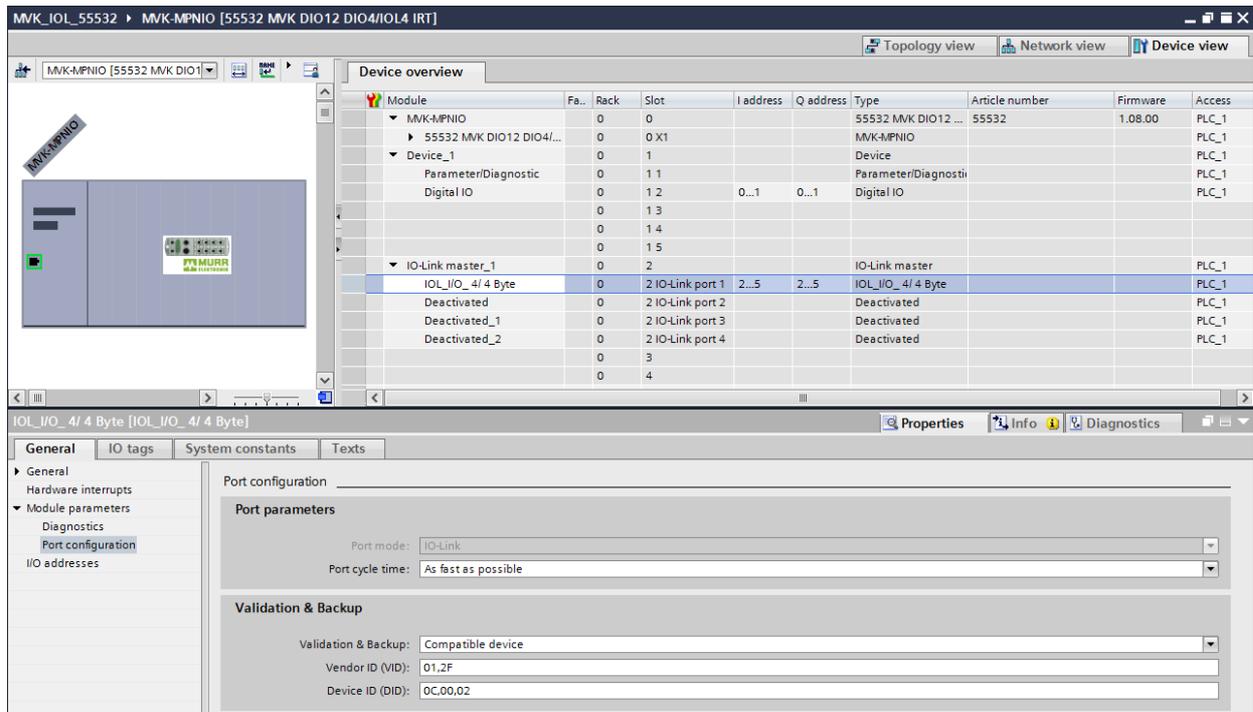


Fig. 8-32: Example validation_vendor ID and device ID

➔ Enter vendor ID and device ID in hexadecimal format.		
➔ Enter the values byte by byte and separate with commas.		
Validation	Decimal (dec)	Hexadecimal (hex)
Vendor ID Murrelektronik	303	01.2F
Device ID	786434	0C,00,02

Tab. 8-29: Vendor ID and device ID Art.-No. 55519

8.3 IO-Link device parameterization

IO-Link configuration

Using the **MVK-MPNIO** device, the configuration and parameterization of the IO-Link devices is possible in different ways:

- Local interface on the IO-Link device (keys and display).
- Configuration of the IO-Link device via a USB master with PC software.
- Configuration via Murrelektronik IO-Link tool and MVK-MPNIO master.
- Configuration via the IOL_CALL FB of the PROFINET control (acyclic communication).
- IODD integration into GSDML (IODD on Board).

IODD integration in GSDML

If the IO-Link device is available in the GSDML of the **MVK-MPNIO**, the IO-Link device can be inserted as a subslot in the configuration instead of an IO submodule

Parameters for the IO-Link device can then be set in the same way as for a comparable subslot in the configuration of your engineering software.



If your IO-Link device is not available, but you wish to use this type of configuration and parameter setting process, please contact your sales representative at Murrelektronik GmbH.

Murrelektronik IO-Link Device Tool

The **Murrelektronik IO-Link device tool** makes it possible to define parameters for IO-Link devices. A hardware catalog is displayed by means of a graphical user interface.



You can find the “Murrelektronik IO-Link Device Tool” software in our online shop under the product’s article number: shop.murrelektronik.com

The exact handling of the software can be found in the manual of the installed “Murrelektronik IO-Link Device Tool” under the menu item “*Help*” and the selection option “*Content*”.

For each IO-Link master port, one IO-Link device can be assigned and set via its IODD.

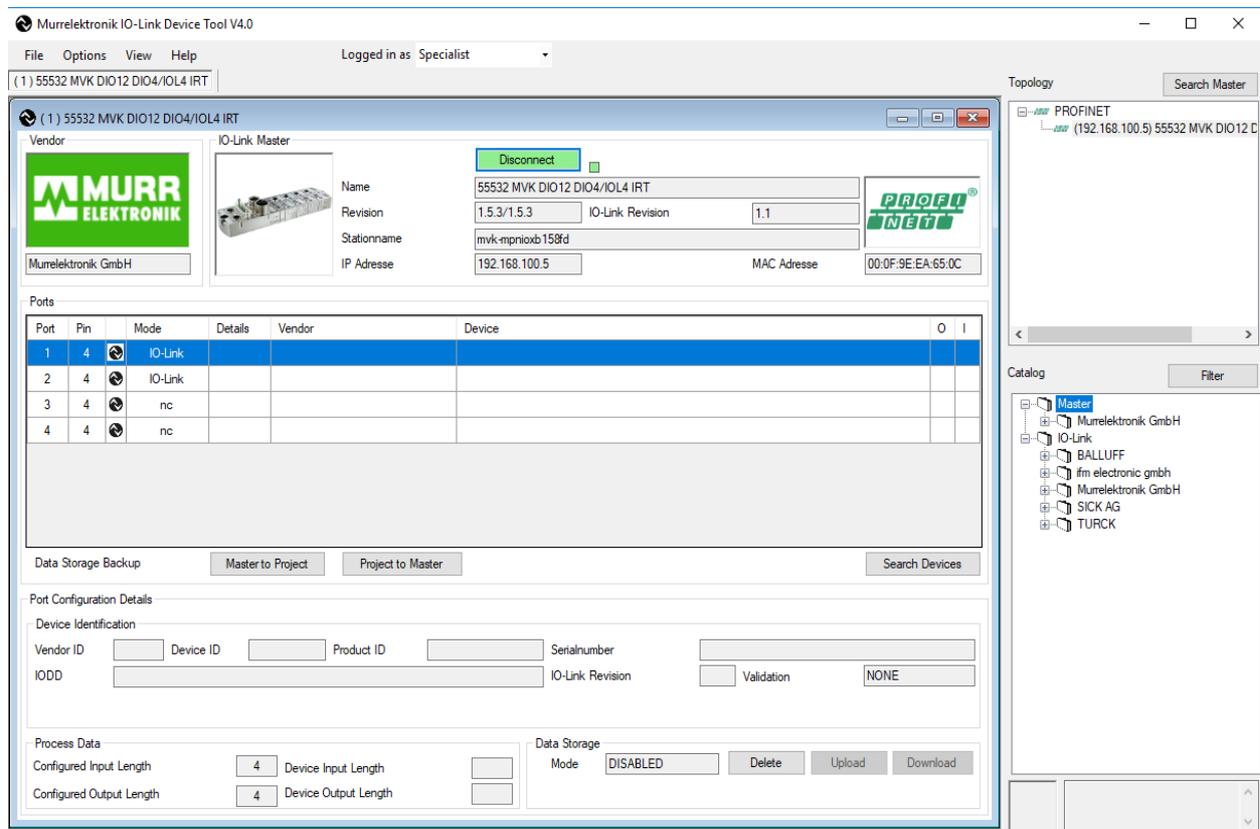


Fig. 8-33: Murrelektronik IO-Link Device Tool

8.3.1 Cyclic and acyclic communication

The IO-Link specification defines three types of data that are exchanged between the IO-Link master and the IO-Link device:

- Cyclic process data (process data objects input/output)
- Acyclic data in the form of device data (on-request data objects)
- Acyclic data as events

The process data objects and their port qualifiers are transmitted cyclically once communication has been established.

For each IO-Link port, the transmission time parameters can be defined individually as an IO-Link cycle time (see chap. Fig. 8-30: "Cycle time for communication").

The process data of the connected device can each have a size of 0 to 32 bytes (input and output, respectively) and will be transmitted via the set address ranges.

The process data size is defined by the device. The port qualifier indicates whether the process data is valid.

Device data (on-request data objects) are:

- Device parameters
- I&M data records (Identification & Maintenance)
- Diagnostic information

Device data can be written to the device as parameters or read from the device as device states.

Transmission takes place acyclically and only on request of the IO-Link master.

IO-Link events are error messages and warnings/maintenance data.

If the device sets the event flag, the IO-Link master will collect the diagnostic data from the device. The **MVK-MPNI**O device will forward the diagnostic data to the controller via the fieldbus.

Further information on device diagnostics and IO-Link event codes are available in chap. Tab. 8-21: "IO-Link event integration".

8.3.1.1 Acyclic IO-Link access

Acyclic access to different data areas in the IO-Link master or access to the data of the IO-Link devices takes place via PN-IO read/write services:

- Read/Write services for I&M data in the master and IO-Link devices.
- IO-Link function block IOL_Call with ISDU (Index Service Data Unit) IOL_Index 0x0000 – 0x7FFF and IOL_Subindex 0x00 – 0xFF

(See: IO-Link Integration Part1 2812_V100_080124 and IO-Link Integration for PROFINET_Ed2_2832_V10_Jun17).

The IO-Link function block supports the following tasks:

- Parameterization of an IO-Link device,
- Diagnostic of an IO-Link device,
- Execution of IO-Link port functions,
- Back-up and recovery of IO-Link device parameters.

The IO-Link function block is supplied by the controller manufacturer (e.g. Siemens FB IO_Link_Device for TIA Portal), see chap. 8.3.1.3 "IO-Link device function block".



NOTE

Further information on this can be found in the manual of the respective control manufacturer.

8.3.1.2 I&M data

I&M data can be read acyclically at any time in order to identify the devices installed in the system. The system-specific description, location, function and installation date can be written to the device.

The **MVK-MPNIO** device supports the following I&M data records:

- IM_Index = 0xAFF0 -> Read access to IM0 IOL_M
- IM_Index = 0xAFF1 -> Read access to IM1 IOL_M
- IM_Index = 0xAFF2 -> Read access to IM2 IOL_M
- IM_Index = 0xAFF3 -> Read access to IM3 IOL_M
- IM_Index = 0xAFF4 -> Read access to IM4 IOL_M
- IM_Index = 0xB063 -> Read access to IOL_M Directory

I&M0 (port0, index 0xAFF0)

I&M0 Data	Size in byte/access (read/write)	Description
Vendor ID	2 / r	ID of the manufacturer (Vendor ID)
Order ID	20 / r	Product name
IM_Serial_Number	16 / r	Serial number of device
IM_Hardware_Revision	2 / r	Hardware revision of the device
IM_Software_Revision	4 / r	Software revision of the device (V0.0.0)
IM_RevisionCounter	2 / r	Revision counter
IM_Profile_ID	2 / r	ID IO-Link submodule profile (API = 0x4E01)
IM_Profile_Specific_Type	2 / r	Additional values for profiles (= 0 not used)
IM_Version	2 / r	I&M version (Default 0x0101)
IM_Supported	2 / r	Supported I&M data records (e.g. 0x0001 -> only I&M0 is supported)

Tab. 8-30: I&M0 data record

I&M1 (Slot0, index 0xAFF1)

I&M1 Data	Size in byte/access (read/write)	Description
TagFunction of submodule	32 / r/w	Function of the device
TagLocation of submodule	22 / r/w	Location of the device in the system

Tab. 8-31: I&M1 data record

I&M2 (Slot0, index 0xAFF2)

I&M2 Data	Size in byte/access (read/write)	Description
Installation_Date	16 / r/w	Installation date of the device

Tab. 8-32: I&M2 data record

I&M3 (Slot0, index 0xAFF3)

I&M3 Data	Size in byte/access (read/write)	Description
Descriptor	54 / r/w	Description of the device

Tab. 8-33: I&M3 data record

**I&M4
(Slot0, Index 0xAFF4)**

I&M4 Data	Size in byte/access (read/write)	Description
Signature	54 / r/w	Data area (ASCII format) for free use (can be used, for example, for saving a device signature)

Tab. 8-34: I&M4 data record

Siemens TIA Portal function blocks for acyclic reading and writing of I&M data records:

- **RDREC** function block for acyclic reading of data records
- **WDREC** function block for acyclic writing of data records

**I&M99
(Slot1, Index 0xB063)**

I&M4 Data	Size in byte/access (read/write)	Description
IOL_Version	1 / r	Supported IO-Link revision of the master 0x11 (IO-Link version 1.1)
IOL_PROFILE_VERSION	1 / r	IO-Link Profile 0x10 (IO-Link profile ver.1.0)
IOL_FEATURE_SUPPORT	4 / r	Bit field displaying features 0x00000000
NUMBER_OF_PORTS	1 / r	Number of available IO-Link ports 0x02 (number of supported IO-Link ports)
REF_PORT_CONFIG	1 / r	Index to port configuration 0x00 (does not support any port configuration files)
REF_IO_MAPPING	1 / r	Index to I/O mapping 0x00 (does not support any I/O mapping data)
REF_IPAR_DIRECTORY	1 / r	Index to iPar directory 0x00 (does not support any iPar directory)
REF_IOL_M	1 / r	Index auf IOL-M parameters 0x00 (does not support any IOL-M parameters)
NUMBER_OF_CAPS	1 / r	Number of client access points 0x01 (number of client access points)
INDEX_CAP1	1 / r	0xFF (Client Access Point for IOL_CALL)

Tab. 8-35: I&M99 data record

Reading of I&M data record Function block RDREC_Instance in the TIA portal

Website
support.industry.siemens.com/

Example: I&M Index 0xAFF0

```

1 // -----
2 // I&M Read
3 //
4 "RDREC_Instance" (REQ:=#PARA_RDREC.REQ,
5     ID:=283,
6     INDEX:=16#AFF0,
7     MLEN:=#PARA_RDREC.MLEN,
8     VALID=>#PARA_RDREC.VALID,
9     BUSY=>#PARA_RDREC.BUSY,
10    ERROR=>#PARA_RDREC.ERROR,
11    STATUS=>#PARA_RDREC.STATUS,
12    LEN=>#PARA_RDREC.LEN,
13    RECORD:=#PARA_RDREC.RECORD);
14

```

Fig. 8-34: Function Block RDREC_Instance

RDREC block	Functionality
RDREC_Instance	This function block is used <ul style="list-style-type: none"> to read out I&M data acyclically using the S7 program

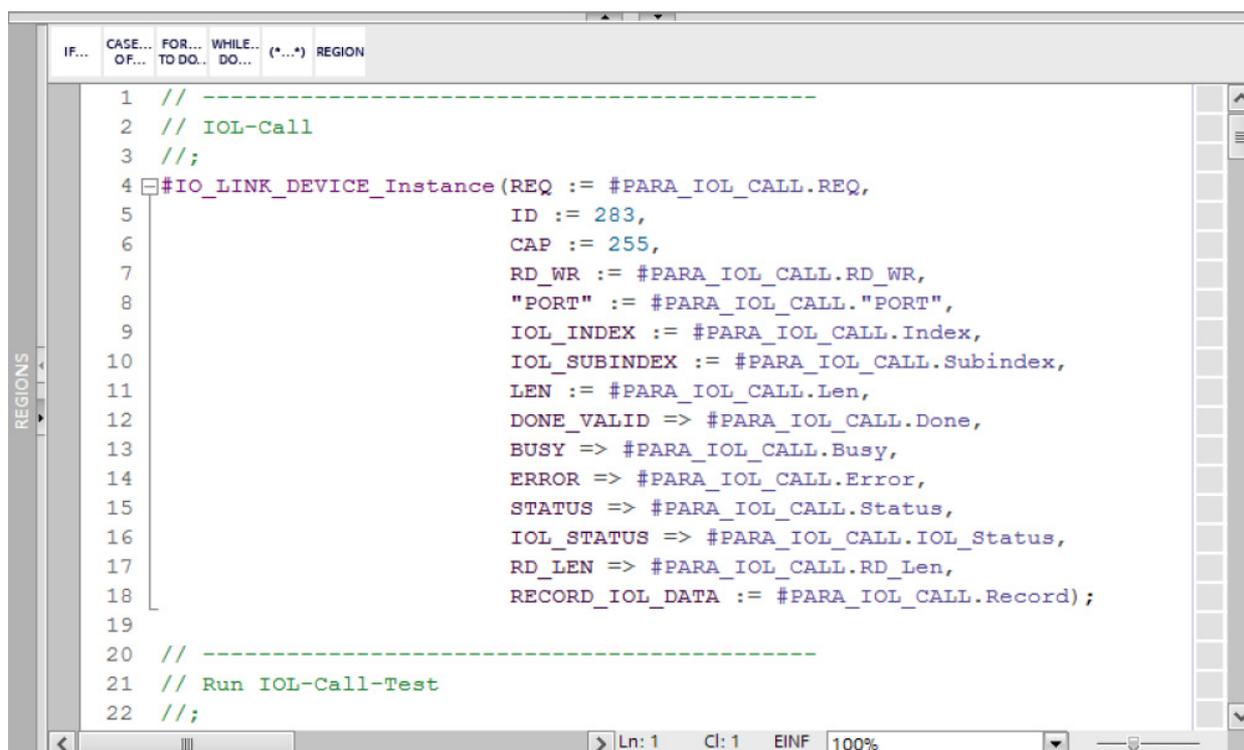
8.3.1.3 IO-Link device function block

IO_LINK_DEVICE function block in TIA Portal

The IO-Link function block is contained in the "IO_LINK_Library_V14.zal14" library.

Library	Website
IO_LINK_Library_V14.zal14	support.industry.siemens.com/

The "IO_LINK_DEVICE" function block in the TIA Portal is similar to the IOL_CALL block. IOL_CALL is defined in the IO-Link specification.



```

1 // -----
2 // IOL-Call
3 //;
4 #IO_LINK_DEVICE_Instance(REQ := #PARA_IOL_CALL.REQ,
5     ID := 283,
6     CAP := 255,
7     RD_WR := #PARA_IOL_CALL.RD_WR,
8     "PORT" := #PARA_IOL_CALL."PORT",
9     IOL_INDEX := #PARA_IOL_CALL.Index,
10    IOL_SUBINDEX := #PARA_IOL_CALL.Subindex,
11    LEN := #PARA_IOL_CALL.Len,
12    DONE_VALID => #PARA_IOL_CALL.Done,
13    BUSY => #PARA_IOL_CALL.Busy,
14    ERROR => #PARA_IOL_CALL.Error,
15    STATUS => #PARA_IOL_CALL.Status,
16    IOL_STATUS => #PARA_IOL_CALL.IOL_Status,
17    RD_LEN => #PARA_IOL_CALL.RD_Len,
18    RECORD_IOL_DATA := #PARA_IOL_CALL.Record);
19
20 // -----
21 // Run IOL-Call-Test
22 //;
    
```

Fig. 8-35: IO-Link device function block

IO-Link block	Functionality
IO_LINK_DEVICE	This function block is used <ul style="list-style-type: none"> ■ to write device parameters acyclically to an IO-Link device via the S7 program ■ to read parameters, measured values and diagnostic data from an IO-Link device

Input parameters

Parameters	Data type	Description
REQ	BOOL	Positive edge: To initiate data transmission
ID	HW_IO	For S7-1200/1500 Hardware ID of the IO-Link communication module
	DWORD	For S7-300/400 Logical address of the IO-Link communication module (module or submodule)
CAP	DINT (S7-1200/1500)	Client Access Point (CAP = 255)
	INT (S7-300/400)	
RD_WR	BOOL	Read or write access 0: read 1: write
PORT	INT	Number of port at which the IO-Link device is operated. Possible values: 0 ... 63 Port 0 IO-Link master module; Port 1 IO-Link device on port 1, etc.
IOL_INDEX	INT	Number of IO-Link index to be read out or described
IOL_SUBINDEX	INT	Number of IO-Link subindex to be read out or described; 0: total records 1 ... 255: Parameter from record
LEN	INT	Length of data to be written (net data) Read: 0 ... 232 (not relevant) Write: 1 ... 232

Tab. 8-36: IO_LINK_DEVICE input parameters

Output parameters

Parameters	Data type	Description
DONE_VALID	BOOL	Validity: 0: Data not valid 1: Data valid
BUSY	BOOL	Order in progress: 0: Job completed (valid or error) 1: Order in process
ERROR	BOOL	Error status: 0: No error 1: Aborted with error
STATUS	DWORD	ERROR = 1 -> function error, see Tab. 8-39: "IO_LINK_DEVICE - Parameter STATUS" and Tab. 8-40: "IO_LINK_DEVICE - Parameter STATUS error code" ERROR = 0 -> Status of function DW#16#000x0000 (x: processing step 0 ... 3)
IOL_STATUS	DWORD	ERROR = 1 -> IO-Link error or communication error, see Tab. 8-41: "IOL M Error Codes"
RD_LEN	INT	Length of the read data (net data)

Tab. 8-37: IO_LINK_DEVICE output parameters

Input and output parameters

Parameters	Data type	Description
RECORD_IOL_DATA	ARRAY [0 ... 231] of BYTE	Source and target areas for the data to be read and to be written

Tab. 8-38: IO_LINK_DEVICE input parameters and output parameters

Parameter STATUS

The STATUS is composed of 4 bytes:

Byte 3	Byte 2	Byte 1	Byte 0
Manufacturer-specific ID	0x80 Defines the error as error of acyclic communication	STATUS code	Manufacturer-specific ID

Tab. 8-39: IO_LINK_DEVICE - Parameter STATUS

Status code	Name	Description
0xFF000000	TIMEOUT	Internal error in communication with the device
0x00FFFF00	INVALID_HANDLE	
0x00FFFE00	HANDLE_OUT_OF_BUFFERS	
0x00FFFD00	HANDLE_DESTINATION_UNAVAILABLE	
0x00FFFC00	HANDLE_UNKNOWN	
0x00FFFB00	HANDLE_METHOD_INVALID	
0xxx80A0xx	MASTER_READ_ERROR	Error while reading
0xxx80A1xx	MASTER_WRITE_ERROR	Error while writing
0xxx80A2xx	MASTER_MODULE_FAILURE	Failure of the IO-Link master, possible bus error
0xxx80A6xx	MASTER_NO_DATA	No data received
0xxx80A7xx	MASTER_BUSY	IO-Link master overloaded
0xxx80A9xx	MASTER_FEATURE_NOT_SUPPORTED	Function not supported by IO-Link master
0xxx80AAxx	MASTER_RESOURCE_UNAVAILABLE	IO-Link master not available
0xxx80B0xx	ACCESS_INVALID_INDEX	Index invalid, wrong INDEX_CAP used
0xxx80B1xx	ACCESS_WRITE_LENGTH_ERROR	Length of data to be written cannot be processed by module, possibly wrong module addressed
0xxx80B2xx	ACCESS_INVALID_DESTINATION	Wrong slot addressed
0xxx80B03xx	ACCESS_TYPE_CONFLICT	IOL_CALL invalid
0xxx80B5xx	ACCESS_STATE_CONFLICT	Error in IOL_CALL sequence
0xxx80B6xx	ACCESS_DENIED	IO-Link master module denies access
0xxx80C2xx	RESOURCE_BUSY	IO-Link master module overloaded or waiting for a reply from connected IO-Link device
0xxx80C3xx	RESOURCE_UNAVAILABLE	
0xxx8901xx	INPUT_LEN_TOO_SHORT	The index to be read contains more data than specified for reading in the "LEN" input variable.

Tab. 8-40: IO_LINK_DEVICE - Parameter STATUS error code

IOL_STATUS The IOL_STATUS consists of 2 bytes of IOL M error codes and 2 bytes of IOL error types.

FB IO_LINK_DEVICE - Parameter IOL_STATUS / IOL M Error Codes

IOL M Error Codes (2 bytes)		
Error Code	Designation according to spec.	Meaning
0x0000	No error	No error
0x7000	IOL_CALL conflict	Unexpected write request, read request expected
0x7001	Wrong IOL_CALL	Decoding error
0x7002	Port blocked	Port blocked by a different task
...	Reserved	-
0x8000	Timeout	Timeout, IOL master or IOL device ports overloaded
0x8001	Wrong index	Error: IOL index specified <32767 or >65535
0x8002	Wrong port address	Port address not available
0x8003	Wrong port function	Port function not available
...	Reserved	-

Tab. 8-41: IOL M Error Codes

FB IO_LINK_DEVICE - Parameter IOL_STATUS / IOL Error Types

IOL Error Types (2 bytes)		
Error Code	Designation according to spec.	Meaning
0x1000	COM_ERR	Communication error Possible cause: The addressed port is not parametrized as DI and is not in the IO-Link mode
0x1100	I_SERVICE_TIMEOUT	Timeout in communication, maybe device does not respond quickly enough
0x5600	M_ISDU_CHECKSUM	Master reports checksum error, access to device not possible
0x5700	M_ISDU_ILLEGAL	Device cannot process request from master
0x8000	APP_DEV	Application error in device
0x8011	IDX_NOTAVAIL	Index not available
0x8012	SUBIDX_NOTAVAIL	Subindex not available
0x8020	SERV_NOTAVAIL	Service temporarily unavailable
0x8021	SERV_NOTAVAIL_LOCTRL	Service temporarily unavailable, device overloaded (e.g. teach-in/ parametrization of device active on device)
0x8022	SERV_NOTAVAIL_DEVCTRL	Service temporarily unavailable, device overloaded (e.g. teach-in/ parametrization of device via DTM/PLC, etc., active)
0x8030	PAR_VALOUTOFRNG	Parameter value outside valid range
0x8031	PAR_VALGTLIM	Parameter value above upper limit
0x8032	PAR_VALLTLM	Parameter value below lower limit
0x8033	VAL_LENORRUN	Length of the data to be written does not fit the length defined for the parameter
0x8034	VAL_LENUNDRUN	
0x8035	FUNC_NOTAVAIL	Function in device not available
0x8036	FUNC_UNAVAILTEMP	Function in device temporarily unavailable
0x8040	PARA_SETINVALID	Parameters invalid: Parameters possibly do not fit other parametrizations of the device
0x8041	PARA_SETINCONSIST	Parameters inconsistent
0x8082	APP_DEVNOTRDY	Application not ready, device overloaded
0x8100	UNSPECIFIC	Manufacturer-specific according to device documentation
0x8101 to 0x80FF	VENDOR_SPECIFIC	

Tab. 8-42: IOL Error Types

8.4 Basic setting

Identification of the individual devices in the network

The identification of PNIO devices takes place via their MAC address and the corresponding device type.

If you want to commission several devices of the same type, they need to be clearly differentiated.

Select the “PN/IE” network in the network view. You can use the **Online | Assign device name** menu to search for available users.

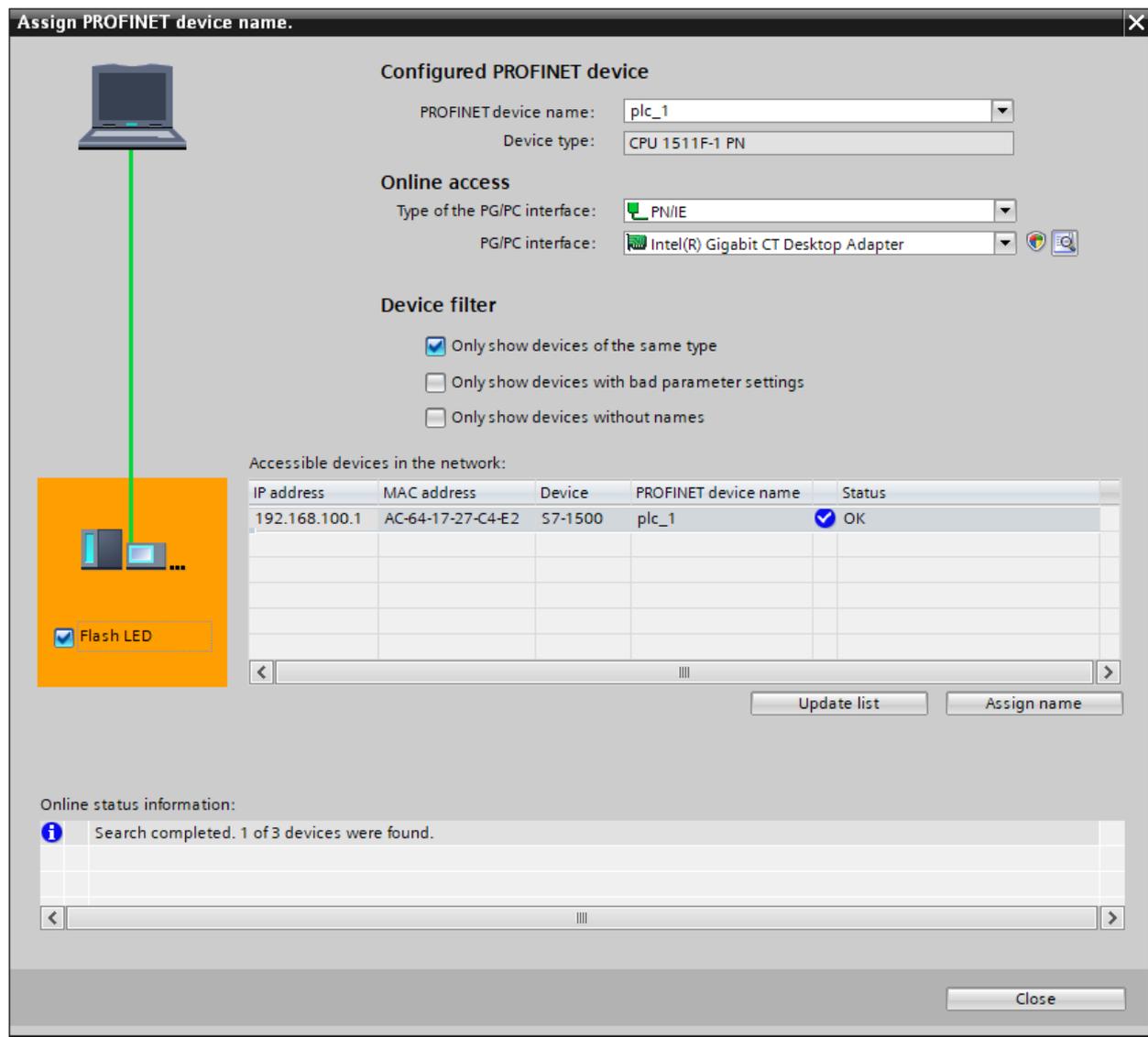


Fig. 8-36: Identifying individual devices in the network

Identification is done via a flashing test. The flashing test causes the LED of the selected **MVK-MPNIO** to flash.

See Tab. 9-12: "Extended LED indication, identification of the device"

- 1 | Mark the available device.
- 2 | Select the **LEDs flashing** option.

Assign the PROFINET device name

After having clearly identified a device, you can assign a name. The IP address is entered automatically by the PNIO controller via DCP (Discovery and Configuration Protocol).

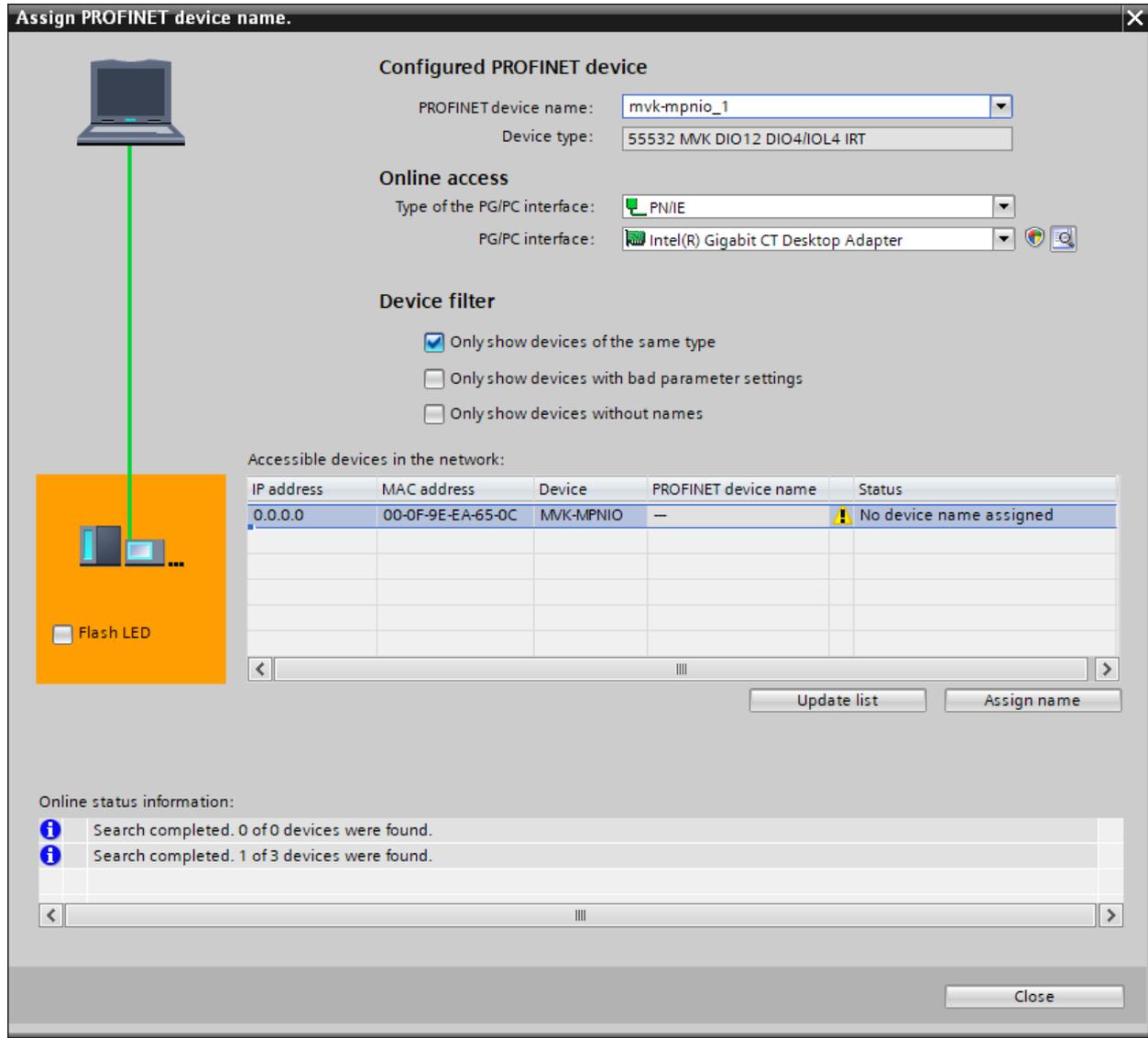


Fig. 8-37: Assign a device name

The address and name resolution is controlled only via this remanently stored name.

- 1 | **Select device.**
- 2 | Click **Assign name.**

PROFINET device name

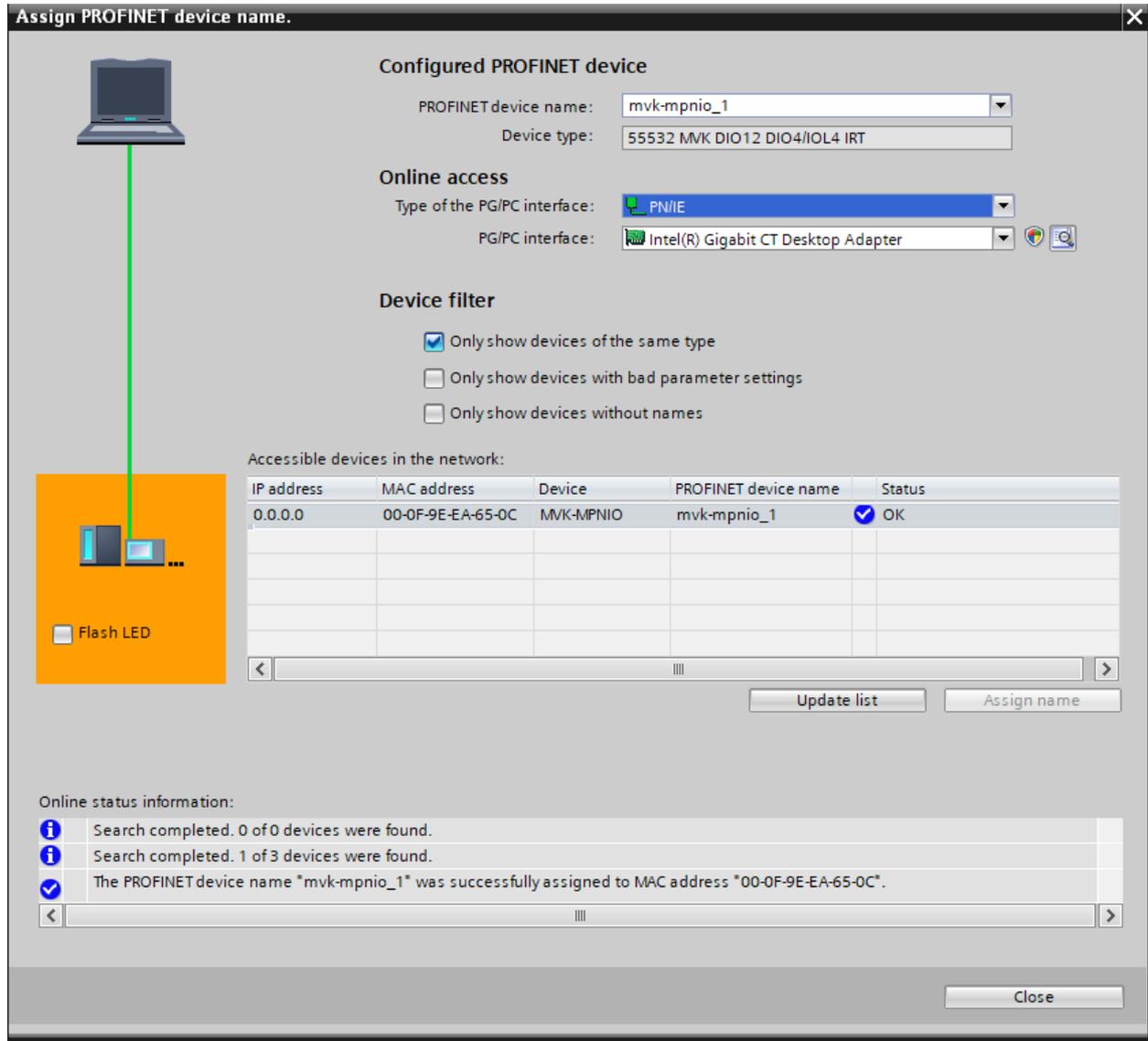


Fig. 8-38: PROFINET device name

The **TIA portal** now displays **MVK-MPNIO** with the newly assigned device name.

8.4.1 Temporary IP address

Entering IP addresses

You can assign an IP address to the **MVK-MPNIO** device that will not be stored. To do so, enter the desired IP address and the subnet mask to be used.

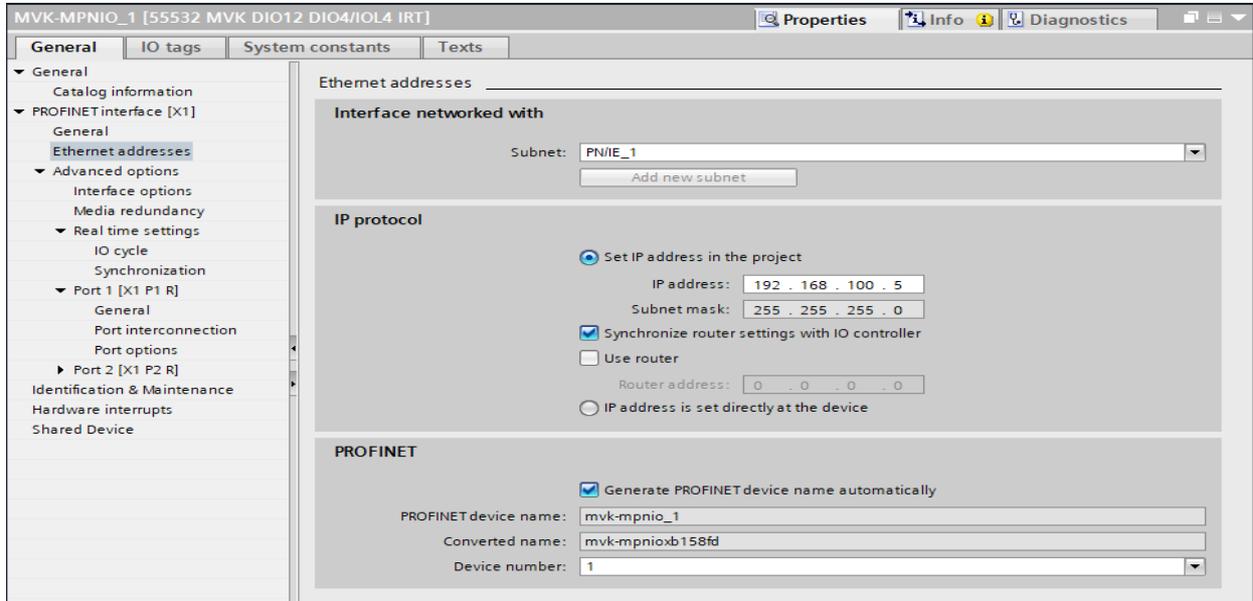


Fig. 8-39: Entering IP addresses

In the **Properties | General** tab

➔ Double-click **Ethernet addresses**.

8.5 PROFINET topology

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 **MVK-MPNIO** devices support the topology setting and automatic topology recognition by the Engineering Tool.

The section below describes how to set the topology for **MVK-MPNIO**. Setting via connected neighboring devices is performed via **Ports X1 P1** and **X1 P2** representing the physical interfaces.

In the **Port interconnection** tab | **Partner port** | a list of possible ports for the devices available in the project is available via the **Partner port** menu option.

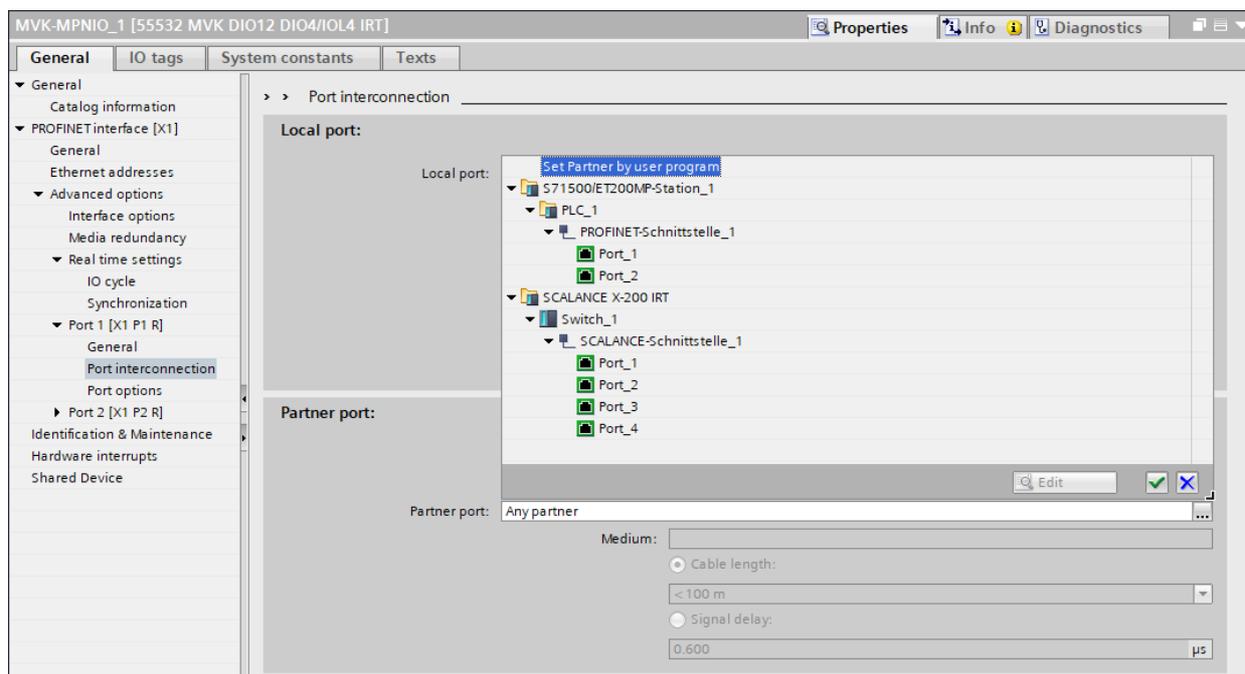


Fig. 8-40: Setting the topology

8.6 Fast-Start-Up (FSU) configuration

Topology

To configure the device for the Fast Start-Up (FSU) and to achieve the desired runtime characteristics, several steps are needed. The corresponding parameters are set directly in the module.

➔ Select the module in the **Topology view**.

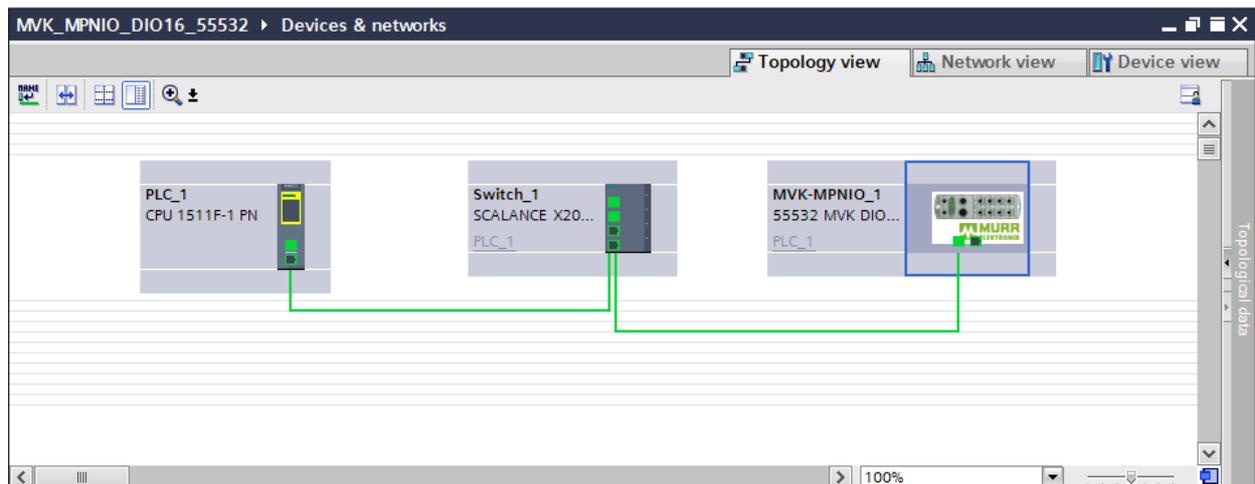


Fig. 8-41: Topology

Activation of the prioritized startup

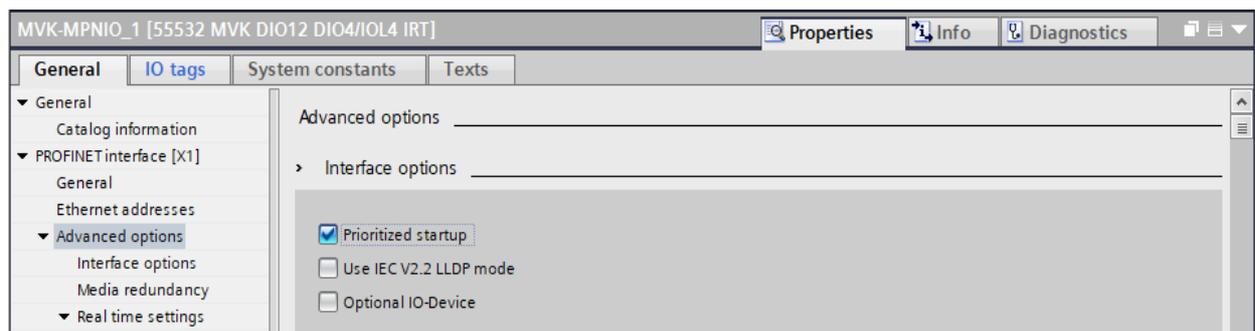


Fig. 8-42: Enabling prioritized startup

➔ Activate the selection **Prioritized startup**.

This activates the fundamental FSU functionality for the device.

Parameter setting on the bus connections

When establishing a conventional connection, the individual PNIO devices negotiate connection parameters causing a delay.

To prevent this delay, fixed connection parameters need to be defined for each port (that participates in the FSU).

- ➔ Select **Port 1** and **Port 2** in the properties for the module, and set the corresponding parameters there.
Set the same parameters on the port of the neighboring module.

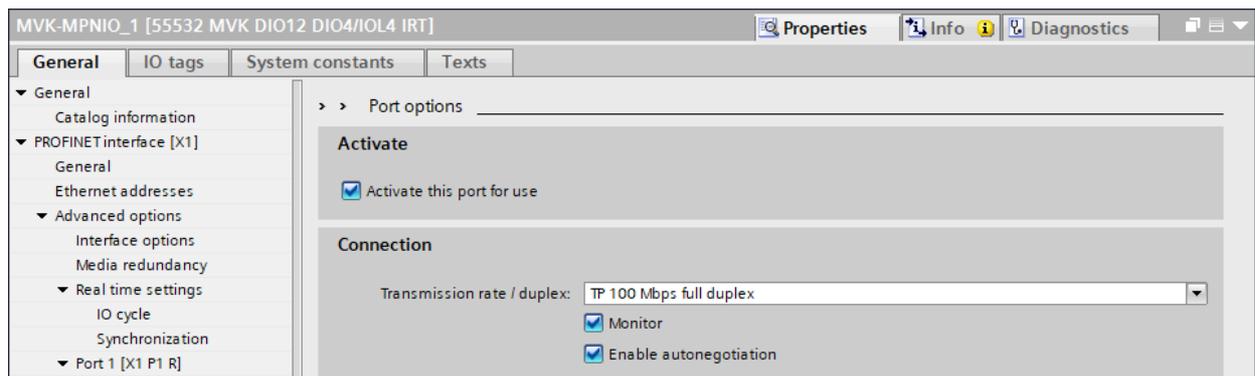


Fig. 8-43: Setting transmission rate/duplex

- ➔ Sets the transmission rate/duplex to **TP 100 Mbps full duplex**.
This eliminates the time-consuming negotiation of connection parameters when the device is started.

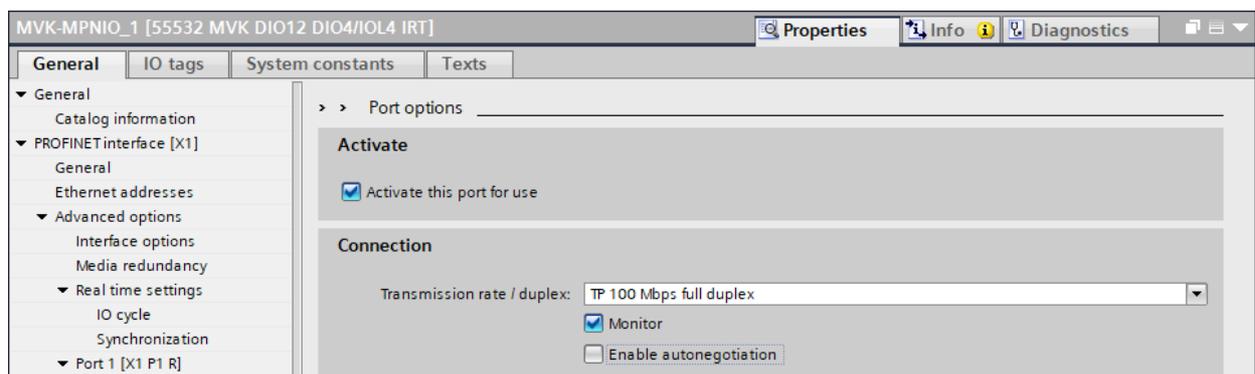


Fig. 8-44: Disabling autonegotiation

- ➔ **Autonegotiation** must be disabled.
This eliminates time-consuming negotiation of connection core pairs when the device is booted.

This completes the settings required for using FSU for the **MVK-MPNIO** device.

8.7 Media redundancy (MRP) configuration

The procedure regarding the configuration of media redundancy is described in the engineering software manual.

In this document, a configuration example is described using the Siemens TIA Portal engineering software.

Preparatory steps:

- 1 | Set up a project in the TIA portal.
- 2 | Add a **controller** with two ports or an additional **PROFINET Managed Switch**.
- 3 | Add the **MVK-MPNIO** device.
- 4 | Assign the **MVK-MPNIO** device to the controller (see Fig. 8-45: "Setting up the MPR manager").

Setting up the MPR manager

For a ring configuration, 2 ports of a PROFINET-managed switch or an S7 CPU must be set as ring manager and all other users as clients.

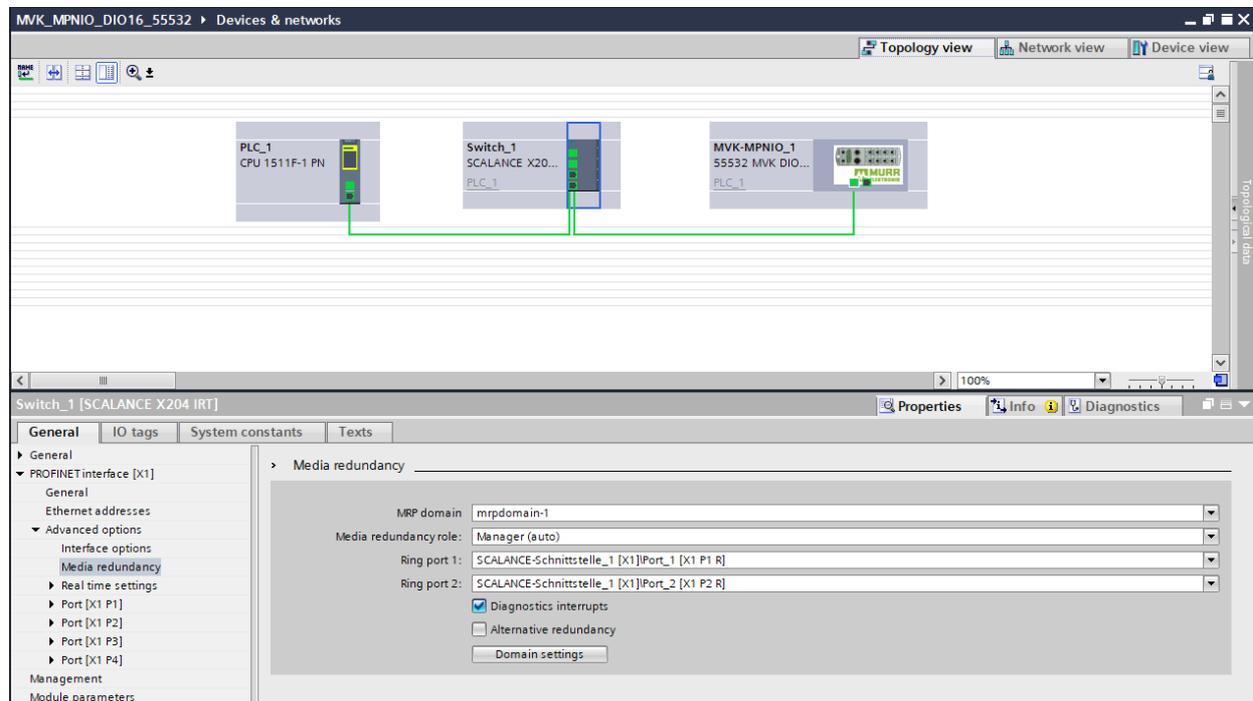


Fig. 8-45: Setting up the MPR manager

- 1 | Select the **PROFINET Managed Switch**.
- 2 | Navigate to the **PROFINET interface | Advanced options | Media redundancy**.
- 3 | For “**Media redundancy role**”, set **Manager (Auto)**.
- 4 | Enable the selection “**Diagnostics interrupts**”.

Setting up an MRP client

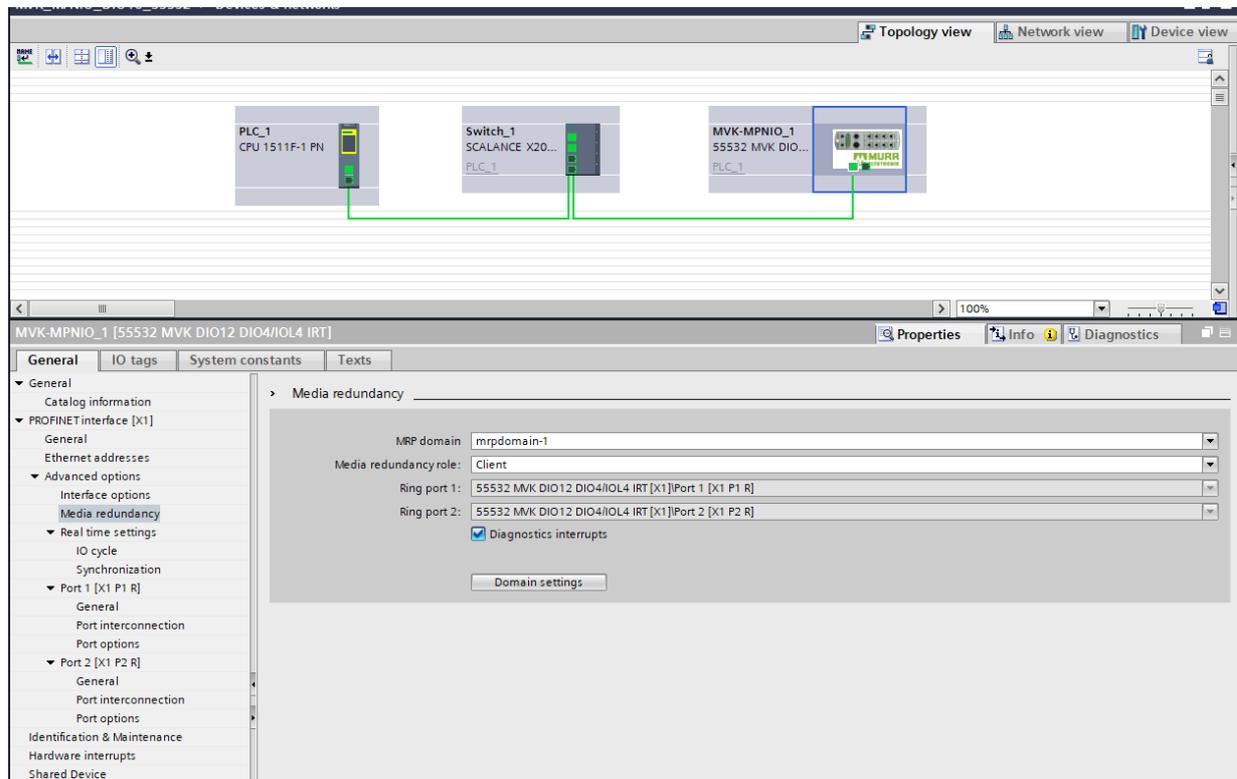


Fig. 8-46: Setting up an MRP client

- 1 | Select the **MVK-MPNIO** device.
- 2 | Navigate to the menu item **PROFINET interface | Advanced options | Media redundancy**.
- 3 | With “**Media redundancy role**”, set **Client**.
- 4 | Enable **Diagnostic interrupts**.

Note:

The **MVK-MPNIO** device must be in the same MRP domain.

Setting up the MRP cycle times

As soon as the media redundancy has been set, the IO cycle times for each device must be parameterized.

Depending on the MRP master, the RT requirements and the system structure, the IO cycle times and factors have to be set in the following window.

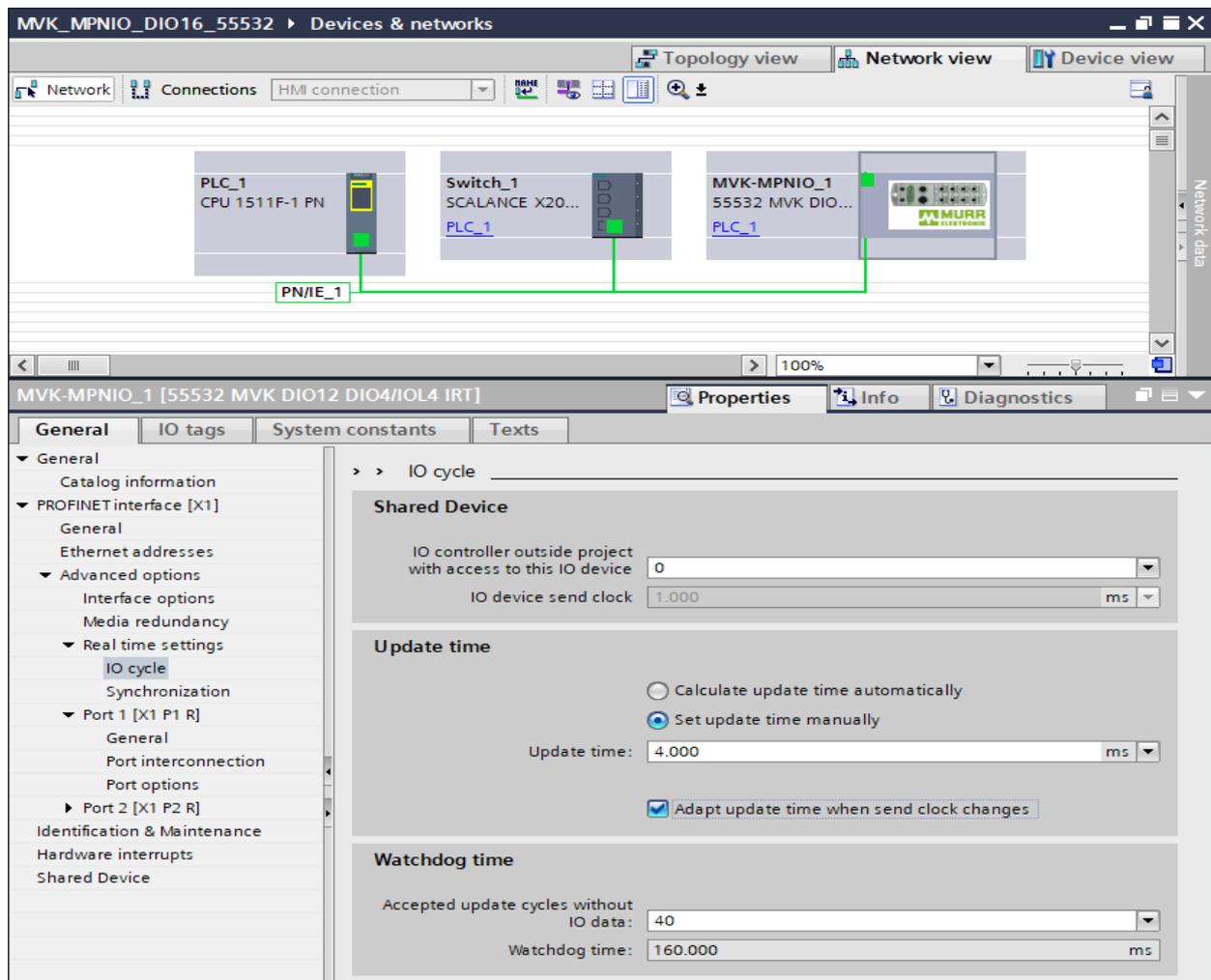


Fig. 8-47: Setting up the MRP cycle times

- 1 | To the menu item
Navigate to the menu item **PROFINET interface | Advanced options | Real-time settings | IO cycle**.
- 2 | Set the values for: **Update time** and **Accepted update cycles without IO data**.

Setting up an MRP domain

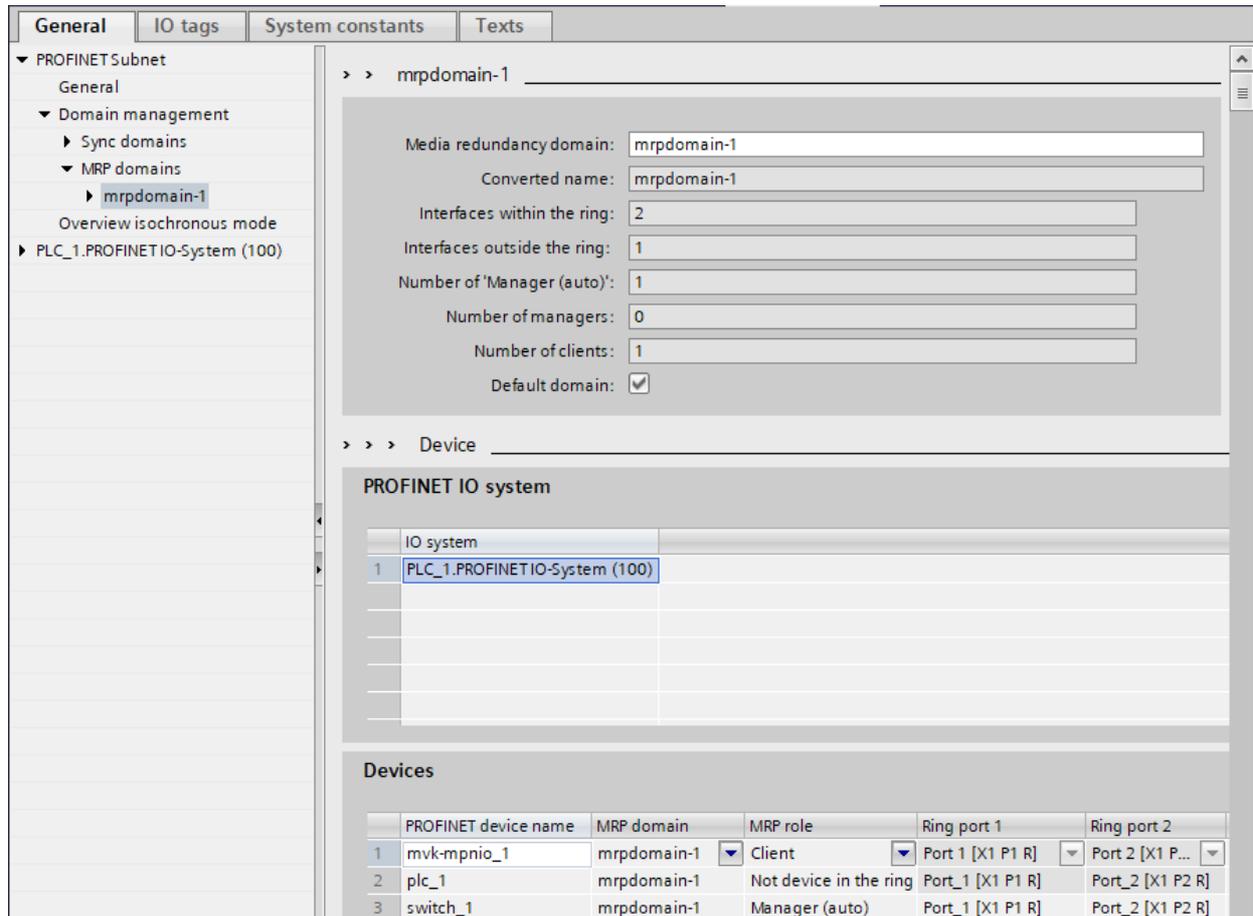


Fig. 8-48: Setting up an MRP domain

- 1 | Navigate to the menu item **Domain Management | MRP-Domains | mrpdomain-1** to obtain the overview of ring users.
 - 2 | Assign the **PROFINET Managed Switch** to the IO controller.
 - 3 | Save the created project.
 - 4 | Click the **PNIE subnet**.
The bus **PLC_1.PROFINET IO-System (100)** is displayed.
 - 5 | Assign the **MVK-MPNIO** module to the IO controller.
- All users of the ring configuration are listed under **Devices**.*



For further information, refer to chap. 3.3.6 "Media redundancy (MRP)".

8.8 Isochronous real time (IRT) configuration

IRT

The procedure for configuring the IRT operation can be found in the engineering software manual.

In this document, a configuration example is described using the Siemens TIA Portal engineering software. As a prerequisite for this communication type, special hardware components with real-time capability (IRT) are required.



NOTE

The device is no active participant in the IRT data exchange. It supports the loss-free transmission of IRT telegrams for synchronized fieldbus devices in the same Ethernet subnet.

Preparatory steps:

- ➔ Set up a project in the **TIA portal**.
- ➔ Add an IRT-capable controller.
- ➔ Add the device.
- ➔ Connect the **PROFINET** interfaces.



NOTE

Make sure that no media redundancy has been set (see chap. 3.3.6 "Media redundancy (MRP)").

IRT communication: Setting up the Sync master



NOTE

This procedure describes the configuration of the not isochronous IRT communication. How to set up an isochronous IRT communication can be found in the software manual of your engineering software.

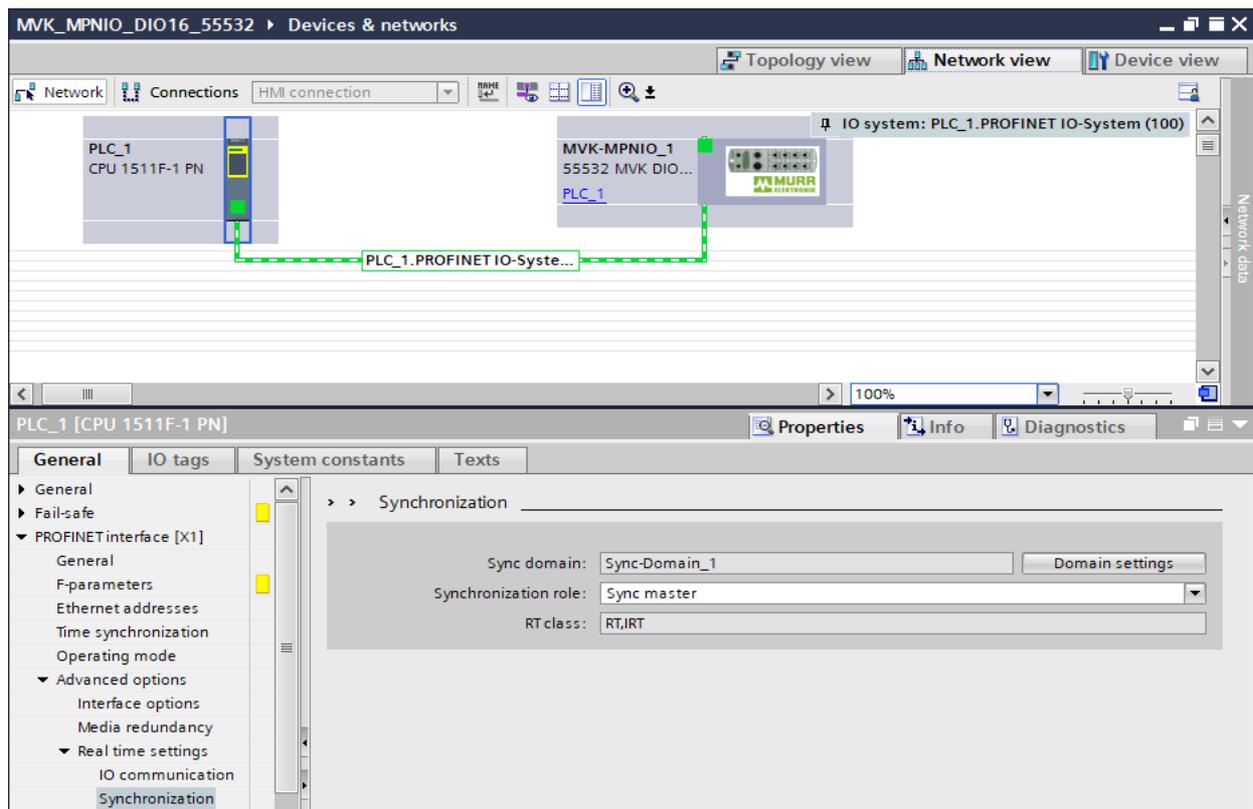


Fig. 8-49: IRT communication: Setting up the Sync master

- 1 | Double-click the **PLC_1** controller.
- 2 | Navigate to the menu item **Advanced options | Real-time setting | Synchronization**.
- 3 | For “**Synchronization role**”, set the **Sync master**.

**IRT communication:
Setting up the Sync
slave**

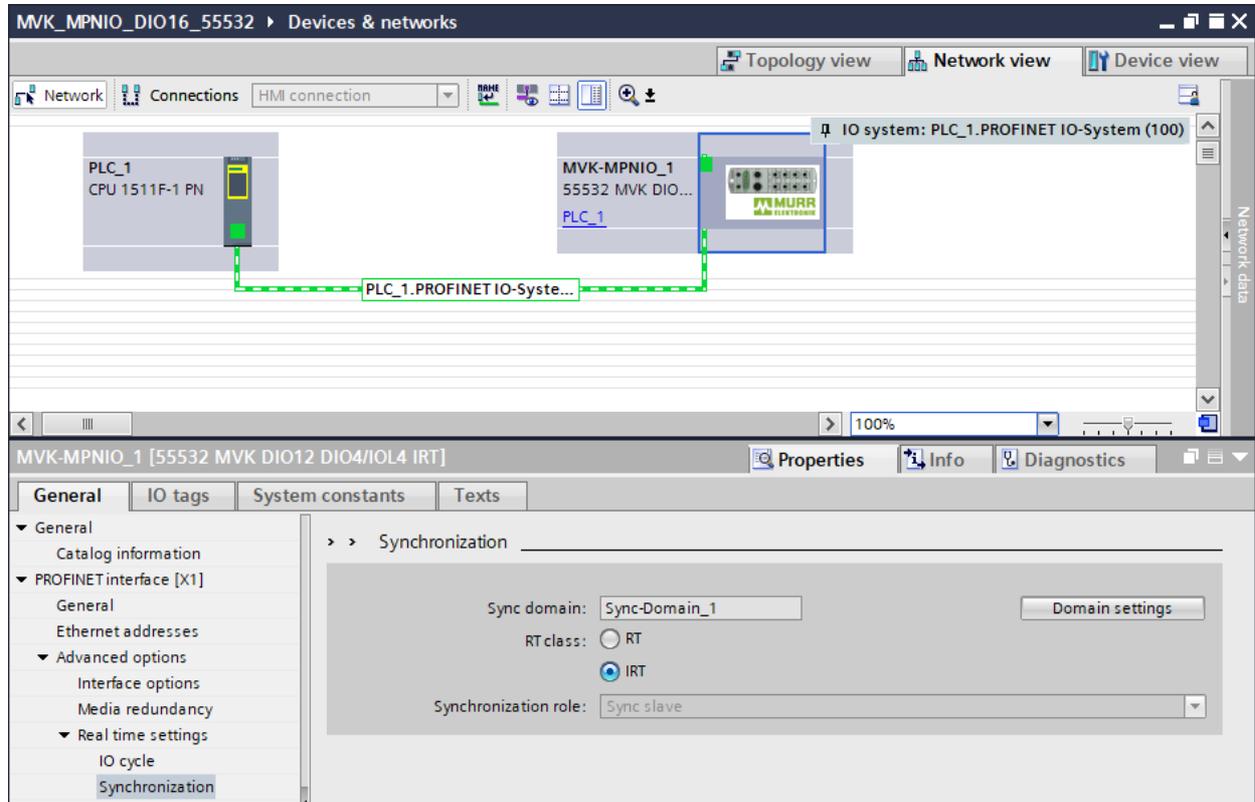


Fig. 8-50: IRT communication: Setting up the Sync slave



For further information, refer to chap. 3.3.5 "Isochronous Real Time (IRT)".

8.9 Shared Device (SD) configuration

The procedure regarding the configuration of the Shared Device can be found in the engineering software manual.

Here, we describe a configuration example using the Siemens TIA Portal.

This procedure requires two projects to be created and a **MVK-MPNIO** device to be configured in both projects.

This procedure is necessary, although it is physically the same device.

Creating project 1

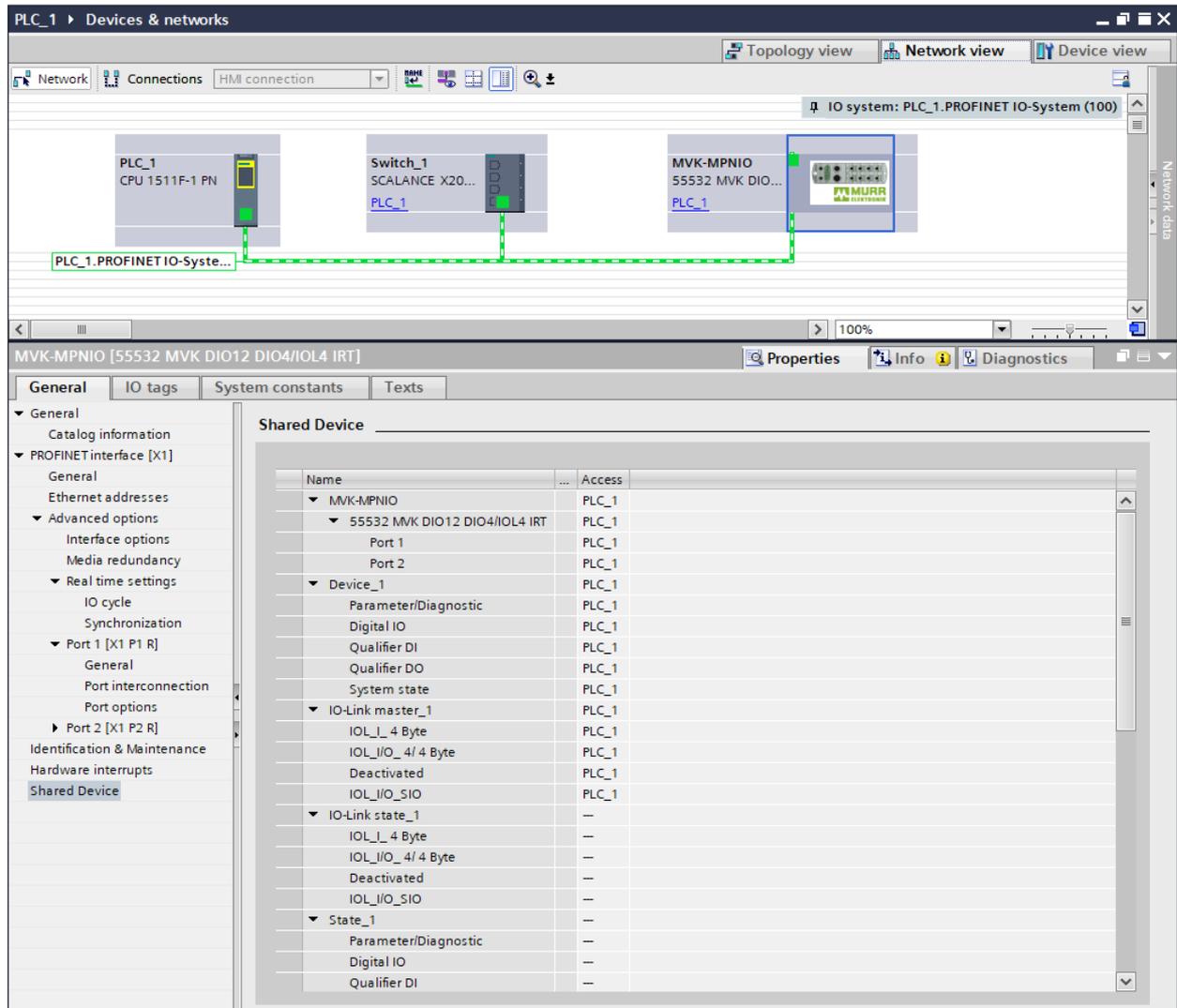


Fig. 8-51: Setting PLC_1 access

Creating project 1

Setting PLC_1 access

- 1 | Set up a project in the TIA portal with the name of "PLC_1".
- 2 | Add a controller.
- 3 | Add the **MVK-MPNIO** device as well as an IO-Link state and a State.
- 4 | Assign the name "PLC_1" to the controller.
- 5 | Assign the **MVK-MPNIO** device to controller "PLC_1".
- 6 | Select the **MVK-MPNIO** device to navigate to the Shared Device menu item *and*
- 7 | set access to the "PLC_1" controller.

Creating project 2

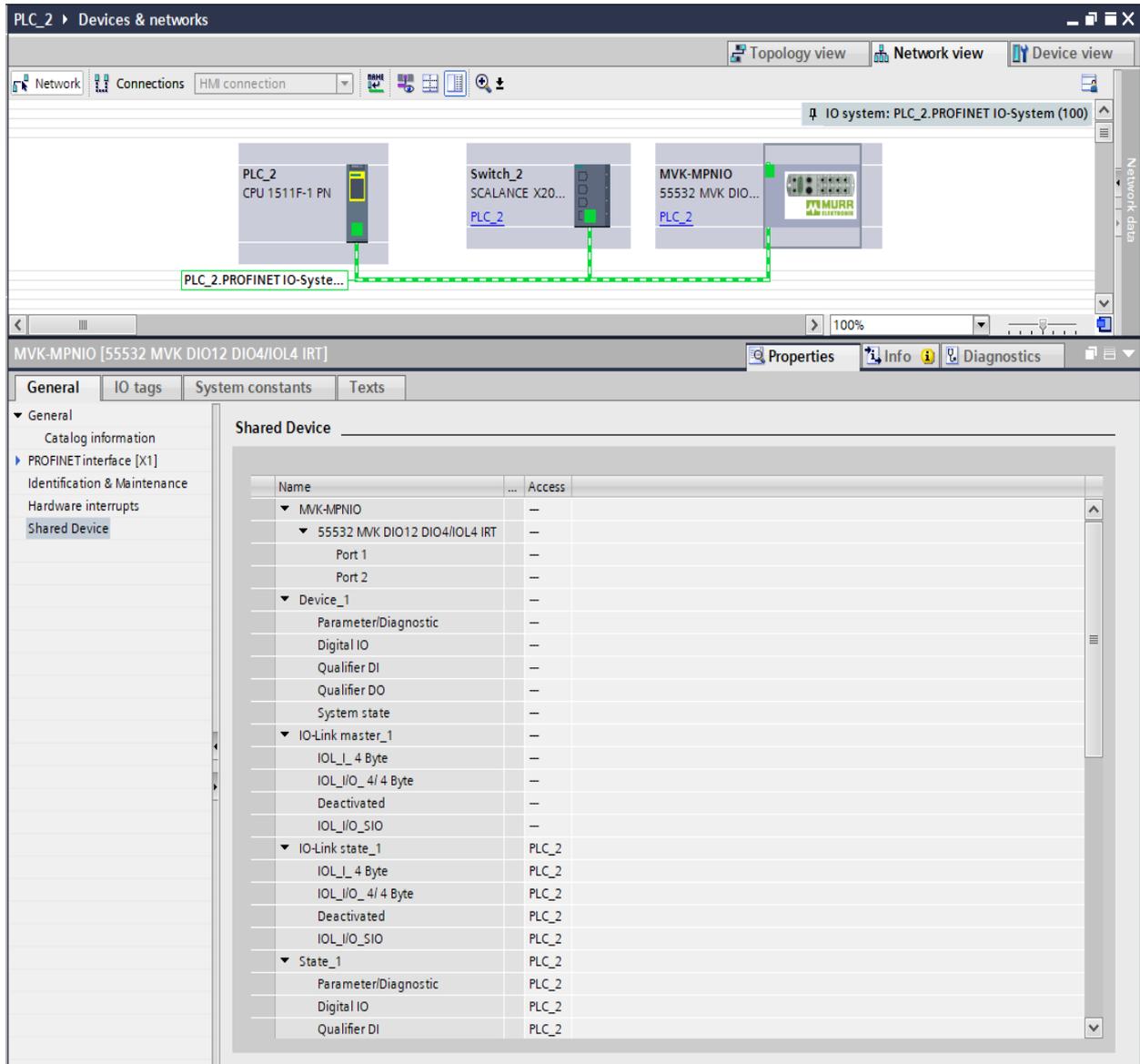


Fig. 8-52: Setting PLC_2 access

Creating project 2**Setting PLC_2 access**

- 1 | Start another instance of the TIA portal.
- 2 | Set up a new project with the name of "PLC_2".
- 3 | Add a controller.
- 4 | Assign the name "PLC_2" to the controller.
- 5 | Copy the **MVK-MPNIO** device from the first "PLC_1" project and insert it in the network view of the "PLC_2" project.
- 6 | Assign the **MVK-MPNIO** device to controller "PLC_2".
- 7 | Select the **MVK-MPNIO** device to navigate to the Shared Device menu item
and
- 8 | set access to the "PLC_2" controller.
- 9 | Then download the configurations to the corresponding controllers.



NOTE

The procedure described is needed to configure shared devices. If necessary, as described in the manual:

- Set parameters for the real-time settings to achieve error-free operation.
-



For further information, refer to chap. 3.3.4 "Shared Device (SD)".

8.10 PROFlenergy configuration

PROFlenergy

Information about the corresponding interfaces for using the PROFlenergy functions of the **MVK-MPNIO** device can be found in your engineering software manual.

It is accessed by means of acyclic read and write commands. The engineering software provides completed blocks.

Example: **FB 815** "PE_START_END" and **FB 816** "PE_CMD" in TIA Portal. The **MVK-MPNIO** device supports PROFlenergy profile version **V1.2**.

The device supports two different energy-saving modes:

Mode I

→ The mode can be activated via **pause_time** ≥ 1000 ms (1s) and < 10000 ms (10s)

→ Switching off the outputs (pin 2, pin 4)

The mode is indicated by special flash sequence of the Power US LED.

Mode II

→ The mode can be activated via **pause_time** ≥ 10000 ms (10s)

→ Switching off the outputs (pin 2, pin 4)

→ Switching off the sensor power supply (pin 1)

→ Switching off all LEDs (exception: Power US LED)

The mode is indicated by special flash sequence of the Power US LED.



Starting / closing the mode

For further information on the behavior of the LEDs, please refer to chap. 9.2 "Extended LED indication".

The device can be switched to the desired mode via a **START_PAUSE** with corresponding **pause_time**.

Under one of the following conditions, the device switches from energy-saving mode back to normal mode:

- ✓ An **END_PAUSE** message is sent
- ✓ A **START_PAUSE** message is sent, accompanied by a **pause_time** < 1000 ms indication
- ✓ An error is active on the device (short circuit, ...)

8.11 SNMP

Sending an SNMP request

Request

All Murrelektronik PROFINET devices can send an SNMP message as a response to a request:

- SNMPv2-MIB:sysDescr.0 object (1.3.6.1.2.1.1.1.0).

Response

The response of the device has the following structure:

- Murrelektronik, **MVK-MPNIO**, Art.-No., HW version, SW version, MAC address.

8.12 Factory settings

Reset to factory settings - retain I&M data

The **Reset to factory settings - I&M data retained** function resets the device to its factory settings but retains the I&M data saved in memory.

Proceed as follows:

- ➔ Click **Connect online** in the TIA portal.
- ➔ After connection, mark the module in question.
- ➔ Open the **MVK-MPNIO** module in project navigation. Double-click **Online & Diagnostics**.
- ➔ Below the **Functions** tab, click **Reset to factory settings** to open a window.
- ➔ Activate the **Retain I&M data** selection.
- ➔ Press the **Reset** button.
The device is reset to the factory setting.

Reset to the factory settings - default values

Setting	Value
IP address	0.0.0.0
Subnet mask	0.0.0.0
Router address	0.0.0.0
PROFINET device name	Empty

Tab. 8-43: Reset to factory settings - default values

Reset to the factory settings - I&M values

I&M values	Value
System ID code	Empty
Place identifier	Empty
Installed date	Empty
Description	Empty
Additional information	Empty

Tab. 8-44: Reset to factory settings - I&M values

Reset to factory settings - retain I&M data

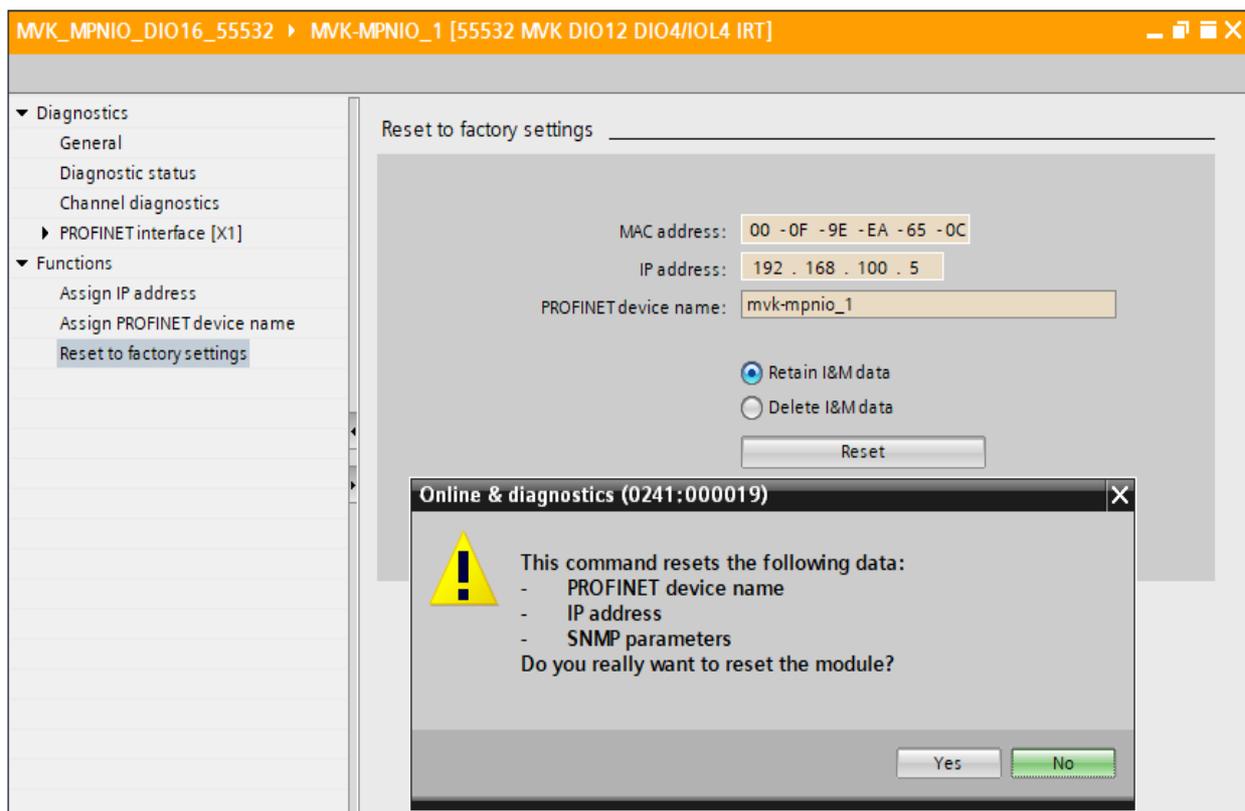
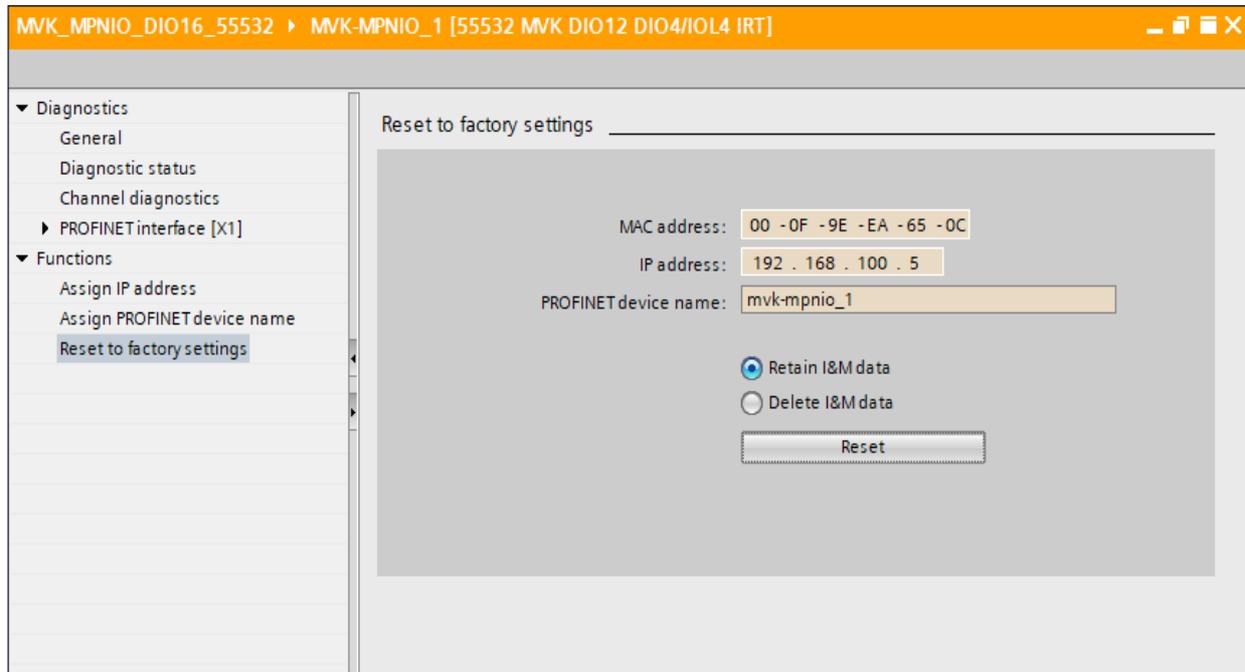


Fig. 8-53: Reset to factory settings, retain I&M data

Reset to factory settings - delete I&M data

The **Reset to factory settings - Delete I&M data** function resets the device to the factory settings and, at the same time, deletes the I&M data stored in memory.

Proceed as follows:

- ➔ Click **Connect online** in the TIA portal.
- ➔ After connection, mark the module in question.
- ➔ Open the **MVK-MPNIO** module in project navigation.
Double-click **Online & Diagnostics**.
- ➔ Below the **Functions** tab, click **Reset to factory settings** to open a window.
- ➔ Activate the **Delete I&M data** menu option.
- ➔ Press the **Reset** button.
The device is reset to the factory setting.

Reset to factory settings - delete I&M data

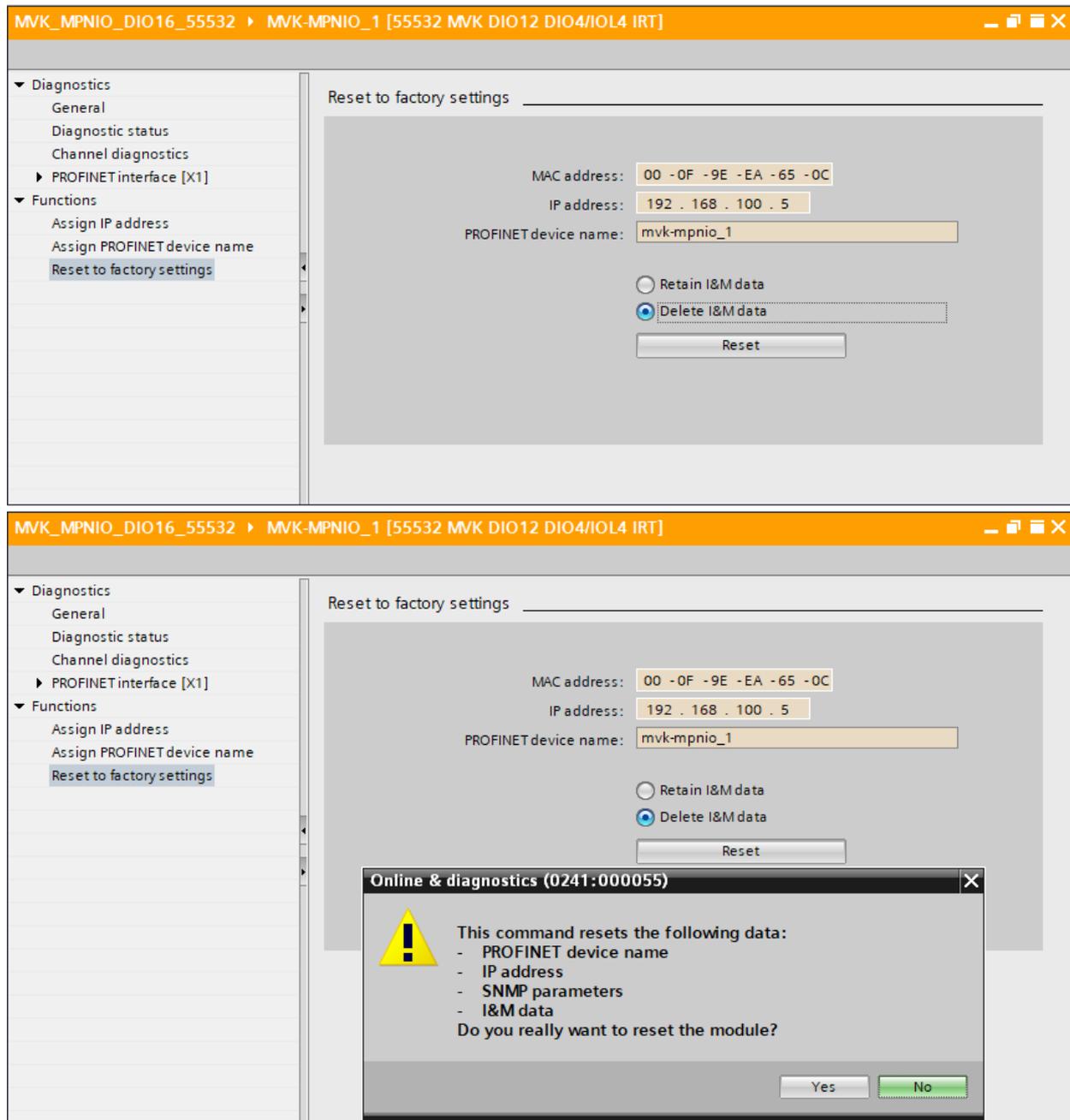


Fig. 8-54: Reset to factory settings, delete I&M data

9 Operation

9.1 LED indication

Arrangement and functions of the LEDs

All **MVK-MPNIO** have separate and clearly arranged indicators:

- LED indication for inputs and outputs
- LED indication for bus
- LED indication POWER
- Extended LED indications

To identify the displayed information clearly, the LEDs on the front panel of the device are labeled. The indication is performed by means of a continuous light or flashing of the LEDs. The following figure shows the arrangement of the LEDs and the table shows the functions.



A separate status display is assigned to each input and output.

LED indication Digital input

Indication	State	Voltage at input	Logical value
 Yellow	Continuously lit	24 V	1
 Red	Continuously lit	-	0
 Off		0 V	0

Tab. 9-1: LED indication digital input

LED indication Digital output

Indication	State	Voltage on output	Logical value
 Yellow	Lit continuously	24 V	1
 Red	Lit continuously	0 V	1
 Off		0 V	0

Tab. 9-2: LED indication digital output

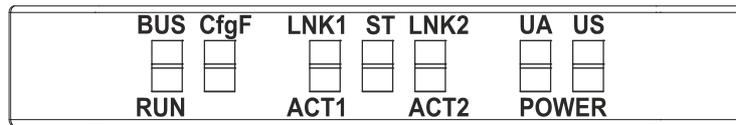
Error at input or output

In the event of an error (short circuit, overload or feedback) at the digital output or the sensor power supply, the relevant LEDs light up in red at the M12 port.

**LED indication
IO-Link**

Indica- tion	State	Description
 Green	Lights continu- ously	IO-Link in status Operate
 Green	Flashing at 1 Hz	No IO-Link connection
 Green	Flashing at 10 Hz	IO-Link in the Pre-Operate state during data storage
 Red	Flashing at 2 Hz	Validation failed. Incompatible IO-Link device connect- ed for data storage. Data storage failed
 Off		IO-Link connection deactivated

Tab. 9-3: LED indication IO-Link



LED indication ST

Indica-tion	State	Description
 Green	Continuously lit	Error-free operation
 Red	Continuously lit	An error is active on the device

Tab. 9-4: LED indication ST

BUS RUN indicates the state of the bus system.

LED indication BUS RUN

Indica-tion	State	Description
 Green	Lights continu-ously	Device is exchanging data with the PLC
 Green	Flashing at 1 Hz	Device has a PROFINET name. No connection to PLC
 Yellow	Flashing at 5 Hz	The device has no PROFINET name
 Off		Device is off

Tab. 9-5: BUS RUN LED indication

LED indication flashing green

This is what you can do:

- ➔ Check the line connections.
- ➔ Check the PLC configuration.

CfgF indicates the state of the PLC configuration.

LED indication CfgF

Indication	State	Description
 Green	Lit continuously	Device in valid IO data exchange with valid configuration
 Red	Lit continuously	Parameterization error. Device not in valid IO data exchange with valid configuration
 Off		Device has not received any parameters yet

Tab. 9-6: LED indication CfgF

LED indication, red

This is what you can do:

➔ Check the PLC configuration.

LNK/ACT (Link/Activity) indicate the state of the Ethernet communication at each port.

LED indication for LNK/ACT

Indication	State	Description
 Green	Lights continuously	Device has detected a link at the associated port
 Green Yellow	Green: continuously lit Yellow: flashing	Link available Link and activity available
 Off		Corresponding port is closed, no cable connection available

Tab. 9-7: LED indication for LNK/ACT

LED indication Off

This is what to do:

➔ Check the line connections.

The power LEDs indicate the state of the supply voltages

- **UA** actuator voltage
- **US** operating voltage

**LED indication
POWER US**

Indica- tion	State	Description
 Green	Lit continuously	$17.5\text{ V} \leq \text{US} \leq 30\text{ V}$ Error-free operation
 Red	Lit continuously	$12.5\text{ V} \leq \text{US} \leq 17\text{ V}$ Undervoltage
 Red	Flashing 1 Hz	$7.5\text{ V} \leq \text{US} \leq 12\text{ V}$ No voltage
 Red	Flashing 5 Hz	$\text{US} \geq 30.5$ Overvoltage
 Off		$\text{US} \leq 7.5\text{ V}$ No voltage

Tab. 9-8: LED Indication POWER US



NOTE

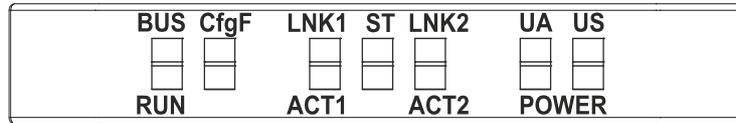
At $\text{US} < 18\text{ V}$, an error-free operation is no longer guaranteed.

**LED indication
POWER UA**

Indica- tion	State	Description
 Green	Continuously lit	$17.5\text{ V} \leq \text{UA} \leq 30\text{ V}$ Error-free operation
 Red	Continuously lit	$12.5\text{ V} \leq \text{UA} \leq 17\text{ V}$ Undervoltage
 Red	Flashing 1 Hz	$\text{UA} \leq 12\text{ V}$ No voltage
 Red	Flashing 5 Hz	$\text{UA} \geq 30.5\text{ V}$ Overvoltage
 Off		$\text{UA} \leq 7.5\text{ V}$ No LED indication

Tab. 9-9: LED indication POWER UA

9.2 Extended LED indication



PROFenergy

LED	Indica-tion	State	Description
POWER US	 Green	Flashing 3 s off 1.5 s on	Device in PROFenergy operation Mode I

Tab. 9-10: Extended LED indication, PROFenergy operation mode I

LED	Indica-tion	State	Description
POWER US	 Green	Flashing 3 s off 0.5 s on	Device in PROFenergy operation Mode II
BUS RUN CfgF ST POWER UA LNK1/ACT1 LNK2/ACT2	 Off		

Tab. 9-11: Extended LED indication, PROFenergy operation mode II

Identification of the device

LED	Indica-tion	State	Description
BUS RUN CfgF ST POWER UA POWER US	 Green	Flashing 1 Hz	Identification of the device

Tab. 9-12: Extended LED indication, identification of the device

Firmware update

LED	Indication	State	Description
BUS RUN CfgF ST POWER UA POWER US	 Yellow	Cascading sequential light	Update is being transmitted
	 Red		Update flashes

Tab. 9-13: Extended LED indication, Firmware update

LED	Indication	State	Description
BUS RUN CfgF POWER UA POWER US	 Yellow	Flashing alternately 1 Hz	Update check in progress
	 Red	Flashing 5 Hz	Update flashing interrupted
	 Red	Flashing alternately 1 Hz	Update failed
ST	 Off		

Tab. 9-14: Extended LED indication, Firmware update

Factory reset

LED	Indication	State	Description
	 Green	Left and right sides are flashing alternately at 1 Hz	Factory reset has been completed successfully
BUS RUN CfgF POWER UA POWER US	 Yellow	Left and right sides are flashing alternately at 1 Hz	Factory reset in progress
	 Red	Left and right sides are flashing alternately at 1 Hz	Factory reset has been completed with failure
ST	 Off		

Tab. 9-15: Extended LED indication, factory reset

Recovery firmware - system startup

LED	Indication	State	Description
ST	 Yellow	Double flash	Recovery firmware: system startup
BUS_RUN CfgF POWER UA POWER US	 Off		

Tab. 9-16: Extended LED indication, recovery firmware - system startup

Recovery firmware - system initialization

LED	Indication	State	Description
BUS RUN	 Green	Lights continuously	Recovery firmware: system initialization
ST	 Yellow	Double flash	
CfgF	 Yellow	Flashing at 1 Hz	
POWER UA POWER US	 Off		

Tab. 9-17: Extended LED indication, recovery firmware - system initialization

Recovery firmware - system run

LED	Indication	State	Description
BUS RUN CfgF	 Green	Lights continuously	Recovery firmware: system run
ST	 Yellow	Double flash	
POWER UA	 Yellow	Flashing at 1 Hz	
POWER US	 Off		

Tab. 9-18: Extended LED indication, recovery firmware - system run

**Recovery firmware -
firmware update -
initialization of trans-
mission**

LED	Indica- tion	State	Description
BUS RUN CfgF	 Green	Lights continu- ously	Firmware update: initialization of trans- mission
POWER UA			
ST	 Yellow	Double flash	
POWER US	 Yellow	Flashing at 1 Hz	

Tab. 9-19: Extended LED indication, recovery firmware - firmware update - initialization of transmission

**Recovery firmware -
firmware update**

LED	Indica- tion	State	Description
ST	 Yellow	Double flash	
BUS RUN CfgF POWER UA POWER US	 Yellow	Cascading se- quential light	The new firmware is being transmitted
	 Yellow	Flashing at 1 Hz alternating	The new firmware is being checked
	 Red	Cascading se- quential light	The new firmware is being updated
	 Red	Single flash	Writing has been aborted
	 Red	Flashing alter- nately 1 Hz	Updating the firmware failed

Tab. 9-20: Extended LED indication, recovery firmware - firmware update

9.3 PROFINET Diagnostics

Alarm

MVK-MPNIO sends diagnostic information in the form of alarms based on the PROFINET specification V2.3.



NOTE

Diagnostics are signaled to the PLC in form of “incoming” or “outgoing” alarms. If an alarm is present for only a short time, it is preferable if the PLC is equipped with a diagnostic buffer. This diagnostic buffer saves alarm details for later evaluation. If the PLC is not equipped with a diagnostic buffer, one should be generated as application software.

9.3.1 General diagnostic messages

Channel Error Type	Extended Channel Error Type	Meaning	Action
0x01	0x4101	Sensor short circuit	Check the wiring to the female connector in question.
0x01	0x4117	Actuator warning	Check the wiring to the female connector in question.
0x01	0x4118	Actuator short circuit	Check the wiring to the female connector in question.
0x02	0x4228	Actuator undervoltage	Check the actuator supply voltage of the device.
0x02	0x4232	Sensor undervoltage	Check the sensor supply voltage of the device.
0x03	0x432C	Actuator overvoltage	Check the actuator supply voltage of the device.
0x03	0x4334	Sensor overvoltage	Check the sensor supply voltage of the device.
0x09	0x4000	Unknown error	
0x11	0x4229	No actuator supply	Check the actuator supply voltage of the device.
0x11	0x4233	No sensor supply	Check the sensor supply voltage of the device.
0x17	0x57F9	Internal communication error	Please contact Murrelektronik.

Tab. 9-21: Device-specific diagnostic messages - error types, meaning and action

9.3.2 General diagnostic messages at IO-Link ports

Channel Error Type	Extended Channel Error Type	Meaning	Action
0x10 (16)	0x50E0 (20704)	IODD-on-board: Error in GSDML	Please contact Murrelektronik.
0x10 (16)	0x50E0 (20704)	IODD-on-board: General error	Please contact Murrelektronik.
0x10 (16)	0x50E1 (20705)	IODD-on-board: Error in GSDML	Please contact Murrelektronik.
0x10 (16)	0x50E2 (20706)	IODD-on-board: Error in GSDML	Please contact Murrelektronik.
0x10 (16)	0x50E3 (20707)	IODD-on-board: Error in GSDML	Please contact Murrelektronik.
0x10 (16)	0x50E4 (20708)	IODD-on-board: Error in GSDML	Please contact Murrelektronik.
0x10 (16)	0x50E5 (20709)	IODD-on-board: Invalid parameter value	Check the parameterization on the device.
0x10 (16)	0x50E6 (20710)	IODD-on-board: Invalid parameter value	Check the parameterization on the device.
0x10 (16)	0x50E7 (20711)	IODD-on-board: Invalid parameter value	Check the parameterization on the device.

Tab. 9-22: Diagnostic messages at IO-Link ports via IODD – error types, meaning and action

9.3.3 Diagnostic messages at IO-Link ports

9.3.3.1 According to IO-Link integration guideline Edition 1

The listed diagnostics are available if the parameter for IO-Link event integration Tab. 8-21: "IO-Link event integration" is set "According to IO-Link integration guideline Edition 1".

Channel Error Type	Extended Channel Error Type	IO-Link event code(s)	Meaning	Action
0x01 (1)	0x0020 (32)	0x5151 (20817)	Short circuit at the IO-Link pins	Check the wiring to the female connector in question.
0x02 (2)	0x0020 (32)	0x5110 (20752) 0x5111 (20753) 0x5112 (20754) 0x5113 (20755) 0x5114 (20756) 0x5115 (20757) 0x5116 (20758) 0x5117 (20759) 0x5118 (20760) 0x5119 (20761) 0x9807 (38919)	IO-Link device: Undervoltage	Check power supply voltage to the IO-Link device.
0x04 (4)	0x0020 (32)	0x5410 (21520) 0x9804 (38916)	IO-Link device: Overload at the outputs	Check the wiring on the IO-Link device.
0x05 (5)	0x0020 (32)	0x4110 (16656) 0x4120 (16672) 0x4210 (16912) 0x4220 (16928) 0x4310 (17168) 0x4320 (17184) 0x9805 (38917)	IO-Link device: Ambient temperature exceeded	Reduce the ambient temperature.
0x06 (6)	0x0020 (32)	0xFF22 (65314)	IO-Link communication is not established	Check the wiring on the IO-Link device and the IO-Link device itself.
0x07 (7)	0x0020 (32)	0x8C10 (35856) 0x8C20 (35872)	IO-Link device: Allowed range of process variables or measuring range exceeded	Check the parameters on the IO-Link device.
0x08 (8)	0x0020 (32)	0x8C30 (35888)	IO-Link device: Process variables drop below their allowed range	Check the parameterization of the IO-Link device.
0x09 (9)	0x0020 (32)	All codes not listed explicitly	IO-Link device: Unknown error	The IO-Link device has sent an unknown event. Consult the documentation of the IO-Link device.

Channel Error Type	Extended Channel Error Type	IO-Link event code(s)	Meaning	Action
0x10 (16)	0x0020 (32)	0x6230 (25136) 0x6310 (25360) 0x6320 (25376) 0x6330 (25392) 0x6340 (25408) 0x6350 (25424) 0x9811 (38929) 0x9812 (38930) 0x9813 (38931) 0x9814 (38932) 0x9815 (38933) 0x9816 (38934) 0x9817 (38935)	IO-Link master/device: Parameterization error	Check that the correct IO-Link device is connected and that only correct parameters are used.
0x12 (18)	0x0020 (32)	0x5450 (21584) 0x5451 (21585) 0x5452 (21586) 0x5453 (21587) 0x5454 (21588) 0x5455 (21589) 0x5456 (21590) 0x5457 (21591) 0x5458 (21592) 0x5459 (21593)	IO-Link device: A fuse has blown or is open	Check the IO-Link device.
0x18 (24)	0x0020 (32)	0x5160 (20832)	IO-Link device: Outputs were disabled	Check the devices connected to the IO-Link device.
0x1A (26)	0x0020 (32)	0x9000 (36864)	IO-Link device: Faults with external resources	Check all resources connected to the IO-Link device.

Tab. 9-23: Diagnostic messages on IO-Link ports according IO-Link integration guideline Edition 1

9.3.3.2 Murrelektronik IO-Link - Integration and extended integration

The diagnostics listed are available if the parameters for Tab. 8-21: "IO-Link event integration" are set to "Murrelektronik IO-Link integration" or "Murrelektronik IO-Link extended integration".

Division of diagnostics into value ranges

Channel Error Type	Extended Channel Error Type	IO-Link event code	Meaning
0x4502 (17666)	0x0000 (0) – 0x7FFF (32767)		Master event
0x4500 (17664)	0x0000 (0) – 0x7FFF (32767)	0x0000 (0) – 0x7FFF (32767)	Event from an IO-Link device that does not support Murrelektronik IO-Link integration.
0x4501 (17665)	0x0000 (0) – 0x7FFF (32767)	0x8000 (32768) – 0xFFFF (65535)	Event from an IO-Link device that does not support the Murrelektronik IO-Link integration. The Extended Channel Error Type plus 0x8000 (32768) corresponds to the original IO-Link event code.
0x4510 (17680)	0x0000 (0) – 0x7FFF (32767)	0x0000 (0) – 0x7FFF (32767)	Event from an IO-Link device that supports Murrelektronik IO-Link integration. The Extended Channel Error Type corresponds to the original IO-Link event code.
0x4511 (17681)	0x0000 (0) – 0x7FFF (32767)	0x8000 (32768) – 0xFFFF (65535)	Event from an IO-Link device that supports Murrelektronik IO-Link integration. The Extended Channel Error Type plus 0x8000 (32768) corresponds to the original IO-Link event code.

Tab. 9-24: Division of diagnostics into value ranges

Description of individual diagnostics - master events

Channel Error Type	Extended Channel Error Type	Meaning	Action
0x4502 (17666)		Master event	
0x4502 (17666)	0x17F0 (6128)	Faults with communication with the device error memory	
0x4502 (17666)	0x1801 (6145)	Faults in start-up parameters	Check the parameterization.
0x4502 (17666)	0x1802 (6146)	Wrong device. Discrepancy in validation	Connect the correct IO-Link device.
0x4502 (17666)	0x1803 (6147)	Discrepancy in the process data	Check the parameterization for the sub-module.
0x4502 (17666)	0x1804 (6148)	Short circuit on C/Q - Pin 4	Check the IO-Link device and the wiring.
0x4502 (17666)	0x1805 (6149)	IO-Link PHY overtemperature	Make provision for better heat dissipation.
0x4502 (17666)	0x1806 (6150)	Short-circuit L+ - Pin 1	Check the IO-Link device and the wiring.
0x4502 (17666)	0x1807 (6151)	Undervoltage L+ - Pin 1	Check the sensor supply.
0x4502 (17666)	0x1808 (6152)	Event overflow on the device	Check the IO-Link device.
0x4502 (17666)	0x1809 (6153)	Backup failed. Memory outside 2k	Check the IO-Link device.
0x4502 (17666)	0x180A (6154)	Inconsistent backup. Data storage index is not available	Check the IO-Link device.

Channel Error Type	Extended Channel Error Type	Meaning	Action
0x4502 (17666)	0x180B (6155)	Inconsistent backup. Non-specific error in data storage	Check the IO-Link device.
0x4502 (17666)	0x180C (6156)	Inconsistent backup. Upload fault	Check the IO-Link device.
0x4502 (17666)	0x180D (6157)	Inconsistent parameters. Fault while downloading	Check the IO-Link device.
0x4502 (17666)	0x180E (6158)	Fault in port class B. No actuator power supply	Check the actuator power supply.
0x4502 (17666)	0x180F (6159)	Short-circuit on Pin 2	Check the IO-Link device and the wiring.
0x4502 (17666)	0x6000 (24576)	Invalid cycle time	Adapt the cycle time to a value valid for the IO-Link device.
0x4502 (17666)	0x6001 (24577)	Revision fault. Incompatible protocol version	The IO-Link device only supports protocols that are not supported by the master. Use an IO-Link device with an assisted protocol version.
0x4502 (17666)	0x6002 (24578)	Inconsistent parameters. ISDU batch processing has failed	Check the values sent by batch processing.
0x4502 (17666)	0x7F22 (32546)	Device is not available. Communication lost	Check the IO-Link device and the wiring.
0x4502 (17666)	0x7F23 (32547)	Invalid backup. Discrepancy with identification of data storage	Check the IO-Link device or delete data storage.
0x4502 (17666)	0x7F24 (32548)	Invalid backup. Overflow of data storage buffer	Check the IO-Link device or delete data storage.
0x4502 (17666)	0x7F25 (32549)	Invalid backup. Access to data storage parameters denied	Check the IO-Link device or delete data storage.
0x4502 (17666)	0x7F31 (32561)	Event lost. Incorrect indication of events	Check the IO-Link device.

Tab. 9-25: Description of individual diagnostics - master events

Description of individual diagnostics - device events

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4500 (17664)		0x0000 (0) – 0x7FFF (32767)	Event from an IO-Link device that does not support the Murrelektronik IO-Link integration. The Extended Channel Error Type corresponds to the original IO-Link event code.	
0x4500 (17664)	0x1000 (4096)	0x1000 (4096)	General malfunction	Unknown error
0x4500 (17664)	0x1800 (6144) – 0x18FF (6399)	0x1800 (6144) – 0x18FF (6399)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.
0x4500 (17664)	0x4000 (16384)	0x4000 (16384)	Temperature error	Overload
0x4500 (17664)	0x4100 (16640)	0x4100 (16640)	Ambient temperature: General fault	Check the ambient temperature.
0x4500 (17664)	0x4110 (16656)	0x4110 (16656)	Admissible ambient temperature exceeded	Localize the heat source.
0x4500 (17664)	0x4120 (16672)	0x4120 (16672)	Ambient temperature dropped below admissible value	Isolate the device.
0x4500 (17664)	0x4200 (16896)	0x4200 (16896)	Device temperature: General fault	Check the device temperature.
0x4500 (17664)	0x4210 (16912)	0x4210 (16912)	Allowed device temperature exceeded	Localize the heat source.
0x4500 (17664)	0x4220 (16928)	0x4220 (16928)	Device temperature dropped below admissible value	Isolate the device.
0x4500 (17664)	0x4300 (17152)	0x4300 (17152)	External temperature: General fault	Check the ambient temperature.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4500 (17664)	0x4310 (17168)	0x4310 (17168)	Admissible ambient temperature exceeded	Localize the heat source.
0x4500 (17664)	0x4320 (17184)	0x4320 (17184)	External temperature dropped below admissible value	Isolate the device.
0x4500 (17664)	0x5000 (20480)	0x5000 (20480)	Hardware error in the device	Replace the device.
0x4500 (17664)	0x5010 (20496)	0x5010 (20496)	Component malfunction	Repair or replace the device.
0x4500 (17664)	0x5011 (20497)	0x5011 (20497)	Loss of non-volatile memory	Check the batteries.
0x4500 (17664)	0x5012 (20498)	0x5012 (20498)	Batteries weak	Replace the batteries.
0x4500 (17664)	0x5100 (20736)	0x5100 (20736)	General fault in supply voltage	Check availability
0x4500 (17664)	0x5101 (20737)	0x5101 (20737)	Fuse blown or off	Replace the fuse or check the fuse switch
0x4500 (17664)	0x5110 (20752)	0x5110 (20752)	Overvoltage in the main power supply	Check the permitted voltage range.
0x4500 (17664)	0x5111 (20753)	0x5111 (20753)	Undervoltage in the main power supply	Check the permitted voltage range.
0x4500 (17664)	0x5112 (20754)	0x5112 (20754)	Faults in the secondary power supply (port class B)	Check the permitted voltage range.
0x4500 (17664)	0x5113 (20755)	0x5113 (20755)	Device power supply: Undervoltage U3 = power supply +5 V	Check availability
0x4500 (17664)	0x5114 (20756)	0x5114 (20756)	Device power supply: Undervoltage U4 = vendor-specific	Check availability
0x4500 (17664)	0x5115 (20757)	0x5115 (20757)	Device power supply: Undervoltage U5 = vendor-specific	Check availability
0x4500 (17664)	0x5116 (20758)	0x5116 (20758)	Device power supply: Undervoltage U6 = vendor-specific	Check availability
0x4500 (17664)	0x5117 (20759)	0x5117 (20759)	Device power supply: Undervoltage U7 = vendor-specific	Check availability
0x4500 (17664)	0x5118 (20760)	0x5118 (20760)	Device power supply: Undervoltage U8 = vendor-specific	Check availability
0x4500 (17664)	0x5119 (20761)	0x5119 (20761)	Device power supply: Undervoltage U9 = vendor-specific	Check availability
0x4500 (17664)	0x5151 (20817)	0x5151 (20817)	Device power supply: Short circuit	Check the installation.
0x4500 (17664)	0x5160 (20832)	0x5160 (20832)	Device power supply: Fault in the power supply to peripherals	Check availability
0x4500 (17664)	0x5200 (20992)	0x5200 (20992)	Device controller: General fault	Check the device controller.
0x4500 (17664)	0x5300 (21248)	0x5300 (21248)	Device control panel: General fault	Check the control panel.
0x4500 (17664)	0x5400 (21504)	0x5400 (21504)	Device power unit: General fault	Check the power unit.
0x4500 (17664)	0x5410 (21520)	0x5410 (21520)	Device power supply unit: Fault in the output driver	Check the installation.
0x4500 (17664)	0x5450 (21584)	0x5450 (21584)	Device power supply unit: Fuse blown or off	Replace the fuse or check the fuse switch
0x4500 (17664)	0x5451 (21585)	0x5451 (21585)	Device power supply unit: Fuse blown or off S1 = L1	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5452 (21586)	0x5452 (21586)	Device power supply unit: Fuse blown or off S2 = L2	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5453 (21587)	0x5453 (21587)	Device power supply unit: Fuse blown or off S3 = L3	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5454 (21588)	0x5454 (21588)	Device power supply unit: Fuse blown or off S4 = vendor-specific	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5455 (21589)	0x5455 (21589)	Device power supply unit: Fuse blown or off S5 = vendor-specific	Replace the fuse or check the fuse switch.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4500 (17664)	0x5456 (21590)	0x5456 (21590)	Device power supply unit: Fuse blown or off S6 = vendor-specific	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5457 (21591)	0x5457 (21591)	Device power supply unit: Fuse blown or off S7 = vendor-specific	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5458 (21592)	0x5458 (21592)	Device power supply unit: Fuse blown or off S8 = vendor-specific	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5459 (21593)	0x5459 (21593)	Device power supply unit: Fuse blown or off S9 = vendor-specific	Replace the fuse or check the fuse switch.
0x4500 (17664)	0x5500 (21760)	0x5500 (21760)	Faults in other device communication	Check the installation.
0x4500 (17664)	0x5510 (21776)	0x5510 (21776)	Faults in device communications interface 2	Check the installation.
0x4500 (17664)	0x6000 (24576)	0x6000 (24576)	Device software error	Check the firmware release version.
0x4500 (17664)	0x6010 (24592)	0x6010 (24592)	Device software: Reset (watchdog)	Check the firmware release version.
0x4500 (17664)	0x6100 (24832)	0x6100 (24832)	Device software: Internal fault	Check the firmware release version.
0x4500 (17664)	0x6300 (25344)	0x6300 (25344)	Device software: Data record fault	Check the data sheet and the values.
0x4500 (17664)	0x6310 (25360)	0x6310 (25360)	Loss of parameters	Check the data sheet and the values.
0x4500 (17664)	0x6320 (25376)	0x6320 (25376)	Parameter error	Check the data sheet and the values.
0x4500 (17664)	0x6321 (25377)	0x6321 (25377)	Parameter missing	Check the data sheet.
0x4500 (17664)	0x6330 (25392)	0x6330 (25392)	Parameter not initialized	Check the data sheet and the values.
0x4500 (17664)	0x6340 (25408)	0x6340 (25408)	Parameter not specific	Check the data sheet and the values.
0x4500 (17664)	0x6350 (25424)	0x6350 (25424)	Parameter was changed	Check the configuration.
0x4500 (17664)	0x7700 (30464)	0x7700 (30464)	Cable break of a subordinate device	Check the installation.
0x4500 (17664)	0x7701 (30465)	0x7701 (30465)	Cable break of the subordinate device 1	Check the installation.
0x4500 (17664)	0x7702 (30466)	0x7702 (30466)	Cable break of the subordinate device 2	Check the installation.
0x4500 (17664)	0x7703 (30467)	0x7703 (30467)	Cable break of the subordinate device 3	Check the installation.
0x4500 (17664)	0x7704 (30468)	0x7704 (30468)	Cable break of the subordinate device 4	Check the installation.
0x4500 (17664)	0x7705 (30469)	0x7705 (30469)	Cable break of the subordinate device 5	Check the installation.
0x4500 (17664)	0x7706 (30470)	0x7706 (30470)	Cable break of the subordinate device 6	Check the installation.
0x4500 (17664)	0x7707 (30471)	0x7707 (30471)	Cable break of the lower-level device 7	Check the installation.
0x4500 (17664)	0x7708 (30472)	0x7708 (30472)	Cable break of the subordinate device 8	Check the installation.
0x4500 (17664)	0x7709 (30473)	0x7709 (30473)	Cable break of the subordinate device 9	Check the installation.
0x4500 (17664)	0x770A (30474)	0x770A (30474)	Cable break of the subordinate device 10	Check the installation.
0x4500 (17664)	0x770B (30475)	0x770B (30475)	Cable break of the subordinate device 11	Check the installation.
0x4500 (17664)	0x770C (30476)	0x770C (30476)	Cable break of the subordinate device 12	Check the installation.
0x4500 (17664)	0x770D (30477)	0x770D (30477)	Cable break of the subordinate device 13	Check the installation.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4500 (17664)	0x770E (30478)	0x770E (30478)	Cable break of the subordinate device 14	Check the installation.
0x4500 (17664)	0x770F (30479)	0x770F (30479)	Cable break of the subordinate device 15	Check the installation.
0x4500 (17664)	0x7710 (30480)	0x7710 (30480)	Short Circuit	Check the installation.
0x4500 (17664)	0x7711 (30481)	0x7711 (30481)	Grounding error	Check the installation.
0x4501 (17665)		0x8000 (32768) – 0xFFFF (65535)	Event from an IO-Link device that does not support the Murrelektronik IO-Link integration. The Extended Channel Error Type plus 0x8000 (32768) corresponds to the original IO-Link event code.	
0x4501 (17665)	0x0100 (256)	0x8100 (33024)	Communication monitoring: General error	Check the device.
0x4501 (17665)	0x0110 (272)	0x8110 (33040)	Process data monitoring: General error	Check the device.
0x4501 (17665)	0x0C00 (3072)	0x8C00 (35840)	Technology-specific error in the application	Reset the device.
0x4501 (17665)	0x0C01 (3073)	0x8C01 (35841)	Simulation active	Check the operating mode.
0x4501 (17665)	0x0C10 (3088)	0x8C10 (35856)	Process value above the valid range	Process value uncertain
0x4501 (17665)	0x0C20 (3104)	0x8C20 (35872)	Exceeding of the measuring range	Check your application.
0x4501 (17665)	0x0C30 (3120)	0x8C30 (35888)	Process value below the valid range	Process value uncertain
0x4501 (17665)	0x0C40 (3136)	0x8C40 (35904)	Service requirement - cleaning	Clean the device.
0x4501 (17665)	0x0C41 (3137)	0x8C41 (35905)	Service requirement - topping up	Top up the device.
0x4501 (17665)	0x0C42 (3138)	0x8C42 (35906)	Service requirement - wear	Replace the wearing parts on the device.
0x4501 (17665)	0x0CA0 (3232) – 0x0DFE (3582)	0x8CA0 (36000) – 0x8DFE (36350)	Device-specific error code	For further details of this IO-Link event, please read the manual for the IO-Link device.
0x4510 (17680)		0x0000 (0) – 0x7FFF (32767)	Event from an IO-Link device that supports Murrelektronik IO-Link integration. The Extended Channel Error Type corresponds to the original IO-Link event code.	
0x4510 (17680)	0x1000 (4096)	0x1000 (4096)	General malfunction	Unknown error
0x4510 (17680)	0x1800 (6144)	0x1800 (6144)	Production data invalid	Replace the device.
0x4510 (17680)	0x1801 (6145)	0x1801 (6145)	Parameter data invalid	Replace the device.
0x4510 (17680)	0x1802 (6146)	0x1802 (6146)	Process data area has dropped below its lower warning threshold	The scanned process data value is less than or equal to the lower warning threshold setting.
0x4510 (17680)	0x1803 (6147)	0x1803 (6147)	Process data area has exceeded its upper warning threshold	The scanned process data value is greater than or equal to the upper warning threshold setting.
0x4510 (17680)	0x1804 (6148)	0x1804 (6148)	Sensor power supply overload	Check the installation. Check the current input of the connected consumer.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4510 (17680)	0x1805 (6149)	0x1805 (6149)	Overflow/Overflow control of analog input	The analog signal is above the nominal range. Check the limits of the nominal range.
0x4510 (17680)	0x1806 (6150)	0x1806 (6150)	Underflow/Underflow control of the analog input	The analog signal is below the nominal range. Check the limits of the nominal range.
0x4510 (17680)	0x1807 (6151) – 0x1808 (6152)	0x1807 (6151) – 0x1808 (6152)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.
0x4510 (17680)	0x1809 (6153)	0x1809 (6153)	Overriding an analog output caused by external voltage	Check the installation on the analog output.
0x4510 (17680)	0x180A (6154)	0x180A (6154)	Underride of an analog output by external voltage	Test event about checking a notification
0x4510 (17680)	0x180B (6155)	0x180B (6155)	Overload at the analog output	Test event to check an incoming/outgoing warning
0x4510 (17680)	0x180C (6156) – 0x181E (6174)	0x180C (6156) – 0x181E (6174)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.
0x4510 (17680)	0x181F (6175)	0x181F (6175)	Test event A	Test event for checking an incoming/outgoing error.
0x4510 (17680)	0x1820 (6176)	0x1820 (6176)	Test event B	Check the permitted voltage range.
0x4510 (17680)	0x1821 (6177)	0x1821 (6177)	Test event C	Check the permitted voltage range.
0x4510 (17680)	0x1822 (6178) – 0x1829 (6191)	0x1822 (6178) – 0x1829 (6191)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.
0x4510 (17680)	0x1830 (6192)	0x1830 (6192)	Overvoltage in the secondary power supply (Port Class B) UA	Check the permitted voltage range.
0x4510 (17680)	0x1831 (6193)	0x1831 (6193)	Undervoltage in the secondary power supply (Port Class B) UA	Check the current consumption of connected consumers.
0x4510 (17680)	0x1832 (6194)	0x1832 (6194)	Error in the secondary voltage (Port Class B) UA	Check the current consumption of connected consumers.
0x4510 (17680)	0x1833 (6195)	0x1833 (6195)	Overload of secondary power supply (Port Class B) UA	Check the installation. Check the current consumption of the connected consumer.
0x4510 (17680)	0x1834 (6196)	0x1834 (6196)	Overload in the main power supply	Check the installation. Check the current consumption of the connected consumer.
0x4510 (17680)	0x1835 (6197)	0x1835 (6197)	Overload at the sensor power supply for a subordinate device	Check the installation. Check the current consumption of the connected consumer.
0x4510 (17680)	0x1836 (6198)	0x1836 (6198)	Overload of actuator supply for a subordinate device	Check the installation.
0x4510 (17680)	0x1837 (6199)	0x1837 (6199)	Overload of a digital output	Check the installation. Check the current consumption of the connected consumer.
0x4510 (17680)	0x1838 (6200)	0x1838 (6200)	Override of a digital output by an external voltage	Check the installation.
0x4510 (17680)	0x1839 (6201) – 0x18FF (6399)	0x1839 (6201) – 0x18FF (6399)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.
0x4510 (17680)	0x4000 (16384)	0x4000 (16384)	Temperature error	Overload
0x4510 (17680)	0x4100 (16640)	0x4100 (16640)	Ambient temperature: General fault	Check the ambient temperature.
0x4510 (17680)	0x4110 (16656)	0x4110 (16656)	Admissible ambient temperature exceeded	Localize the heat source.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4510 (17680)	0x4120 (16672)	0x4120 (16672)	Ambient temperature dropped below admissible value	Isolate the device.
0x4510 (17680)	0x4200 (16896)	0x4200 (16896)	Device temperature: General fault	Check the device temperature.
0x4510 (17680)	0x4210 (16912)	0x4210 (16912)	Allowed device temperature exceeded	Localize the heat source.
0x4510 (17680)	0x4220 (16928)	0x4220 (16928)	Device temperature dropped below admissible value	Isolate the device.
0x4510 (17680)	0x4300 (17152)	0x4300 (17152)	External temperature: General fault	Check the ambient temperature.
0x4510 (17680)	0x4310 (17168)	0x4310 (17168)	Admissible external temperature exceeded	Localize the heat source.
0x4510 (17680)	0x4320 (17184)	0x4320 (17184)	External temperature dropped below admissible value	Isolate the device.
0x4510 (17680)	0x5000 (20480)	0x5000 (20480)	Hardware error in the device	Replace the device.
0x4510 (17680)	0x5010 (20496)	0x5010 (20496)	Component malfunction	Repair or replace the device.
0x4510 (17680)	0x5011 (20497)	0x5011 (20497)	Loss of non-volatile memory	Check the batteries.
0x4510 (17680)	0x5012 (20498)	0x5012 (20498)	Batteries weak	Replace the batteries.
0x4510 (17680)	0x5100 (20736)	0x5100 (20736)	General fault in supply voltage	Check availability.
0x4510 (17680)	0x5101 (20737)	0x5101 (20737)	Fuse blown or off	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5110 (20752)	0x5110 (20752)	Overvoltage in the main power supply	Check the permitted voltage range.
0x4510 (17680)	0x5111 (20753)	0x5111 (20753)	Undervoltage in the main power supply	Check the permitted voltage range.
0x4510 (17680)	0x5112 (20754)	0x5112 (20754)	Faults in the secondary power supply (port class B)	Check the permitted voltage range.
0x4510 (17680)	0x5113 (20755)	0x5113 (20755)	Device power supply: Undervoltage U3 = power supply +5 V	Check availability
0x4510 (17680)	0x5114 (20756)	0x5114 (20756)	Device power supply: Undervoltage U4 = vendor-specific	Check availability
0x4510 (17680)	0x5115 (20757)	0x5115 (20757)	Device power supply: Undervoltage U5 = vendor-specific	Check availability
0x4510 (17680)	0x5116 (20758)	0x5116 (20758)	Device power supply: Undervoltage U6 = vendor-specific	Check availability.
0x4510 (17680)	0x5117 (20759)	0x5117 (20759)	Device power supply: Undervoltage U7 = vendor-specific	Check availability
0x4510 (17680)	0x5118 (20760)	0x5118 (20760)	Device power supply: Undervoltage U8 = vendor-specific	Check availability.
0x4510 (17680)	0x5119 (20761)	0x5119 (20761)	Device power supply: Undervoltage U9 = vendor-specific	Check availability.
0x4510 (17680)	0x5151 (20817)	0x5151 (20817)	Device power supply: Short circuit	Check the installation.
0x4510 (17680)	0x5160 (20832)	0x5160 (20832)	Device power supply: Faults in the power supply to peripherals	Check availability.
0x4510 (17680)	0x5200 (20992)	0x5200 (20992)	Device controller: General fault	Check the device controller.
0x4510 (17680)	0x5300 (21248)	0x5300 (21248)	Device control panel: General fault	Check the control panel.
0x4510 (17680)	0x5400 (21504)	0x5400 (21504)	Device power unit: General fault	Check the power unit.
0x4510 (17680)	0x5410 (21520)	0x5410 (21520)	Device power supply unit: Fault in the output driver	Check the installation.
0x4510 (17680)	0x5450 (21584)	0x5450 (21584)	Device power supply unit: Fuse blown or off	Replace the fuse or check the fuse switch.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4510 (17680)	0x5451 (21585)	0x5451 (21585)	Device power supply unit: Fuse blown or off S1 = L1	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5452 (21586)	0x5452 (21586)	Device power supply unit: Fuse blown or off S2 = L2	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5453 (21587)	0x5453 (21587)	Device power supply unit: Fuse blown or off S3 = L3	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5454 (21588)	0x5454 (21588)	Device power supply unit: Fuse blown or off S4 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5455 (21589)	0x5455 (21589)	Device power supply unit: Fuse blown or off S5 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5456 (21590)	0x5456 (21590)	Device power supply unit: Fuse blown or off S6 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5457 (21591)	0x5457 (21591)	Device power supply unit: Fuse blown or off S7 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5458 (21592)	0x5458 (21592)	Device power supply unit: Fuse blown or off S8 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5459 (21593)	0x5459 (21593)	Device power supply unit: Fuse blown or off S9 = vendor-specific	Replace the fuse or check the fuse switch.
0x4510 (17680)	0x5500 (21760)	0x5500 (21760)	Faults in other device communication	Check the installation.
0x4510 (17680)	0x5510 (21776)	0x5510 (21776)	Faults in device communications interface 2	Check the installation.
0x4510 (17680)	0x6000 (24576)	0x6000 (24576)	Device software error	Check the firmware release version.
0x4510 (17680)	0x6010 (24592)	0x6010 (24592)	Device software: Reset (watchdog)	Check the firmware release version.
0x4510 (17680)	0x6100 (24832)	0x6100 (24832)	Device software: Internal fault	Check the firmware edition status.
0x4510 (17680)	0x6300 (25344)	0x6300 (25344)	Device software: Data record fault	Check the data sheet and the values.
0x4510 (17680)	0x6310 (25360)	0x6310 (25360)	Loss of parameters	Check the data sheet and the values.
0x4510 (17680)	0x6320 (25376)	0x6320 (25376)	Parameter error	Check the data sheet and the values.
0x4510 (17680)	0x6321 (25377)	0x6321 (25377)	Parameter missing	Check the data sheet.
0x4510 (17680)	0x6330 (25392)	0x6330 (25392)	Parameter not initialized	Check the data sheet and the values.
0x4510 (17680)	0x6340 (25408)	0x6340 (25408)	Parameter not specific	Check the data sheet and the values.
0x4510 (17680)	0x6350 (25424)	0x6350 (25424)	Parameter was changed	Check the configuration.
0x4510 (17680)	0x7700 (30464)	0x7700 (30464)	Cable break of a subordinate device	Check the installation.
0x4510 (17680)	0x7701 (30465)	0x7701 (30465)	Cable break of the subordinate device 1	Check the installation.
0x4510 (17680)	0x7702 (30466)	0x7702 (30466)	Cable break of the subordinate device 2	Check the installation.
0x4510 (17680)	0x7703 (30467)	0x7703 (30467)	Cable break of the subordinate device 3	Check the installation.
0x4510 (17680)	0x7704 (30468)	0x7704 (30468)	Cable break of the subordinate device 4	Check the installation.
0x4510 (17680)	0x7705 (30469)	0x7705 (30469)	Cable break of the subordinate device 5	Check the installation.
0x4510 (17680)	0x7706 (30470)	0x7706 (30470)	Cable break of the subordinate device 6	Check the installation.
0x4510 (17680)	0x7707 (30471)	0x7707 (30471)	Cable break of the subordinate device 7	Check the installation.
0x4510 (17680)	0x7708 (30472)	0x7708 (30472)	Cable break of the subordinate device 8	Check the installation.

Channel Error Type	Extended Channel Error Type	IO-Link Event code(s)	Meaning	Action
0x4510 (17680)	0x7709 (30473)	0x7709 (30473)	Cable break of the subordinate device 9	Check the installation.
0x4510 (17680)	0x770A (30474)	0x770A (30474)	Cable break of the subordinate device 10	Check the installation.
0x4510 (17680)	0x770B (30475)	0x770B (30475)	Cable break of the subordinate device 11	Check the installation.
0x4510 (17680)	0x770C (30476)	0x770C (30476)	Cable break of the subordinate device 12	Check the installation.
0x4510 (17680)	0x770D (30477)	0x770D (30477)	Cable break of the subordinate device 13	Check the installation.
0x4510 (17680)	0x770E (30478)	0x770E (30478)	Cable break of the subordinate device 14	Check the installation.
0x4510 (17680)	0x770F (30479)	0x770F (30479)	Cable break of the subordinate device 15	Check the installation.
0x4510 (17680)	0x7710 (30480)	0x7710 (30480)	Short Circuit	Check the installation.
0x4510 (17680)	0x7711 (30481)	0x7711 (30481)	Grounding error	Check the installation.
0x4511 (17681)		0x8000 (32768) – 0xFFFF (65535)	Event from an IO-Link device that supports Murrelektronik IO-Link integration. The Extended Channel Error Type plus 0x8000 (32768) corresponds to the original IO-Link event code.	
0x4511 (17681)	0x0100 (256)	0x8100 (33024)	Communication monitoring: General error	Check the device.
0x4511 (17681)	0x0110 (272)	0x8110 (33040)	Process data monitoring: General error	Check the device.
0x4511 (17681)	0x0C00 (3072)	0x8C00 (35840)	Technology-specific error in the application	Reset the device.
0x4511 (17681)	0x0C01 (3073)	0x8C01 (35841)	Simulation active	Check the operating mode.
0x4511 (17681)	0x0C10 (3088)	0x8C10 (35856)	Process value above the valid range	Process value uncertain.
0x4511 (17681)	0x0C20 (3104)	0x8C20 (35872)	Measuring range exceeded	Check your application.
0x4511 (17681)	0x0C30 (3120)	0x8C30 (35888)	Process value below the valid range	Process value uncertain.
0x4511 (17681)	0x0C40 (3136)	0x8C40 (35904)	Service requirement - cleaning	Clean the device.
0x4511 (17681)	0x0C41 (3137)	0x8C41 (35905)	Service requirement - topping up	Top up the device.
0x4511 (17681)	0x0C42 (3138)	0x8C42 (35906)	Service requirement - wear	Replace the wearing parts on the device.
0x4511 (17681)	0x0CA0 (3232) – 0x0DFE (3582)	0x8CA0 (36000) – 0x8DFE (36350)	Device-specific error code	For further details on this IO-Link event, please read the IO-Link device manual.

Tab. 9-26: Description of individual diagnostics - device events

10 Maintenance and cleaning



NOTE

→ Replace defective or damaged devices.



NOTE

In the event of maintenance work, you can replace the device with the same type.

→ **Check whether the switch settings of the old and new device are identical.**



NOTE

Device cleaning.

→ Use only oil-free compressed air or spirit.

→ Only use lint-free materials (e.g. leather cloth).

→ Do not use contact spray.

10.1 Software update



HINWEIS

The operating entity is responsible for the software update. The software update may only be performed by trained personnel. Prior to the software update, the connection to the higher-level control unit must be deactivated.

The **MVK-MPNIO** device offers the possibility to carry out an update. The update is performed with the “**AutoUpdateX V3**” software. It requires a firmware provided by Murrelektronik.

- Only firmware provided by Murrelektronik may be used.



You can find the “AutoUpdateX V3” software in our online shop under the product's article number: shop.murrelektronik.com.

Instructions on the operation of the software can be found in the manual of the installed “AutoUpdateX V3” under the menu item “Help”.

10.2 Recovery Firmware

In case of a damaged firmware image, the device starts in the **recovery mode** after switching on.

The recovery firmware is carried out in this mode.

The recovery mode uses a Murrelektronik-specific IP protocol and requires an IP address via a DHCP server.

In the recovery mode, an operating firmware for the device can be installed by means of the AutoupdateX tool.

11 Appendix

11.1 Accessories

Designation	Art. No.
Connector cap 7/8" outer thread with chain	55390
7/8" Plastic screw plug	55385
Screw Plug M12 Metal	996049
Plastic M12 screw plug, VE10	58627
Metal addressing lid	55317
Grounding strap screw-down set M4	4000-71003-0101604

11.1.1 Tools

Designation	Art.-No.
6-part screwdriver set	7000-98001-0000000
M12 torque wrench set, AF 13	7000-99102-0000000
7/8" installation wrench set, wrench size 22	7000-99104-0000000



Fig. 11-1: Installation wrench



PRODUCTS AND ACCESSORIES

You will find a wide range of products in our catalog or in our Murrelektronik online shop: shop.murrelektronik.com

11.2 Glossary

Term	Meaning
Bus Run LED	LED for signaling the bus state.
CfgF LED	LED for signaling correct/incorrect configuration.
Byte	Term from IEC 61158. Corresponds to 1 byte or 8 bits.
DI	Digital input
DIP switch	Dual in-line package / switch with two connection rows arranged in parallel.
DO	Digital output
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharges
FE	Functional ground
IIoT	The Industrial Internet of Things (IIoT) is the industrial form of the Internet of Things (IoT). In contrast to the IoT, it does not represent the user-oriented concepts but focuses on the application of the internet of things in the manufacturing and industrial environment.
IN	Input
I&M data	For the identification and maintenance (I&M), data records (data structures) that must be implemented as mandatory for all devices with DP-V1 have been defined for PROFIBUS. These data structures are used to uniquely identify the field device and facilitate maintenance.
IO-Link	Standardized communication system to connect intelligent sensors and actuators to an automation system
IRT	Isochronous-Real-Time/protocol for synchronous activation of data and functions on different devices.
IP67	Ingress protection/degree of protection according to DIN EN 60529
IP address	Address for identification in an Ethernet network
LED	Light Emitting Diode
LNK/ACT-LED	Link/Activity LED for signaling Ethernet communication.
MAC address	MAC address stands for Media Access Control Address and represents the unique identification of a network interface. A MAC address is also often referred to as physical address.
MRP	Media Redundancy Protocol / A protocol for management of ring topologies in a production system. It is used to increase the availability of devices in the network.
n.c.	Not connected
OUT	Output
PELV	Protective Extra Low Voltage
Power LED	LED for indication of the power supply
PROFINET	Process Field Network
PROFenergy	PROFINET profile for the energy management in production systems
PQI	The Port Qualifier Information (PQI) provides status information on the IO-Link port and/or the device status.
SELV	Safety Extra Low Voltage with safe disconnection.
Shared Device (SD)	Protocol extension of a PNIO device for establishing simultaneous communication links with several PNIO controllers.
SNMP	Simple Network Management Protocol/Protocol for easy monitoring and control of various network users.
SPS/PLC	Programmable logic control
UA	Actuator voltage

Term	Meaning
US	Sensor voltage
IO-Link validation	Compatibility or identity check of a connected IO-Link device.

12 Legal notes

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Murrelektronik GmbH | Falkenstraße 3 | 71570 Oppenweiler | GERMANY
☎ +49 7191 47-0 | 📠 +49 7191 47-491 000 | info@murrelektronik.com
www.murrelektronik.com

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