MURR ELEKTRONIK

stay connected

ENGLISH MANUAL

for devices of the IMPACT67 EtherNet/IP series

Art.-No. 54631

This document applies to the following products:

Product designation	Art.-No.
IMPACT67 Pro E DIO8 IOL8 M12L 5P	54631

Document status:

Manual number	54631
Language	EN
Version	1.4
Date	2025-11

Murrelektronik GmbH
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

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.

Instructions on use and storage

- ➔ Read this chapter carefully before working with the documentation or the device.
- ➔ Read the documentation carefully before commissioning 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 covered in this manual.

Target group

This document is intended for qualified automation engineering personnel.

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.

Customer Service Center (CSC)

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.

A number of support tools and measurement facilities are available for field bus systems and EMC interferences.

Please do not hesitate to call us at +49 (0) 7191 47-2050 or send an e-mail to support@murrelektronik.com

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	IMPACT67 device
1x	Operating instructions – multilingual
15x	Designation label

1.3 Applicable documents

Other applicable documents

Document	Art. No.	Location
Operating Instructions	54631	Included in the scope of delivery or downloadable from http://shop.murrelektronik.com
Product data		

1.4 Environmentally friendly disposal

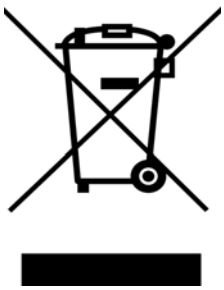
Compliance with country-specific waste disposal regulations

➔ 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).

Scrap materials may only be sorted by qualified personnel

➔ Proceed with care when dismounting the device. There is a risk of injury.

➔ Send the separated components to the correct recycling line.



Disposal

The product can be returned to Murrelektronik GmbH free of charge for disposal. The same applies to 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

1.5.1 Symbols

This document includes information and notes to be observed for your own safety and to avoid injuries and material damage. Such information is indicated 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

➔ 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

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

EtherNet/IP™	ODVA.Inc
IO-Link	c/o PROFIBUS Nutzerorganisation e.V. (PNO)
STUDIO 5000 LOGIX DESIGNER	Rockwell Automation Inc.

1.5.3 Specifications

Specification	Link
EtherNet/IP	www.odva.org

Specification	Link
IO-Link Version 1.1.1	www.io-link.com

1.5.4 Software tool

Software tool	Link
Studio5000, Rockwell Automation Inc	www.rockwellautomation.com

1.5.5 Murrelektronik software tool

Software tool	Link
Murrelektronik IO-Link Device Tool Version V40 and higher	shop.murrelektronik.com
AutoUpdateX V3	shop.murrelektronik.com

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/devices, comply with the 5 safety rules of electrical engineering.

Protection of persons and material assets

➔ According to applicable national specifications/standards (e.g., DIN VDE 0105-100).

Safety rules for protection against high electrical voltage:

1 | Switch off.

2 | Secure against switching on again.

3 | Make sure that there is no voltage on any pole.

4 | Ground and short-circuit.

5 | Cover or block off adjacent parts that are live or energized.

Qualified personnel

Only qualified automation technology personnel is allowed to install, commission and operate the device.

According to the standard IEC 60050-195, qualified personnel means persons having the appropriate training and experience to enable them to avoid hazards and risks that may arise from electricity.

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

Interventions in the hardware and software of the device dare, if they are not described in this document, only be carried out by qualified personnel from Murrelektronik GmbH.

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

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.

Protective measures by the machine operator

- ➔ Observe the instructions in this manual.
- ➔ Observe the test specifications contained in the operating instructions of all connected components.

2.2 Intended purpose

IMPACT67 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.

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

- ➔ If the device is used in domestic and mixed environments, the applicable standards must be observed.

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.

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 **IMPACT67 Pro** is a fully encapsulated fieldbus device in a plastic case. It is particularly robust and designed for use in rough environments.

Property	Description
Robust	Versatile applications under very high loads due to: ■ robust plastic case, ■ No formation of water of condensation due to fully encapsulated case.
Vibration-proof	Safety function also guaranteed when subjected to continuous vibration
Resistant	Long life due to acid and alkali resistant plastic.
Tight	Tight up to degree of protection IP67 (EN 60529)

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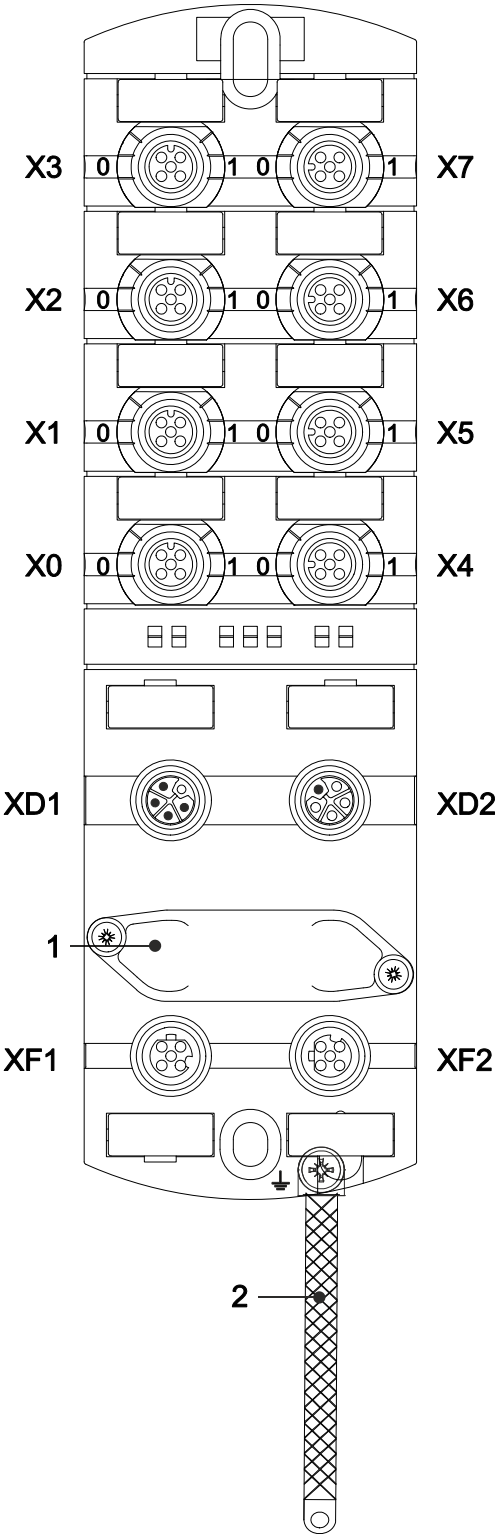
3.1.1 Product Designation Code

IMPACT67 Pro	Product family
E	Function ■ EtherNet/IP
DIO8	Digital inputs and outputs ■ D = Digital ■ I = Input ■ O = Output Number of channels ■ 8 = 8 channels (pin 2)
IOL8	IOL = IO-Link master Number of channels ■ 8 = 8 channels (pin 4)
M12L 5P	POWER connection (power supply) ■ M12 = Size ■ L = Coded ■ 5P = 5-pin version with Functional ground (FE)

3.1.2 Device structure

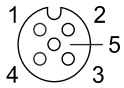


X0 ... X7	Digital inputs and outputs or IO-Link, M12, A-coded
0	Channel corresponds to pin 4
1	Channel corresponds to pin 2
	Examples:
	Channel **0**2 = **Pin 4** Female connector X2
	Channel **1**6 = **Pin 2** Female connector X6
XD1	Power supply POWER IN, M12, L-coded, **5-pin**
XD2	Power supply POWER OUT, M12, L-coded, **5-pin**
1	Rotary switch
XF1	EtherNetI/P-Port 1, M12 D-coded
XF2	EtherNet/IP-Port 2, M12 D-coded
2	Ground strap for functional ground

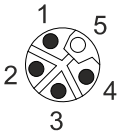
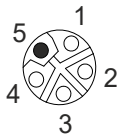
Fig. 3-1: Device design

3.1.3 Pin assignment

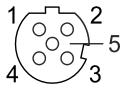
M12 female connector A-coded

X0 ... X7		
	Pin 1	24 V ⎓
	Pin 2	DI/DO
	Pin 3	0 V
	Pin 4	DI/DO/IO-Link
	Pin 5	0 V

M12 male/female connector L-coded POWER IN/OUT

XD1			XD2
	Pin 1	24 V ⎓ US	
	Pin 2	0 V	
	Pin 3	0 V	
	Pin 4	24 V ⎓ UA	
	Pin 5	⏚	

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.

3.1.4 Indication elements

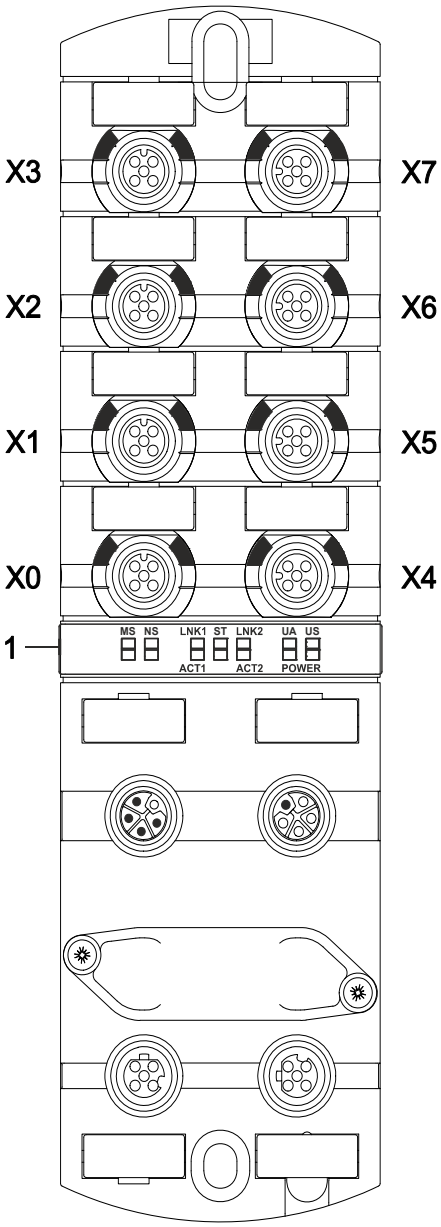


Fig. 3-2: Indicators

X0 ... X7	LED digital inputs and digital outputs or IO-Link
1	LED MS
	LED NS
	LED LNK1/ACT1
	LED status (ST)
	LED LNK2/ACT2
	LED POWER UA
	LED POWER US

3.2 IO-Link

IO-Link is a standardized protocol that enables connection of intelligent devices (sensors and actuators) to an automation system.

Communication takes place between an IO-Link master and one or more IO-Link devices. A master module has one or more ports and one device can be connected to each port. IO-Link is a point-to-point communication system and is not a fieldbus.

The IO-Link master module is the interface between the controller and the IO-Link system.

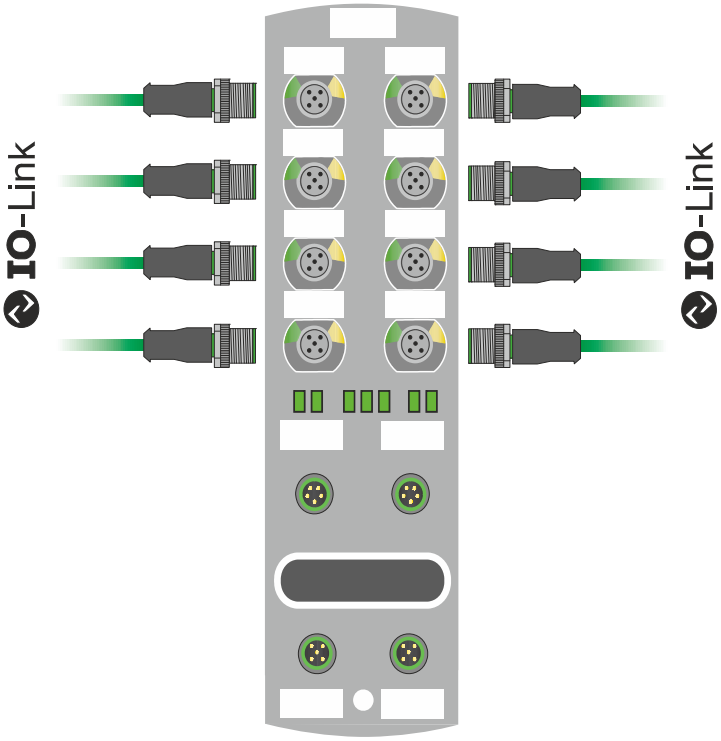


Fig. 3-3: IO-Link

IO-Link mode

IO-Link communication (C/Q) is activated on pin 4, an IO-Link device can be connected and used.

Explicit Message

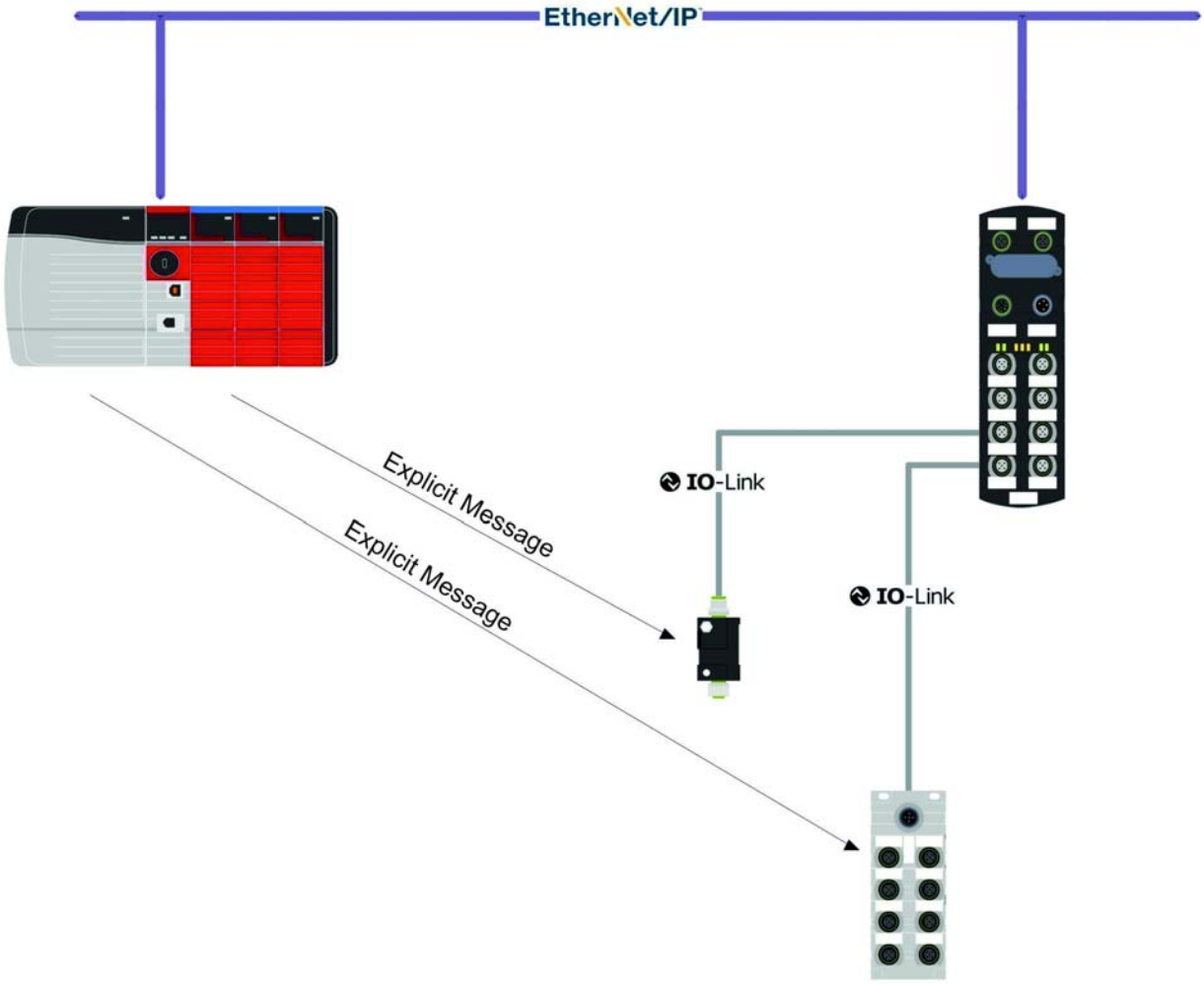
The acyclic data can be used to write the device parameters from an IO-Link device or to read parameters, measured values and diagnostic data from an IO-Link device.

The following tasks can be performed:

- Parameterization/configuration of an IO-Link device when the system is running.
- Diagnostic of an IO-Link device by reading diagnostic parameters.
- Execution of IO-Link port functions.
- Back-up/recovery of IO-Link device parameters.

The data on the IO-Link device is uniquely addressed with index and sub-index.

This data can be accessed with the so-called IOL CALL. This is usually provided as a data handling block by the PLC manufacturer.



For further information, see chap. 8.5 "IO-Link configuration".

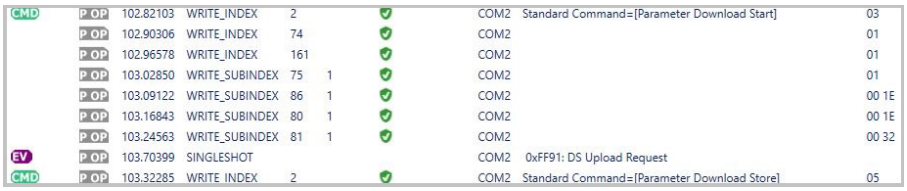
3.2.1 Data storage

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.



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

3.3 EtherNet/IP

3.3.1 Communication

EtherNet/IP is based on a generator/receiver communication model for which the multicast Ethernet communication enables fast “Report by exception” responses.

The connection to the control scanner can only be established in an EtherNet/IP network via 10/100MBit/s Ethernet switches.

The maximum permissible cable length to the end point without any auxiliary devices is 100 m.

A 2-port switch is integrated into the fieldbus device. This switch sends multicast messages to all switch ports and behaves in this case like a hub. When Unmanaged Switches are used, more multicast users (EtherNet/IP users) are added to the system, resulting in more multicast traffic for the users. Thus, a higher amount of bandwidth is used in the system which results in longer response times as each user must evaluate messages that are not addressed to the user.

Excessive network traffic may result in missed messages and RPI response delays which may interrupt communication.

It is therefore recommended to split the entire network into several segments by means of several switches. By choosing suitable RPI times and switches, high-speed networks can be decoupled from non-time-critical systems.

A Managed switch should be considered for network segments that include traffic unrelated to the IO-Link segment.

Managed switches are recommended for high-speed control systems. To manage the multicast traffic, the switch must support the IGMP Snooping function (Internet Group Management Protocol). For the connection of a control system to a large plant or company network, consider using a virtual LAN on a switch, or a router.

Unicast connections

The device is able to establish data connections using Unicast connections. Unicast connections may result in reduced traffic on the network. Please select the best type of connection for your application.

3.3.2 Requested Packet Interval (RPI)

When setting up an EtherNet/IP system, the RPI value must be carefully set in the scanner.

According to the manufacturer's version, this value is in the range between 1 ms and several hundred ms.

The RPI value determines the speed at which the scanner sends Ethernet/IP messages (packets).

It also determines the maximum speed at which the bus node sends messages.

The value that is set in the scanner is transmitted to the device as soon as the connection is established so that the system uses the same time base.

The RPI value can be used not only to set the speed, but also to set the speed at which the scanner expects timely reception.

If the selected RPI time is too short, a higher network load is automatically generated.

Due to the higher network load, the device must spend more time to process the queries accordingly.

This is also applicable to the messages which are not addressed directly to the device since they must be accepted and rejected anyway.

This results in an overload situation in which the device is no longer able to execute the internal processes and adhere to the required RPI time.

If the reception of the telegram exceeds the set RPI time by a factor of 4, the control interrupts the I/O communication and switches into an error state.

Please note:

a | Configurations which require RPI times shorter than 10 ms must be tested in advance for correct operation.

b | The minimum supported RPI time is 1 ms!

For further information, refer to chap. 8.3 "Requested Packet Interval (RPI) configuration".

3.3.3 Device Level Ring (DLR)

Device Level Ring (DLR)

Device Level Ring (DLR) is a protocol that allows media redundancy in a ring topology, e.g. for EtherNet/IP™.

A ring network consists of at least one ring supervisor and any desired number of users.

To build up the topology and to detect cable breaks inside the ring, there are two different methods:

a | Beacon-based

b | Announce-based

Users which support DLR must have implemented the DLR object (0x47) that provides the methods for configuration and diagnostic.

The devices described in this manual support the Beacon-based DLR technology.
The described devices do **not** support the ring supervisor function and can therefore not be used as ring supervisor.

For further information, refer to chap. 8.4 "Device Level Ring (DLR) configuration".

3.4 Industrial Internet of Things (IIoT)

The device supports the following IIoT functions for industrial communication: JSON, MQTT, and OPC UA.

For further information, refer to chap. 8.6 "Industrial Internet of Things (IIoT)".

4 Technical Data

4.1 Electrical data

Bus data		
Fieldbus protocol		EtherNet/IP
Ethernet		10/100 Mbit/s
Addressing		BOOTP, DHCP, WebUI, Rotary encoder switch
Connection types		Exclusive Owner, Listen Only, Input Only
Device Level Ring (DLR)		Beacon-based
Connection		M12, 4-pin, D-coded

OPC UA-Server		
OPC UA Server	According to "IO-Link Companion Specification" and Murrelektronik IO-Link Diagnosis www.murrelektronik.com	Yes
Transport		UA TCP, UA Secure Conversation, UA Binary Encoding
Server profile		Micro Embedded Device
Protocol		OPC UA TCP
User access	Read access only Read and write access	Anonymous User name/password
Number of sessions		2
Number Subskriptions per Session		2
Number „Monitored Items“ per Session		20
Minimum release interval		100 ms
Maximum number of sessions/clients		5
Data coding		UA binary
Energy monitoring	Current and voltage	Yes
Temperature monitoring		Yes

MQTT-Client		
MQTT		Client
Client services		Publish
Protocols	Over TCP	MQTT
Topic size	Individually per MQTT publication and common topic prefix of the associated MQTT connection	≤256 bytes ≤256 bytes
Topics		■ Printable UTF-8 string ■ NUL-terminated ■ Multibyte encoding (MBCS) ■ Payload: JSON
Will Topic		≤256 Bytes
Quality of Service		QoS 0, QoS 1 and QoS 2
IP standard		IPv4

MQTT-Client		
Port	1883 (default)	MQTT unencrypted
MQTT standard		V3.1.1
JSON, MQTT	JSON integration for IO-Link V1.0.0	Yes, via REST API and MQTT
Energy monitoring	Current and voltage	Yes
Temperature monitoring		Yes
Restriction		The Subscribe service is not supported.

REST API		
Standard	According to “JSON Integration for IO-Link,Version 1.0.0, Mar 2020” https://io-link.com/share/Downloads/IO-Link_Integration/JSON_Integration_10222_V100-_Mar20.zip	Yes
Protocol		HTTP
User access	Read access only Read and write access	Anonymous User name/password
Authentication	According to RFC 7617	HTTP Basic Authentication
Supported endpoints		See product manual

Web server		
HTTP		HTTP/1.1
Port		80
Connections	Over TCP	≤8 simultaneous connections. One connection is being processed.
JavaScript		Required
HTTPS		Not supported

IO-Link		
IO-Link devices operating voltage		24 V ⎓
IO-Link devices voltage range		20 ... 30 V ⎓
Transfer rate		COM1 / COM2 / COM3
Standardized Master Interface (SMI)		According to IO-Link specification V1.1
Transfer rate recognition		Automatic

Supply		
Operating voltage US		24 V⎓
Voltage range US		18 ... 30 V⎓
	When using IO-Link	20.3 ... 30 V⎓
Operating voltage UA		24 V⎓
Voltage range UA		18 ... 30 V⎓
Sensor current US	≤40 °C (see Derating)	≤16 A
Actuator current UA	≤40 °C (see Derating)	≤16 A
Current consumption	At idle	≤0.18 A
Protection against reverse polarization for US and UA		Yes
Reverse polarity protection		Yes

Supply		
Connection		M12, 5-pin, L-coded
Cable cross-section	Current per supply ≤12 A	≥1,5 mm^2
	Current per supply >12 A	≥2,5 mm^2

Input (DI)		
Sensor power supply	Per port, ≤40 °C (see Derating)	≤2 A load Automatic start
Total current sensor supply	≤40 °C (see Derating)	≤10 A
Filter time		0 ... 15 ms + tcycle, adjustable
Delay time for signal change		2 ... 5 ms
Input characteristic	EN 61131-2	Type 1 + Type 3
Short-circuit protection, sensor supply		MOSFET with current measurement
Connection		M12, 5-pin, A-coded
Cable cross-section		≤0.75 mm^2
Cable length		≤30 m
Total current	Per port	≤4 A

Output (DO)		
Output current DO (UA)	Per pin, ≤40 °C (see Derating)	≤2 A
Total current outputs	≤40 °C (see Derating)	≤10 A
Frequency		≤50 Hz
Short-circuit protection actuator		MOSFET with current measurement
Connection		M12, 5-pin, A-coded
Cable cross-section		≤0.75 mm^2
Cable length		≤30 m
Total current	Per port	≤4 A

Derating

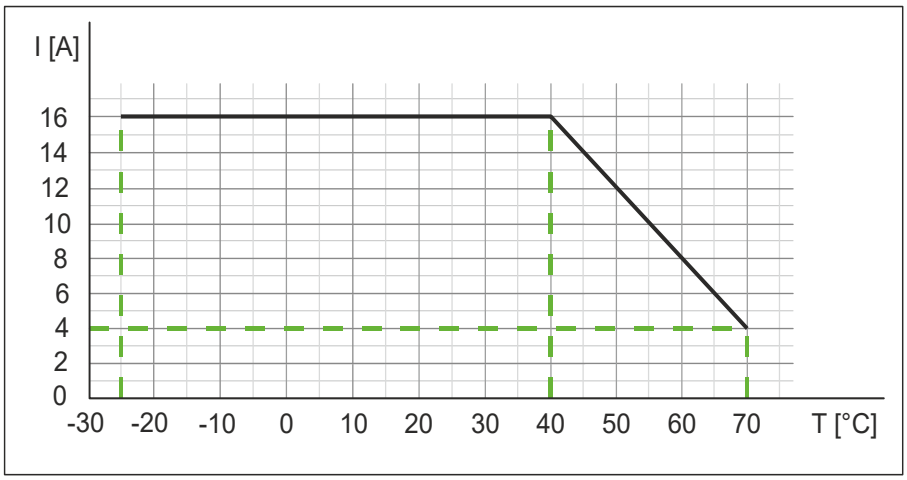


Fig. 4-1: Sensor current US and actuator current UA

Derating

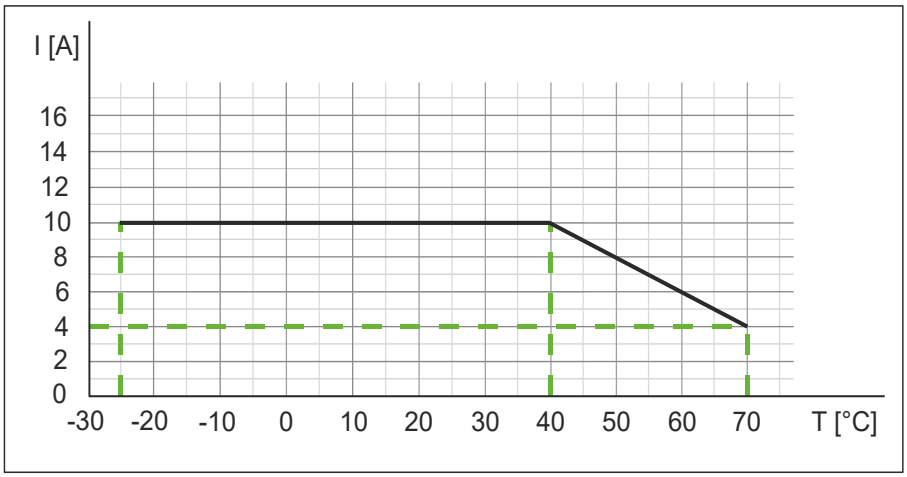


Fig. 4-2: Total current, sensor power supplies and total current, outputs

Derating

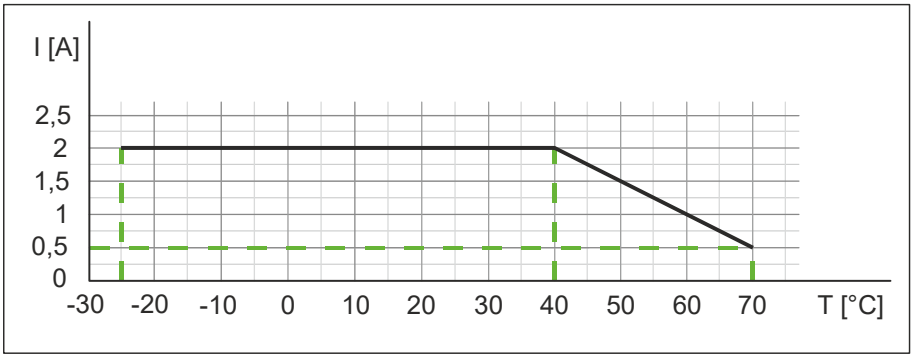


Fig. 4-3: Current per sensor power supply and output

4.2 Environmental characteristics

Climatic		
Ambient temperature Until HW 1.02 and SW 1.06		-25 °C ... +70 °C
Ambient temperature From HW 1.03 and SW 1.07		-40 °C ... +70 °C
Storage temperature Until HW 1.02 and SW 1.06	Provide acclimatization for commissioning	-25 °C ... +85 °C
Storage temperature From HW 1.03 and SW 1.07	Provide acclimatization for commissioning	-40 °C ... +85 °C
Transport temperature Until HW 1.02 and SW 1.06	Provide acclimatization for commissioning	-25 °C ... +85 °C
Transport temperature From HW 1.03 and SW 1.07	Provide acclimatization for commissioning	-40 °C ... +85 °C
Relative humidity		≤95 %
Installation hight	Above sea level	≤3000 m

Mechanical		
Oscillation test	EN 60068 Part 2-6	10 ... 58 Hz, Oscillation angle 0,35 mm, 58 ... 150 Hz; 20 g
Shock test	EN 60068 Part 2-27	50 g, duration 11 ms

Electrical safety		
Protection degree	EN 60529	IP67
Protection class	Using a SELV- or PELV- power supply	III
Pollution degree		2

EMC-inteference		
Radiated inteference E-field enclosure	EN 55016-2-3	Conform

EMC-immunity		
Electrostatic discharge (ESD)	EN 61000-4-2	Conform
Electromagnetic RF-fields	EN 61000-4-3	Conform
Fast transient burst	EN 61000-4-4	Conform
Surge AC	EN 61000-4-5	Conform
Conducted RF-fields	EN 61000-4-6	Conform
Voltage dips	EN 61000-4-11	Conform

4.3 Protection

Device protection		
Overvoltage protection		Yes
Overload protection device supply	To be ensured through load circuit monitoring	Yes
Inverse-polarity protection device supply		Yes
Short-circuit protection sensor supply		Electronically
Short-circuit protection output		Electronically
Protective circuit input	Internal	Suppressor diode

4.4 Mechanical data

Material data		
Housing material		Plastic

Assembly data		
Weight	Net	470 g
Dimensions	L x W x H	225.4 x 63 x 36 mm

4.5 Conformities, Approvals

Conformity, Approvals		
Product standard	EN 61131-2 Programmable logic controllers, Part 2	Compliant
CE	2014/30/EU 2011/65/EU	Compliant
UKCA		Compliant
EMC	2014/30/EU	Compliant
REACH	No. 1907/2006	SVHC List
WEEE	2012/19/EU	Compliant
ULus		E201820
RoHS	2011/65/EU & 2015/863	Exception 6c&7a
China RoHS	SJ/T 11364-2014	25 EPUP

Hazardous substance (有害物質)						
Part Name 零件名稱	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Hexavalent Chromium (Cr (VI)) 六价铬	Polybrominated biphenyls (PBB) 多溴联苯	Polybrominated diphenyl ethers (PBDE) 多溴联苯醚
Component part PCB [1] [2] 组件部分 印刷电路板	X	O	O	O	O	O
Connection Terminal / Screws / Housing[3] 接线端子 /拧/ 外殼	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。

1 EU RoHS Directive 2011/65/EU, Annex III: Exemption 7(a) Lead in high melting temperature type solders (i.e., lead-based alloys containing 85 % by weight or more lead)

2 EU RoHS Directive 2011/65/EU, Annex III: Exemption 7(c)-I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g., piezoelectronic devices, or in a glass or ceramic matrix compound.

3 EU RoHS Directive 2011/65/EU, Annex III: Exemption 6(c) Copper alloy containing up to 4 % lead by weight.

4.6 IP ports used

Port	
UDP Port 44818:	Encapsulation messages based on UDP
UDP Port 2222:	Implicit messaging (10 messaging)
UDP Port 68	DHCP client
TCP Port 44818	Encapsulation messages based on TCP. Explicit messaging
TCP Port 80	Integrated Webserver
TCP Port 4840	Integrated OPC UA Server. Default value. Port number can be modified by configuration.
UDP 55510	AutoUpdateX V3 Protocol

For the MQTT client, no fixed or configurable port is provided.
If the MQTT client is active, the next free port of the IP stack is assigned to it.

5 Mounting

5.1 Requirements

➔ Prerequisites for mounting:

- Even mounting surface to avoid mechanical tension.
- Provide proper 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

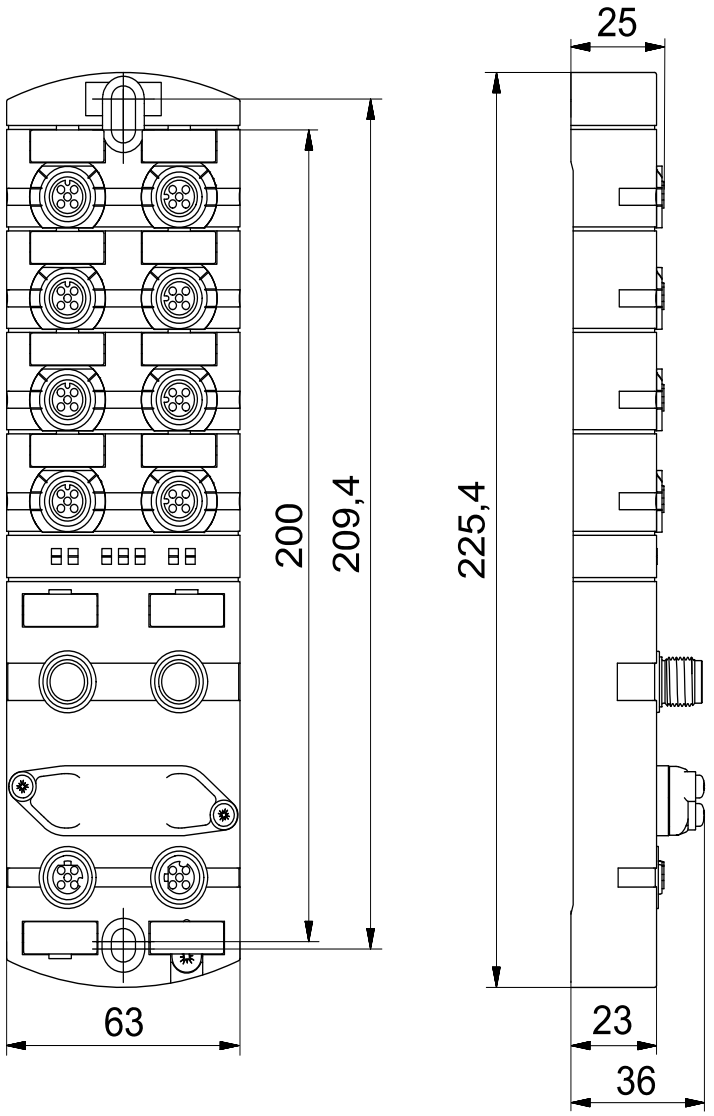


Fig. 5-1: Dimensions in mm

5.3 Mounting distance

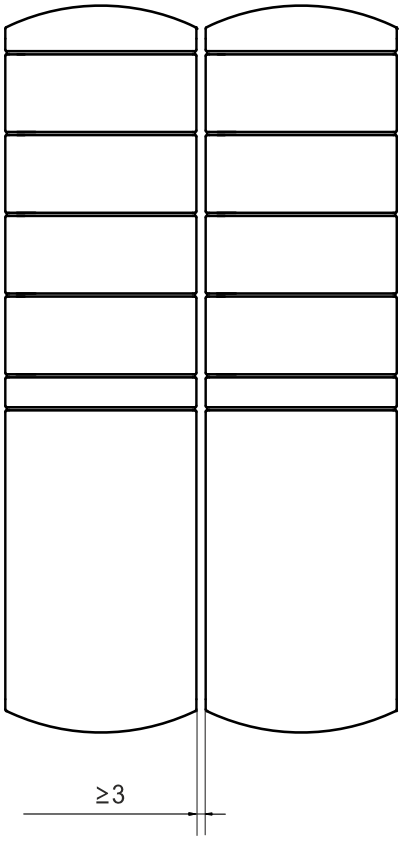


Fig. 5-2: Distance in mm

NOTE

➔ For correct installation and improved heat dissipation, we recommend keeping a minimum distance of 3 mm when mounting the IMPACT67.

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.

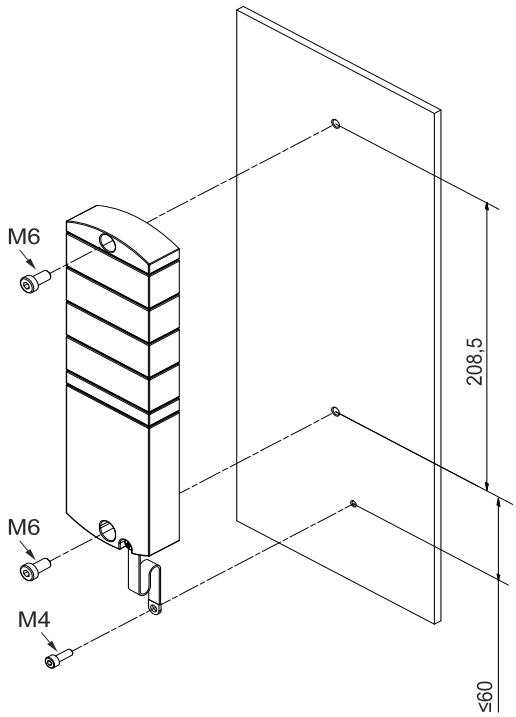


Fig. 5-3: Fasten device. Dimensions in mm (figure similar)

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 the housing.

3 | Slightly tighten the lower M6 bolt.

4 | Tighten the M6 bolts to the specified tightening torque.

5 | Ground device.

Attach the grounding strap (see chap. 5.4.1 "Functional ground").

NOTE
The screws and the grounding strap illustrated are not included with the device.

5.4.1 Functional ground

NOTE
Use a conductive screw to attach the grounding strap.

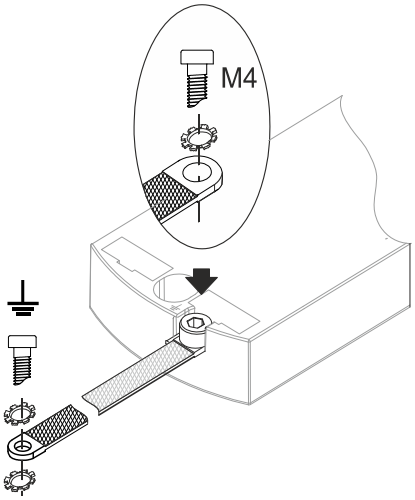


Fig. 5-4: Attach the grounding strap

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

For further information, refer to chap. 12.3.1 "System components".

The bolts and the grounding strap illustrated are not included in the scope of delivery. The grounding strap is available in the online shop of Murrelektronik GmbH
shop.murrelektronik.com.

5.4.2 Addressing lid

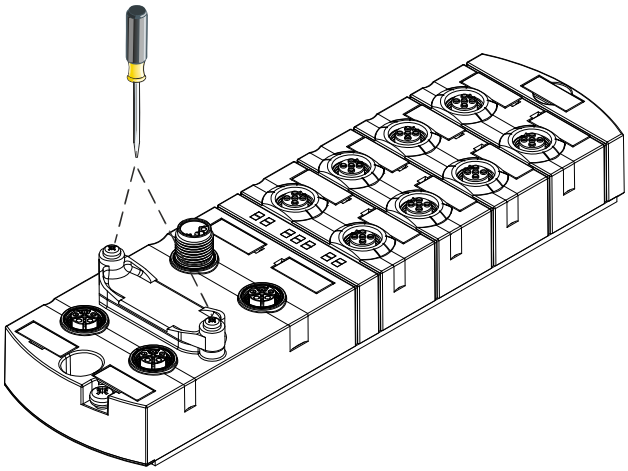


Fig. 5-5: Fasten rotary switch cover

M3	0,8 Nm		Art.-No. 7000-98001-0000000

For information on how to set the rotary switches, please refer to chap. 6.1.1 "Rotary switch settings"

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/devices, comply with the 5 safety rules of electrical engineering.

Protection of persons and material assets

➔ According to applicable national specifications/standards (e.g., DIN VDE 0105-100).

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.

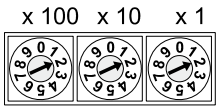
2 | Switch on actuator voltage.

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

6.1.1 Rotary switch settings

NOTE
Delivery state: The rotary switches are set to **000**, DHCP activated.

NOTE
An unambiguous and unique IP address must be assigned to each user in the network.



Address range 1 ... 999
x1 Rotary switch (ones)
x10 Rotary switch (tens)
x100 Rotary switch (hundreds)

Tab. 6-1: Rotary switch for addressing

Position/ Range	Web server	JSON	OPC UA	MQTT	Description	
0	-**	-**	-**	-**	Out of the box: DHCP	Previously saved internet configuration: the saved configuration is used.
1 ... 254	-**	-**	-**	-**	Last octet	Setting of the forth octet of the IP address using the rotary switch value. Default setting: **192.168.1.xxx**
255	-**	-**	-**	-**	Static IP address	The IP address saved last is active.
256 ... 910	-**	-**	-**	-**	Reserved**	
911	Disabled	Disabled	Disabled	Disabled	Secure Mode	Fieldbus communication in normal operation
912	-**	Disabled	Disabled	Disabled	IIoT mode disabled	
913	Disabled	Disabled	-**	-**	Web server and JSON disabled	
914	Enabled	Enabled	Enabled	Enabled	Activates all IIoT protocols and the web server.	
915-978	-**	-**	-**	-**	Reserved**	
979	Enabled	Enabled	Enabled(up to FWV1.05) Disabled(from FWV1.06)	Enabled(up to FWV1.05) Disabled(from FWV1.06)	Reset to factory settings	Sequence of actions only for this rotary switch position: 1 | Disconnect the device from the power supply. 2 | Set switch position 979. 3 | Supply the device with voltage. 4 | Wait until reset is completed. • ST LED **flashes** green: Device is performing the reset. • ST LED **lights up permanently** green: Reset is completed. ST LED indication, see 9.1 "LED indication" 5 | Disconnect the device from power. 6 | Switch position to 000 or any other desired position. 7 | Supply the device with voltage.
980-999	-**	-**	-**	-**	Reserved**	

Tab. 6-2: Setting the address

NOTE
Reserved switch positions do not have any fieldbus communication, see 9.1 "LED indication".

NOTE**
The last protocol setting is maintained.

Service settings

Web interface is activated/deactivated by rotary switch setting:

- 913 deactivated
- 914 activated

To do this:

1 | The device must be de-energized.
2 | The rotary switch must be set to 913 or 914.
3 | The device must be supplied with voltage.
4 | Wait until the MS/NS and US1/US2 LEDs flash green alternately.
5 | The device must be de-energized.
6 | The original rotary switch position must be set.
7 | The device must be supplied with voltage.

NOTE
Communication with the device is not possible with rotary switch positions 913 and 914.

NOTE
The saved default IP address is 192.168.1.6.

NOTE
The IP address parameters are stored for all switch settings. This must be taken into account in particular with the switch setting **0**.

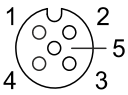
Setting an address

1 | Remove device supply.
2 | Dismantle the address cover.
3 | Set a unique address.
4 | Mount the address cover.
5 | Connect device supply.

The tightening torques can be found in chapter 5.4.2 "Addressing lid"

6.1.2 Connecting sensors and actuators

Connecting the M12 ports



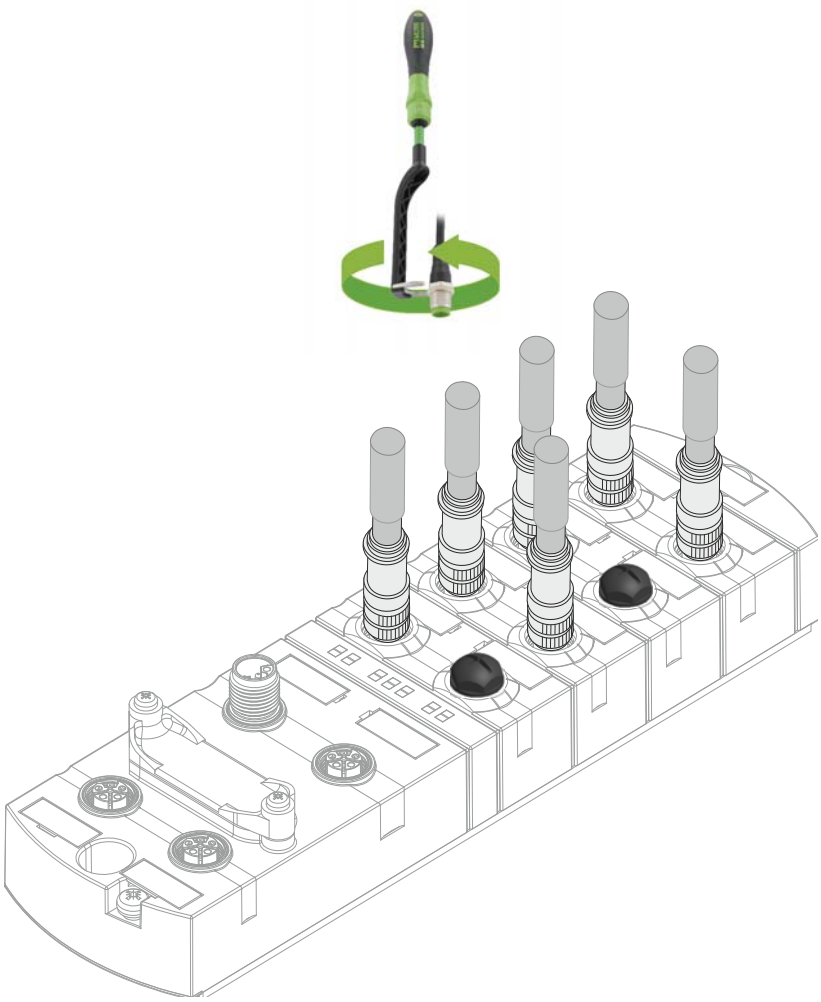


Fig. 6-1: Example of M12 connection inputs and outputs

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

The pin assignment of the slots can be found in chap. 3.1.3 "Pin assignment".

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.

NOTE
Maximum cable length of the sensor and actuator cables is limited to 30 m.

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 **2 A**.
- 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)

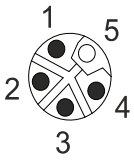
NOTE
The device automatically selects the appropriate communication speed for the IO-Link device.

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

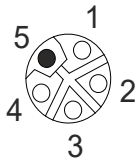
A large selection of accessories can be found in the catalog or online shop of Murrelektronik GmbH: shop.murrelektronik.com

6.1.3 Connecting the power supply

Connect M12 male connector to POWER IN



and M12 female connector to POWER OUT



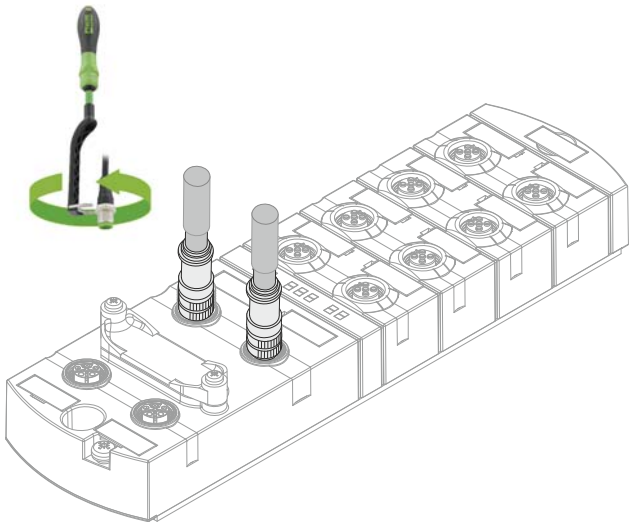


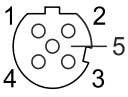
Fig. 6-2: Example of M12 connection POWER

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

The pin assignment of the slots can be found in chap. 3.1.3 "Pin assignment".

6.1.4 Connecting EtherNet/IP bus

Connecting the M12 port



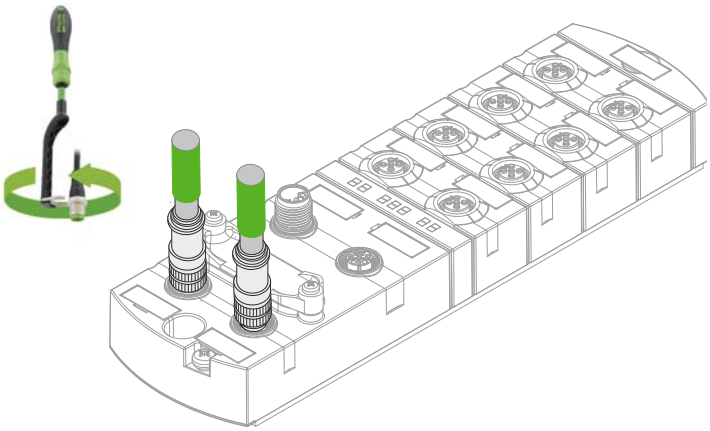


Fig. 6-3: Example of M12 connection bus

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

The pin assignment of the slots can be found in chap. 3.1.3 "Pin assignment".

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.

Connection of cables

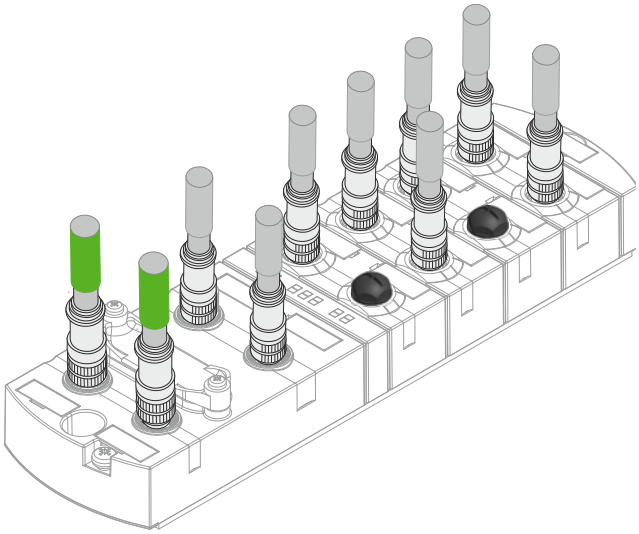


Fig. 6-4: Connection of cables

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

A large selection of accessories can be found in the catalog or online shop of Murrelektronik GmbH: shop.murrelektronik.com

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

7 Start-up

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 the EDS files

Tool used

This chapter describes how to configure a device, using the example of Studio5000 Logix Designer from Rockwell Automation Germany.

Loading the EDS files

Installing the EDS files and/or the device description file.

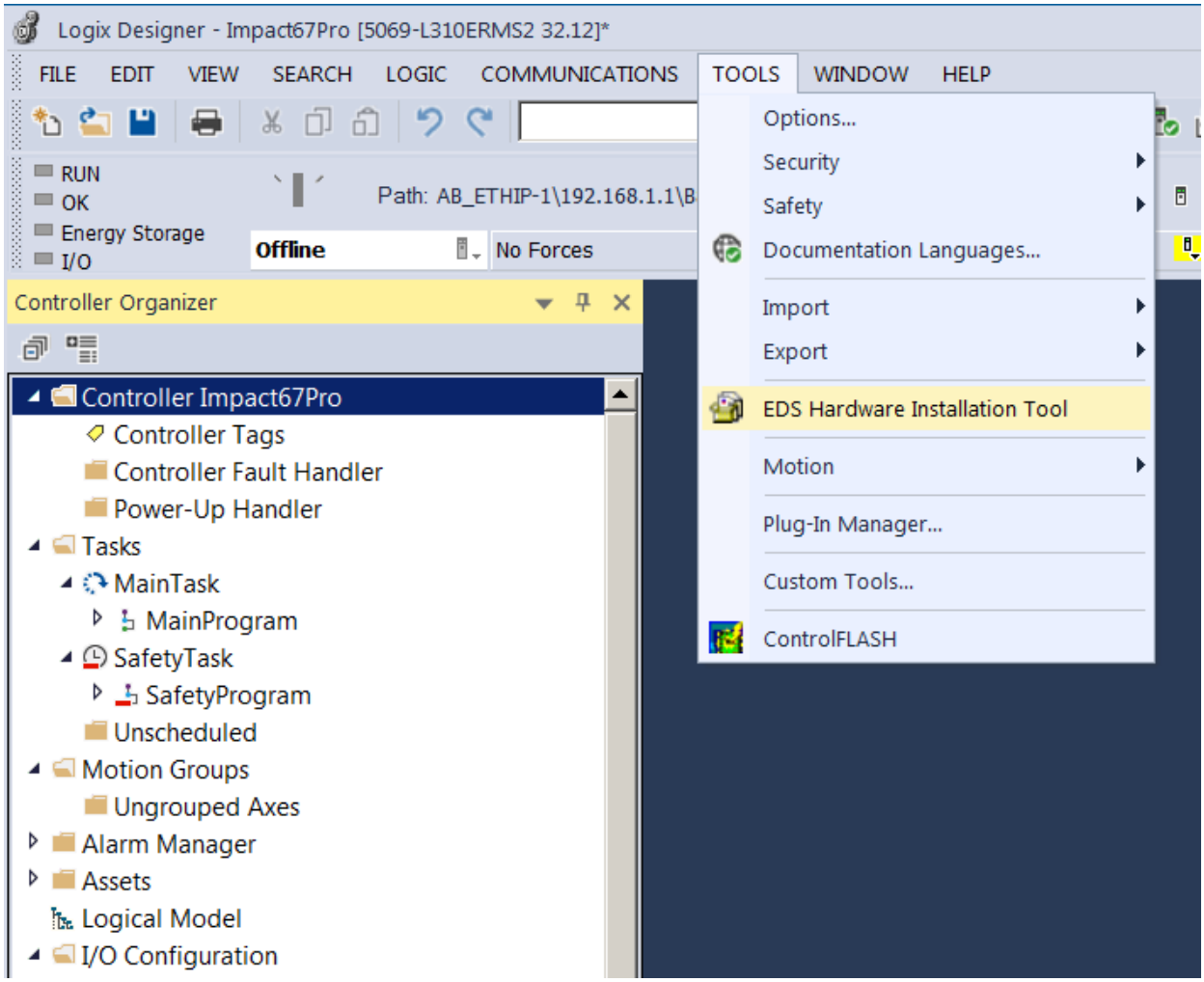


Fig. 7-1: Loading the EDS files

In **Project menu | Tools**,

➔ click ***EDS Hardware Installation Tool***.

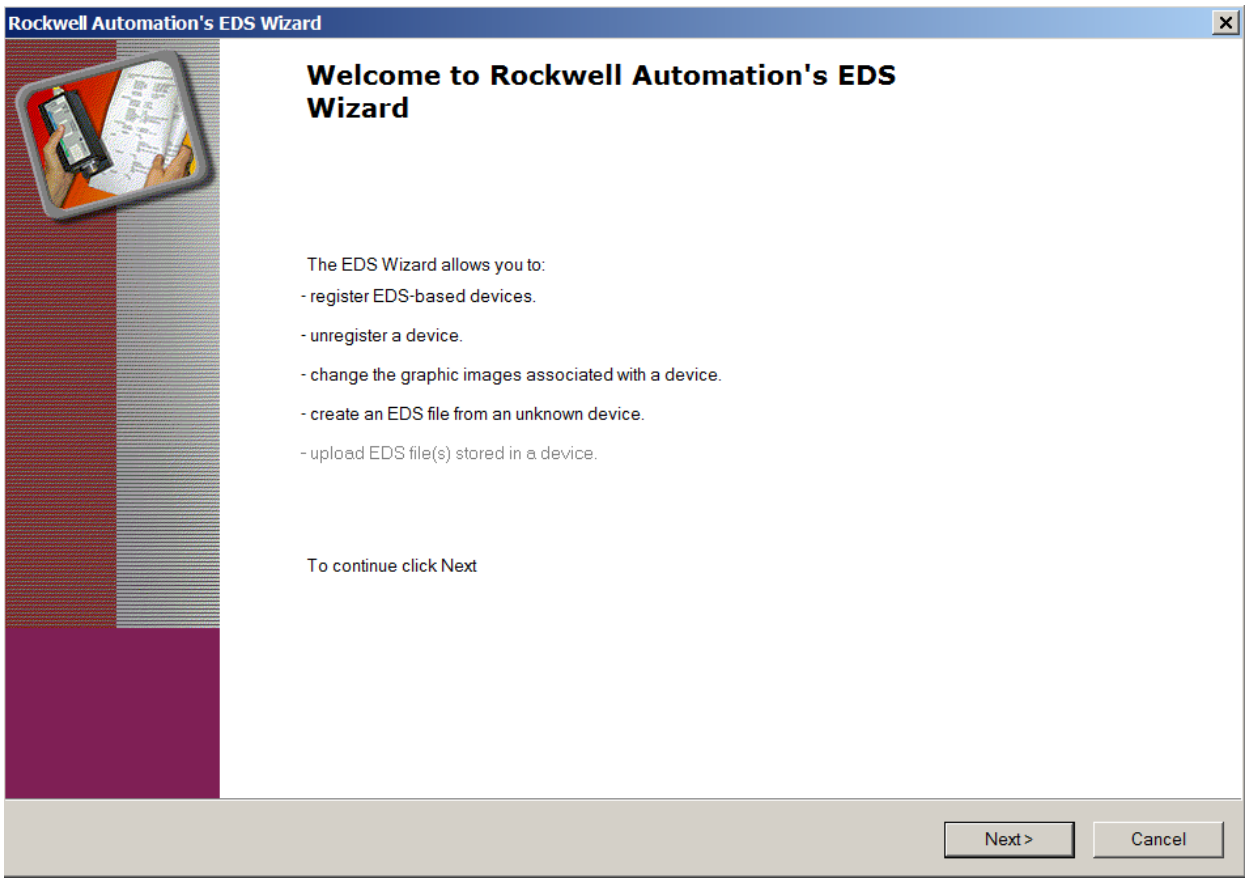


Fig. 7-2: EDS Wizard

➔ Click ***Next*** and follow the instructions of the dialog window.

➔ Finish the installation of the EDS files.

The devices can now be selected and added to the network.

The EDS file can be found in the online shop of Murrelektronik GmbH under the article number of the device.

7.2 Adding a device to the network

Adding new modules

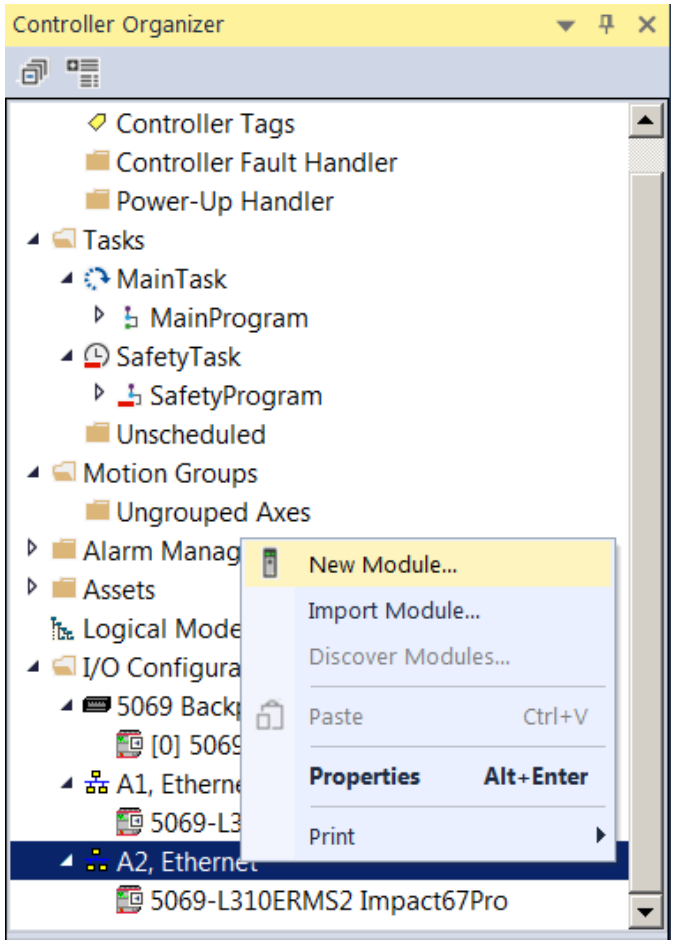


Fig. 7-3: New Module

In the **Controller Organizer | Ethernet**

➔ Click ***New Module***.

In the following dialog window, devices are shown which

a | have been registered previously with an EDS *or*

b | have already been delivered with the installation of the engineering software.

Alternative module selection

The dialog window can also be called via the menu line **Files/New Component/Module**.

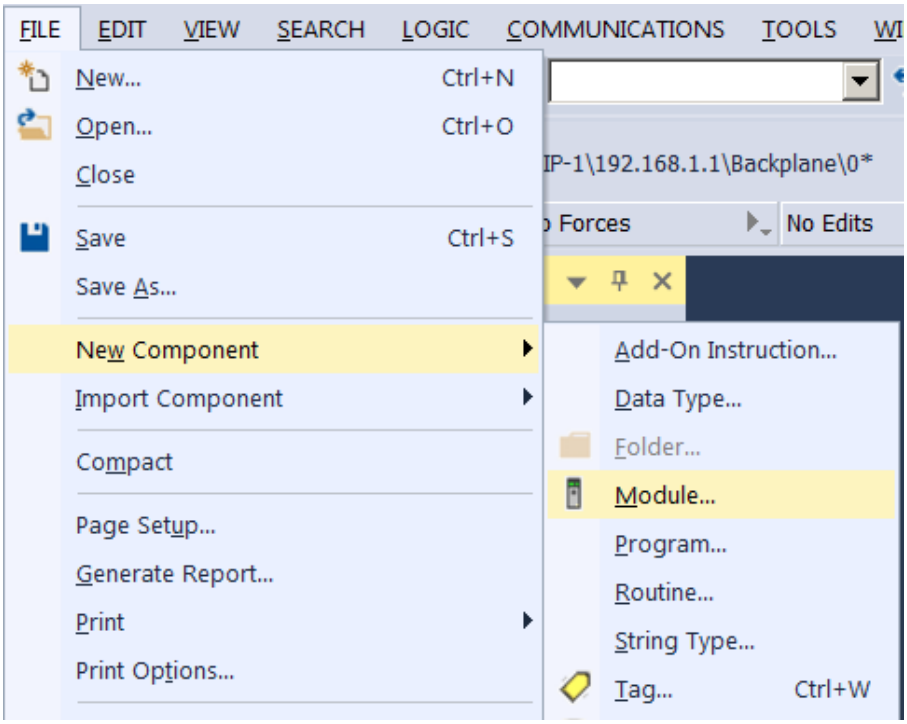


Fig. 7-4: Alternative module selection

Searching a device

Use the input mask to search for the device that you want to add to the network.

a | Use search terms which describe the desired device, e.g. product number, product name or manufacturer.

b | Use a filter from the dialog window.

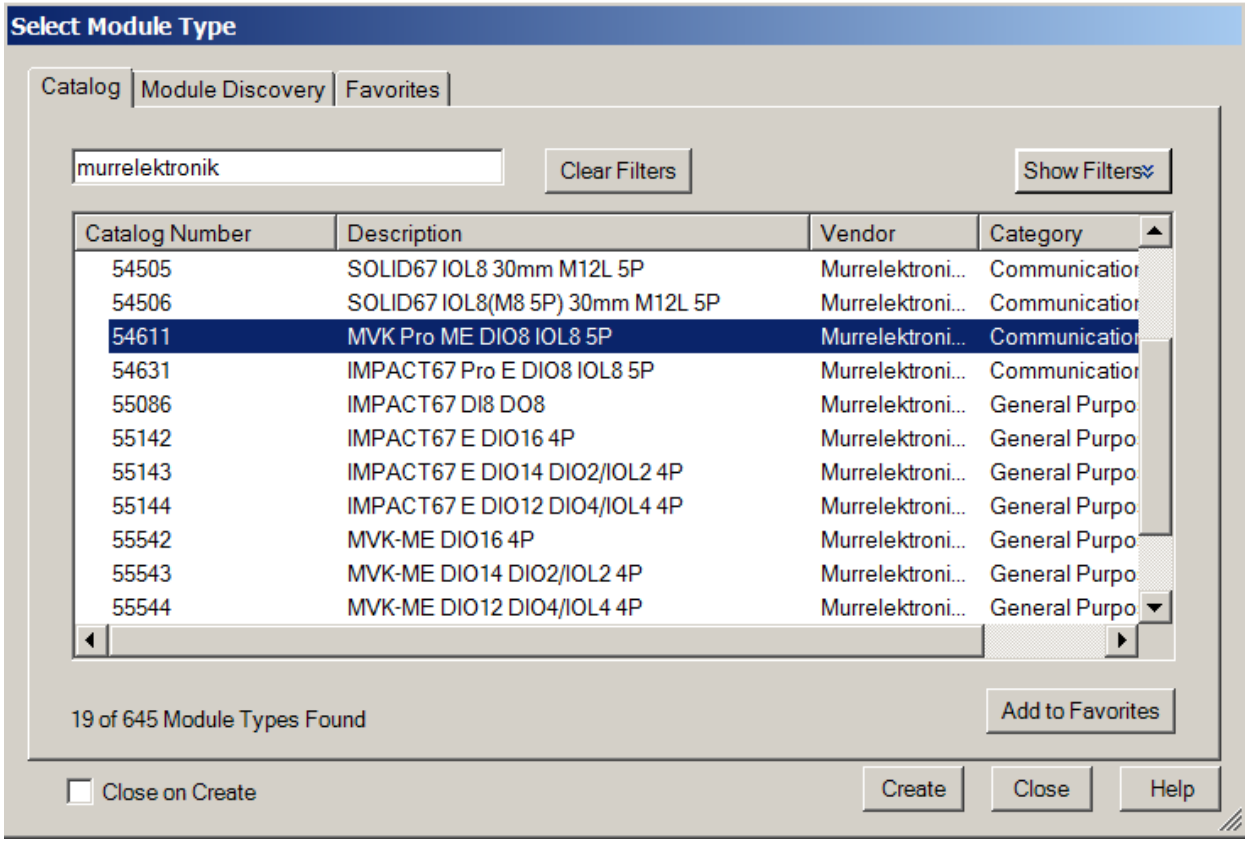


Fig. 7-5: Searching a device

➔ Mark the device.

➔ Double-click ***Create***.

General settings

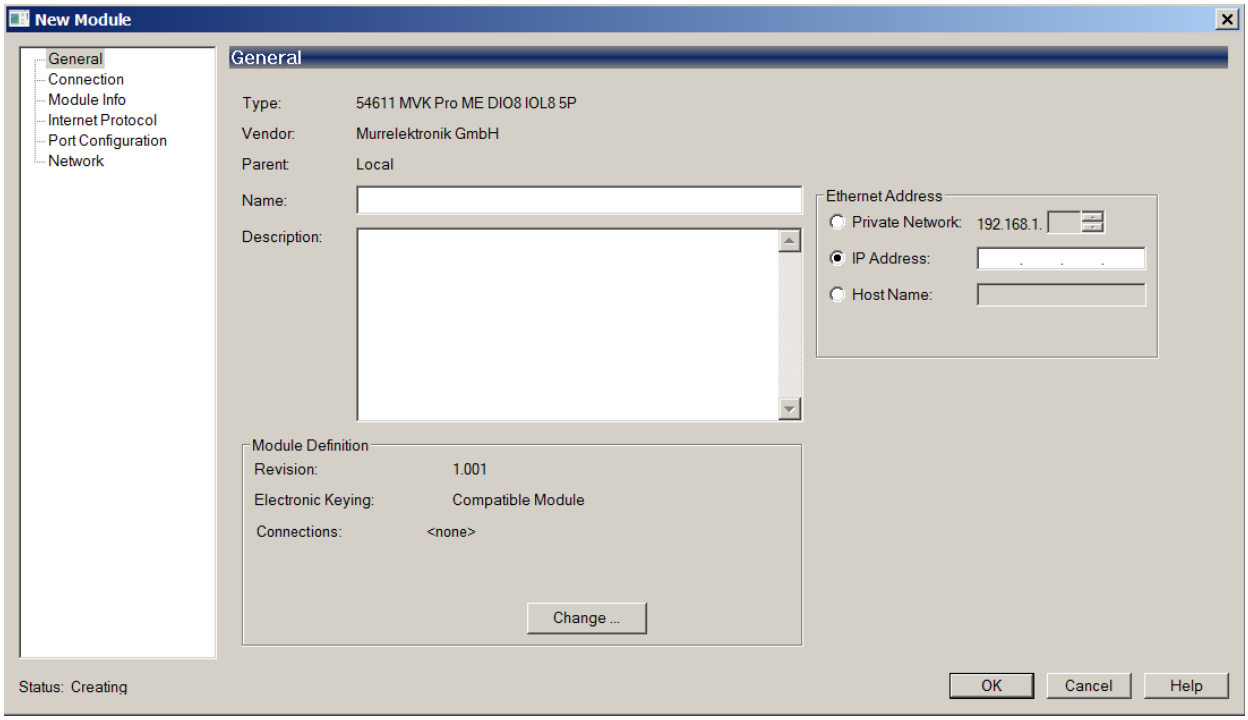


Fig. 7-6: General settings

In ***New Module*** | ***General***

➔ Assign a unique device name.

➔ Assign the IP address.

In ***New Module*** | ***Connection***

➔ Assign further settings, e.g. the RPI settings.

➔ Add the device to the network by pressing ***OK***.

Selecting the connection

In order to choose the best connection for every application, you can choose from various connection options:

a | when adding the device to the network, select the right connection *or*

b | call the settings again by double-clicking the device.

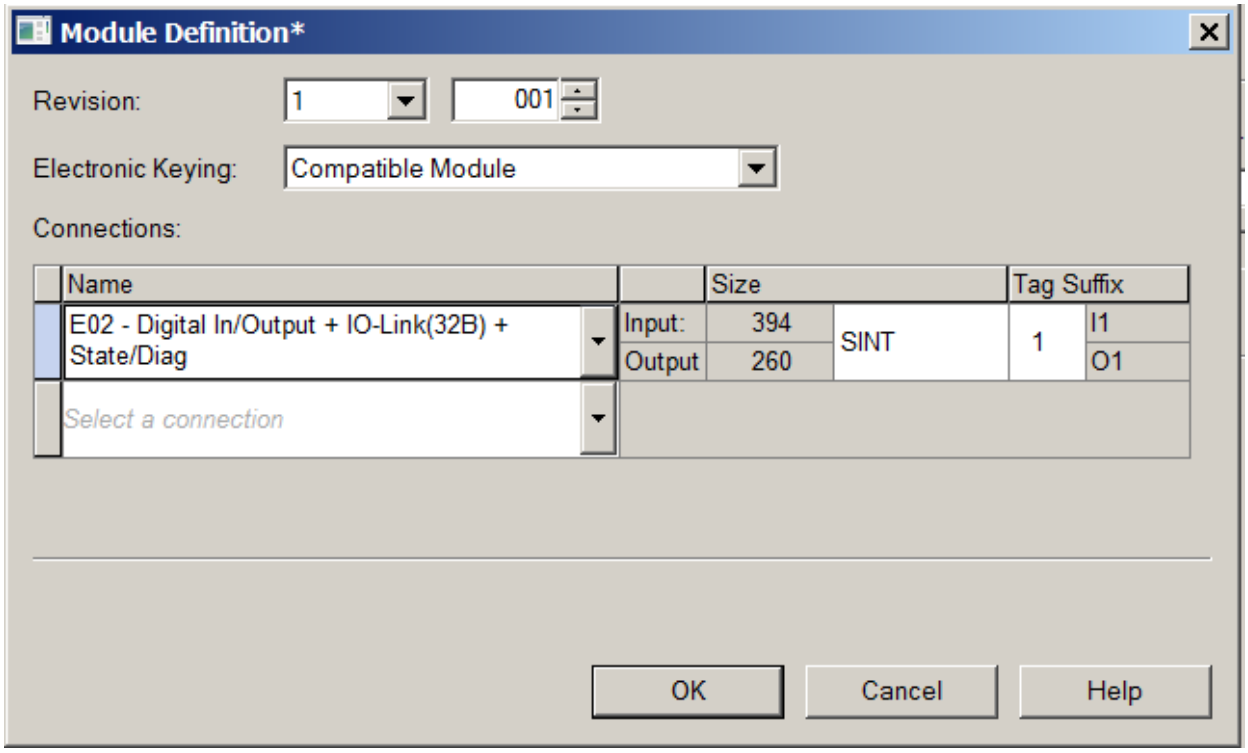


Fig. 7-7: Module Definition

In **Module Definition**

➔ Click ***Change***.
A new window appears.

➔ Set the number or the type of connection
7.3.2 "Connection matrix" here.

➔ Click the preset connection (***Exclusive Owner***).

➔ Select the connection that meets the requirements.

The list of all connections that can be set is displayed.

NOTE
The devices support up to 3 connections at a time (1 Exclusive Owner and 2 Non-Exclusive-Owner connections).

7.3 Commissioning without EDS

7.3.1 Connections, parameters and properties

NOTE
The data type specification is made according to the CIP specification Volume 1 Appendix C-2. Individual data type specifications are explained below.

NOTE
Listen-only connections are established only as multicast and only to multicast non-listen-only connections of the same category via EDS. This determines the configuration instance used for the non-listen-only connection.

NOTE
Expert Mode are listed with the minimum length and do not consider configurations of IO-Link data lengths.

The final length of an assembly instance is the minimum length plus the sum of all all configured IO-Link data lengths.

This is to be calculated separately for input and output data.

Minimum length + ∑ IO-Link port Z data length

7.3.2 Connection matrix

Exclusive Owner connection

Assembly configuration				Description	Input assembly		Output assembly	
over EDS		over web server						
Instance 170	Length xx	Instance 171	Length 0		In-stance	Length	In-stance	Length
E01		WE01		Digital IOs, IOL 8 bytes with status and diagnostics	100	202	110	67
E02		WE02		Digital IOs, IOL 32 bytes with status and diagnostics	101	394	111	260

Tab. 7-1: Exclusive Owner connection

Exclusive Owner connection in the expert mode

Assembly configuration				Description	Input assembly		Output assembly	
over EDS		over web server						
Instance 170	Length xx	Instance 171	Length 0		In-stance	Length	In-stance	Length
E03		WE03		Digital IOs, IOL X bytes	102	≥10	112	≥4
E04		WE04		Digital IOs, IOL X bytes with status and diagnostics	103	≥138		

Tab. 7-2: Exclusive Owner connection in the expert mode

Input Only connection

Assembly configuration				Description	Input assembly		Output assembly	
over EDS		over web server						
Instance 170	Length xx	Instance 171	Length 0		In-stance	Length	In-stance	Length
I01		WI01		Digital IOs, IOL 8 bytes with status and diagnostics	100	202	193	0
I02		WI02		Digital IOs, IOL 32 bytes with status and diagnostics	101	394		

Tab. 7-3: Input Only connection

Input Only connection in expert mode

Assembly configuration				Description	Input assembly		Output assembly	
over EDS		over web server						
Instance 170	Length xx	Instance 171	Length 0		In-stance	Length	In-stance	Length
I03		WI03		Digital IOs, IOL X bytes	102	≥10	193	0
I04		WI04		Digital IOs, IOL X bytes with status and diagnostics	103	≥138		

Tab. 7-4: Input Only connection in expert mode

Listen Only connection

Connection name	Description	Input assembly		Output assembly	
		In-stance	Length	In-stance	Length
L01	Digital IOs, IOL 8 bytes with status and diagnostics	100	202	192	0
L02	Digital IOs, IOL 32 bytes with status and diagnostics	101	394		
L03	Digital IOs, IOL X bytes	102	≥10		
L04	Digital IOs, IOL X bytes with status and diagnostics	103	≥138		

Tab. 7-5: Listen Only connection

Listen Only connection in expert mode

Connection name	Description	Input assembly		Output assembly	
		In-stance	Length	In-stance	Length
L03	Digital IOs, IOL X bytes	102	≥10	192	0
L04	Digital IOs, IOL X bytes with status and diagnostics	103	≥138		

Tab. 7-6: Listen Only connection in expert mode

7.3.3 Assemblies

Sequence of input data

Input data instance	100	101	102	103
Size in bytes	**202**	**394**	**≥10 + ∑IO-Link Input data**	**≥10 + ∑IO-Link Input data**
Digital input	0 ... 1	0 ... 1	0 ... 1	0 ... 1
Qualifier data DI	2 ... 3	2 ... 3	2 ... 3	2 ... 3
Qualifier data DO	4 ... 5	4 ... 5	4 ... 5	4 ... 5
System status	6 ... 9	6 ... 9	6 ... 9	6 ... 9
IO-Link port X0 input data	10 ... 17	10 ... 41	A ... (0 ...32 Bytes)	A ... (0 ...32 Bytes)
IO-Link port X0 status data	18 ... 25	42 ... 49	-	A + 8 Bytes
IO-Link port X1 input data	26 ... 33	50 ... 81	B ... (0 ...32 Bytes)	B ... (0 ...32 Bytes)
IO-Link port X1 status data	34 ... 41	82 ... 89	-	B + 8 Bytes
IO-Link port X2 input data	42 ... 49	90 ... 121	C ... (0 ...32 Bytes)	C ... (0 ...32 Bytes)
IO-Link port X2 status data	50 ... 57	122 ... 129	-	C + 8 Bytes
IO-Link port X3 input data	58 ... 65	130 ... 161	D ... (0 ...32 Bytes)	D ... (0 ...32 Bytes)
IO-Link port X3 status data	66 ... 73	161 ... 169	-	D 8 Bytes
IO-Link port X4 input data	74 ... 81	170 ... 201	E ... (0 ...32 Bytes)	E ... (0 ...32 Bytes)
IO-Link port X4 status data	82 ... 89	202 ... 209	-	E + 8 Bytes
IO-Link port X5 input data	90 ... 97	210 ... 241	F ... (0 ...32 Bytes)	F ... (0 ...32 Bytes)
IO-Link port X5 status data	98 ...105	242 ... 249	-	F 8 Bytes
IO-Link port X6 input data	106 ... 113	250 ... 281	G ... (0 ...32 Bytes)	G ... (0 ...32 Bytes)
IO-Link port X6 status data	114 ... 121	282 ... 289	-	G + 8 Bytes
IO-Link port X7 input data	122 ... 129	290 ... 321	H ... (0 ...32 Bytes)	H ... (0 ...32 Bytes)
IO-Link port X7 status data	130 ... 137	322 ... 329	-	H + 8 Bytes
Diagnostic buffer	138 ... 201	330 ... 393	-	+ 64 Bytes

Tab. 7-7: Assembly instance 101

Assembly 102: 10 Byte fix plus Input data length A to H

Assembly 102: 138 Byte fix plus Input data length A to H + A to H status

If no input data is configured, the status data is also not available.

Sequence of output data

Output data instance	110	111	112
Size in bytes	**67**	**260**	**≥4 + ∑ IO-Link output data**
Digital output	0 ... 1	0 ... 1	0 ... 1
IO-Link port X0 output data	2 ... 9	2 ... 33	A (0 ... 32 Bytes)
IO-Link port X1 output data	10 ... 17	34 ... 65	B (0 ... 32 Bytes)
IO-Link port X2 output data	18 ... 25	66 ... 97	C (0 ... 32 Bytes)

Output data instance	110	111	112
Size in bytes	**67**	**260**	**≥4 + ∑ IO-Link output data**
IO-Link port X3 output data	26 ... 33	98 ... 129	D (0 ... 32 Bytes)
IO-Link port X4 output data	34 ... 41	130 ... 161	E (0 ... 32 Bytes)
IO-Link port X5 output data	42 ... 49	162 ... 201	F (0 ... 32 Bytes)
IO-Link port X6 output data	50 ... 57	194 ... 241	G (0 ... 32 Bytes)
IO-Link port X7 output data	58 ... 65	226 ... 257	H (0 ... 32 Bytes)
Diagnostic confirmation	66 ... 67	258 ... 259	+ 2 Bytes

Tab. 7-8: Assembly instance 110 - 112

Assembly 112: 4 bytes fix plus output data length A to H

Sequence of configuration bytes

Configuration bytes	Instance 170	Instance 171
Size in bytes	384	0
General parameters	0 ... 1	
Diagnostic parameters	2 ... 19	
IO-Link port X0	20 ... 43	
IO-Link port X1	44 ... 67	
IO-Link port X2	68 ... 91	
IO-Link port X3	92 ... 115	
IO-Link port X4	116 ... 139	
IO-Link port X5	140 ... 163	
IO-Link port X6	164 ... 187	
IO-Link port X7	188 ... 211	
OPC/UA	212 ... 217	
MQTT	218 ... 379	
WebUI	380 ... 381	
RESTAPI (JSON)	382 ... 383	

Tab. 7-9: Assembly instance 170/171

7.3.4 Configuration values

NOTICE

Unexpected behavior of the device.

➔ Use only the values listed in this manual.

General parameters byte 0 ... 1

Byte	Parameters	Value	Default value	Description
0	Pin/Port based IO layout for digital channels	IO layout: ■ 0 = Port based ■ 1 = Pin based	0	Parameterizes the layout of the I/O data.

Tab. 7-10: General parameters

Diagnostic parameters bytes 2 ... 19

Byte	Parameters	Value	Default value	Description
0	Global Diagnostic Report	■ 0 = Do not report ■ 1 = Report	1	Global diagnostics report
1	Under Voltage Sensor Supply Diagnostic Message	■ 0 = Do not report ■ 1 = Report	1	Undervoltage US diagnostic report
2 - 3	Under Voltage Sensor Supply Threshold	■ 0 = Default ■ 17500 = 17.5 V ... 18.0 V ■ 18000 = 18.0 V ... 18.5 V ■ 18500 = 18.5 V ... 19.0 V ■ 19000 = 19.0 V ... 19.5 V ■ 19500 = 19.5 V ... 20.0 V	0	Threshold value US at undervoltage
4	Under Voltage Actuator Supply Diagnostic Message	■ 0 = Do not report ■ 1 = Report	1	Undervoltage UA diagnostic report
5 - 6	Under Voltage Actuator Supply Threshold	■ 0 = Default ■ 17500 = 17.5 V ... 18.0 V ■ 18000 = 18.0 V ... 18.5 V ■ 18500 = 18. V ... 19.0 V ■ 19000 = 19.0 V ... 19.5 V ■ 19500 = 19.5 V ... 20.0 V	0	Threshold value UA at undervoltage
7	No Actuator Supply Diagnostic Message	■ 0 = Do not report ■ 1 = Report	1	Diagnostic report no UA
8	LED Indication For Suppressed Diagnostic Messages	■ 0 = No LED indication ■ 1 = LED indication	0	LED indication for suppressed diagnostic messages
9	Diagnostic Message Acknowledgement	■ 0 = Disabled ■ 1 = Enabled	0	Confirmation of diagnostic message
10	Port X0 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X0 Diagnostic Report
11	Port X1 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X1 Diagnostic Report

Byte	Parameters	Value	Default value	Description
12	Port X2 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X2 Diagnostic Report
13	Port X3 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X3 Diagnostic Report
14	Port X4 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X4 Diagnostic Report
15	Port X5 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X5 Diagnostic Report
16	Port X6 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X6 Diagnostic Report
17	Port X7 Diagnostic Report	■ 0 = Report All Diagnostic Messages ■ 1 = Report All Diagnostic Messages Except For Wire Break ■ 2 = Report Only Wire Break Diagnostic Messages	0	Port X7 Diagnostic Report

Tab. 7-11: Diagnostic parameters

IO-Link port X0 ... X7 parameters

Byte	Parameters	Value	Default value	Description
0	IO-Link Function Pin 4	■ 0 = Deactivated ■ 1 = IO-Link Manual Configuration ■ 2 = IO-Link Autostart ■ 3 = Digital Input NO ■ 4 = Digital Output ■ 97 = Digital Input NC	0	IO-Link function Pin 4

Byte	Parameters	Value	Default value	Description
1	Validation&Backup	■ 0 = No Device check ■ 1 = Type compatible Device V1.0 ■ 2 = Type compatible Device V1.1 ■ 3 = Type compatible Device V1.1, Backup + Restore ■ 4 = Type compatible Device V1.1, Restore	0	Validation and backup, * see note
2	Behavior Pin 2 (Ch1Y)	■ 0 = Automatic Mode (DIO) ■ 1 = Digital Input ■ 2 = Digital Output ■ 5 = AUX Power ■ 6 = Digital Input NC ■ 7 = Deactivated	0	Behavior Pin 2 (Ch1Y)
3	PortCycleTime **	■ 0: As fast as possible ■ 1 - 255: Bit0..5 Multiplier / Bit6..7 TimeBase[ms]	0	Port cycle time
4 - 5	Vendor ID	■ Vendor ID of the attached IO-Link device for the use with validation setting	0	
6 - 9	Device ID	■ Device ID of the attached IO-Link device for the use with validation setting	0	
10	IO-Link Prozess Data Swap	■ 0 = No Swap ■ 1 = 16 Bit Swap *In case of odd data length the last byte will not be touched* ■ 2 = 32 Bit Swap *In case the data length is not on 4 byte boundary* □ 3 byte, swap of byte x with x+2. x+1 will not be touched □ 3 byte, swap of byte x with x+2. x+1 will not be touched □ 1 byte, byte will not be touched ■ 3 = Full Swap	0	Swap settings for the IO-Link process data. Applies to input and output data.
11	IO-Link Event Integration	■ 0 = Standard Integration ■ 1 = Murrelektronik Integration ■ 2 = Murrelektronik IO-Link Extended Integration	0	IO-Link event integration
12	Digital Input Signal Filter Pin 4	■ 0 = No Filter ■ 1 = 1 ms ■ 2 = 3 ms ■ 3 = 5 ms ■ 4 = 10 ms ■ 5 = 15 ms	0	Digital input signal filter Pin 4
13	Digital Input Signal Filter Pin 2	■ 0 = No Filter ■ 1 = 1 ms ■ 2 = 3 ms ■ 3 = 5 ms ■ 4 = 10 ms ■ 5 = 15 ms	0	Digital input signal filter Pin 2
14	Digital Output Failsafe Mode Pin 4	■ 0 = Force 0 ■ 1 = Force 1 ■ 2 = Last State	0	Digital Output Failsafe Mode Pin 4

Byte	Parameters	Value	Default value	Description
15	Digital Output Failsafe Mode Pin 2	■ 0 = Force 0 ■ 1 = Force 1 ■ 2 = Last State	0	Digital Output Failsafe Mode Pin 2
16	Digital Port Function Configuration Pin 1	■ 0 = Deactivated ■ 1 = L+ (US) Sensor Supply	1	Digital port function configuration Pin 1
17	Output Current Limitation for Pin 1	■ 0 = 0.5 A ■ 1 = 1.0 A ■ 2 = 1.5 A ■ 3 = 2.0 A	3	Output current limitation for Pin 1
18	Output Current Limitation for Pin 2	■ 0 = 0.5 A ■ 1 = 1.0 A ■ 2 = 1.5 A ■ 3 = 2.0 A	3	Output current limitation for Pin 2
19	Output Current Limitation for Pin 4	■ 0 = 0.5 A ■ 1 = 1.0 A ■ 2 = 1.5 A ■ 3 = 2.0 A	0	Output current limitation for Pin 4
20	Configured IO-Link Input Data Length Port X	■ 0 ... 32	32	IO-Link input process data length without PQI
21	Configured IO-Link Output Data Length Port X	■ 0 ... 32	32	IO-Link output process data length
23	RESERVED		0	Reserved for future use

Tab. 7-12: IO-Link port X0 ... X7 parameters

* When switching to the “Restore” state, any device configurations previously stored in the device are discarded, especially when switching from “Back-up&Restore” to “Restore”.
If a compatible device is connected for the first time in the “Restore” state, the master fetches the data storage data (one-time backup) from the device, saves it and then sends this data to each newly connected, compatible device with a different configuration (restore).

These parameters are repeated for each IO-Link port of the device.

PortCycleTime **

The PortCycleTime is made up as follows:

- Bits 0..5 contain the multiplier for the PortCycleTime
- Bits 6..8 contain the time base for the PortCycleTime

If all bits are set to 0, the IO-Link master will operate the IO-Link device with the shortest cycle time supported by the IO-Link device

A precise description is contained in the IO-Link specification:
IO-Link Interface and System Specification Version 1.1.3, June 2019, Abhschnitt B1.3.

Calculation of the PortCycleTime:

Time base (Bit 6..7)	Time base (Bit 0..5)	Calculation	Adjustable cycle time
0	0,1 ms	Multiplier x time base	0,4 ms to 6,3 ms
1	0,4 ms	6,4 ms + Multiplier x time base	6,4 ms to 31,6 ms
2	1,6 ms	32,0 ms + Multiplier x time base	32,0 ms to 132,8 ms
3	Reserved	Reserved	Reserved

The following table contains pre-calculated values for the PortCycleTime:

PortCycleTime	PortCycleTime encoding (Bit 6..7)	Multiplier (Bit 0..5)	Time base encoding (Bit 6..7)
1,6 ms	16	16	0
2,0 ms	20	20	0
3,2 ms	32	32	0
4,0 ms	40	40	0
4,8 ms	48	48	0
6,4 ms	64	0	1
8,0 ms	68	4	1
10,0 ms	73	9	1
12,0 ms	78	14	1
16,0 ms	88	24	1
20,0 ms	98	34	1
20,8 ms	100	36	1
32,0 ms	128	0	2
40,0 ms	133	5	2
64,0 ms	148	20	2
80,0 ms	158	30	2
120,0 ms	183	55	2
128,0 ms	188	60	2

OPC/UA parameters

Byte	Parameters	Value	Default value	Description
0	Use Of OPC/UA	■ 0 = Disabled ■ 1 = Enabled	0	Activates or disables the OPC/ UA Server function
1 - 2	OPC/UA TCP Port Number	■ 1024 – 49151 TCP port number	4840	Defines on which port the OPC/ UA Server is active
3	Allow OPC/UA Clients to Write ISDU Data	■ 0 = Disabled ■ 1 = Enabled	0	Activates or disables the option to write ISDU data from a OPC/ UA client
4	Allow OPC/UA Clients to Write Output Data	■ 0 = Disabled ■ 1 = Enabled	0	Activates or disables the option to write output data from a OPC/ UA client
5	RESERVED		0	Reserved for future use

Tab. 7-13: OPC/UA parameters

MQTT parameters

Byte	Parameters	Value	Default value	Description
0	Use Of MQTT	■ 0 = Disabled ■ 1 = Enabled	0	Activates or disables the MQTT function
1 - 4	MQTT Server IP Address	Value of IP MQTT Server IP Address	0xC0AB01FE = 192.171.1.254	Sets the IP address of the MQTT server
5 - 29	MQTT Client ID	Client ID of the MQTT Client	“MqttClient”	Sets the ID which the device shall use to send MQTT data
30 - 95	MQTT Client Head Topic	MQTT Client Head Topic	“”	Sets the Head Topic to which the device writes MQTT data
96 - 161	MQTT Topic For System Data	MQTT Topic For System Data	“”	Sets the topic for system data to which the device writes MQTT data

Tab. 7-14: MQTT parameters

WebUI parameters

Byte	Parameters	Value	Default value	Description
0	Use Of WebUI	■ 0 = Disabled ■ 1 = Enabled	1	Activates or disables the WebUI
1	RESERVED		0	Reserved for future use

Tab. 7-15: WebUI parameters

JSON parameters

Byte	Parameters	Value	Default value	Description
0	Use Of JSON	■ 0 = Disabled ■ 1 = Enabled	0	Activates or disables the option to send and receive JSON communication
1	RESERVED		0	Reserved for future use

Tab. 7-16: JSON parameters

8 Configuration and parameterization

WARNING!

Protection function may be impaired if the devices configuration is changed.

- ➔ Make sure that only authorized persons change the configuration.
- ➔ If you change the configuration, use the password hierarchy provided by your engineering software.
- ➔ After every change to the configuration, test the protection equipment for efficiency.

8.1 Configuration

Overview

There are two options for configuring the devices:

1. Download an EDS file from the Murrelektronik website or the place of purchase.

Then, import the EDS files into your programming software (see chap. 7.1 "Loading the EDS files" for an example of how to do this). Using the EDS file allows you to benefit from the advantages of a preconfigured connection.

2. Configure the devices using the integrated web server.

NOTE

To transfer index changes via the Webserver and acyclic ISDU writes to the DataStorage, a ParamDownloadStore command must be sent after the index changes.

- ➔ The ParamDownloadStore command can be triggered by writing value 0x05 to index 0x02.

Configuration via EDS

After the import of the EDS in the programming software and the selection of a connection suitable for the application, the configuration files can be found in the controller tags.

The input and output tags associated with the device can be found next to it.

Name	Value	Force Mask	Style	Data Type	Class	Description	Constan
MVK_PRO:C	{...}	{...}		_0280:54611_3DF...	Standard		
MVK_PRO:C.Pin_Port_based_IO_layout_for_digital_cha	0		Decimal	SINT	Standard		
MVK_PRO:C.Quick_Connect	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Global_Diagnostic_Report	1		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Under_Voltage_Sensor_Supply1	1		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Under_Voltage_Sensor_Supply2	0		Decimal	INT	Standard		
MVK_PRO:C.Diag_Param_Under_Voltage_Actuator_Supp1	1		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Under_Voltage_Actuator_Supp2	0		Decimal	INT	Standard		
MVK_PRO:C.Diag_Param_No_Actuator_Supply_Diagnosti	1		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_LED_Indication_For_Suppresse	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Diagnostic_Message_Acknowled	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Port_X0_Diagnostic_Report	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Port_X1_Diagnostic_Report	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Port_X2_Diagnostic_Report	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Port_X3_Diagnostic_Report	0		Decimal	SINT	Standard		
MVK_PRO:C.Diag_Param_Port_X4_Diagnostic_Report	0		Decimal	SINT	Standard		

Monitor Tags / Edit Tags /

Fig. 8-1: Configuration via EDS

All configuration tags have a specific name that describes the function of the areas.

➔ Enter the appropriate values for your application.
Each time a connection with the control system is established, the device is correctly configured.

For more information on the adjustable values, please refer to chapter 7.3.4 "Configuration values"

WebUI

The device can also be configured via WebUI if required. To use this function, one of the Exclusive Owner connections starting with the “WE” symbols must be selected when configuring the connection in the PLC software.

Chapter 10.2 "Access and login" parameters.

8.2 Setting parameters

Setting parameters

➔ Navigate to the ***controller tags*** in the ***Controller Organizer*** program window, as shown in the figure.

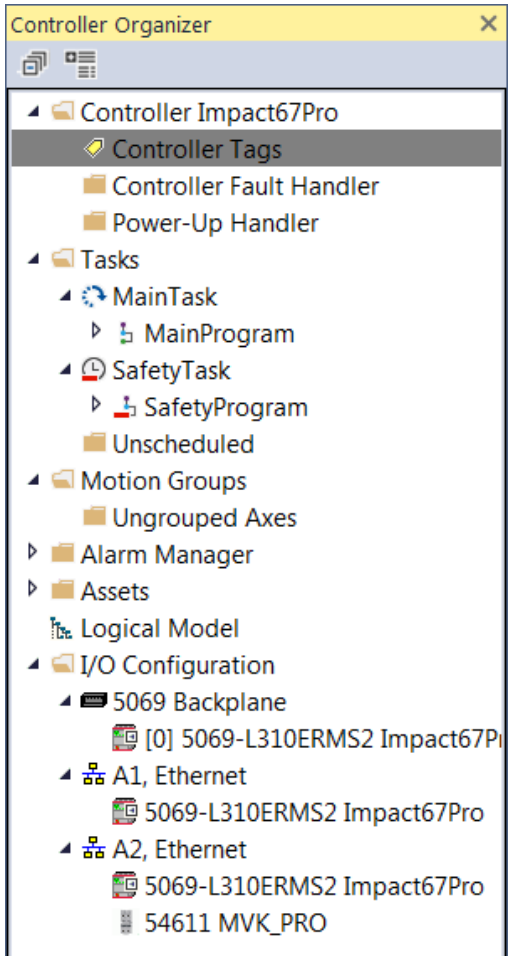


Fig. 8-2: Controller Organizer window

➔ Double-click the ***Controller Tags*** entry.
The overview of the process and configuration data opens.

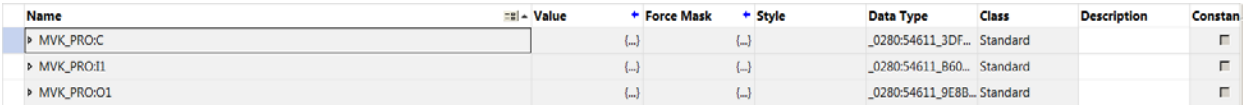


Fig. 8-3: Process and configuration data

➔ Click the plus symbol in the configuration data line ***Name_Of_Module: C***.
All parameters of the device are visible.

➔ Enter the values for the application.

NOTICE

Configuration is transferred to device once during Forward Open process. Communication between controller and device must be interrupted for configuration changes to take place.

For adjustable parameter values, refer to chap. 7.3.4 "Configuration values"

8.3 Requested Packet Interval (RPI) configuration

Setting the RPI values

Searching the device

When setting up an EtherNet/IP system, the RPI value must be carefully set in the controller.
To set the RPI values, the device properties must be selected.

In **Controller Organizer**:

- ➔ Double-click the device *or*
- ➔ Right-click the device and select **Properties** from the context menu.

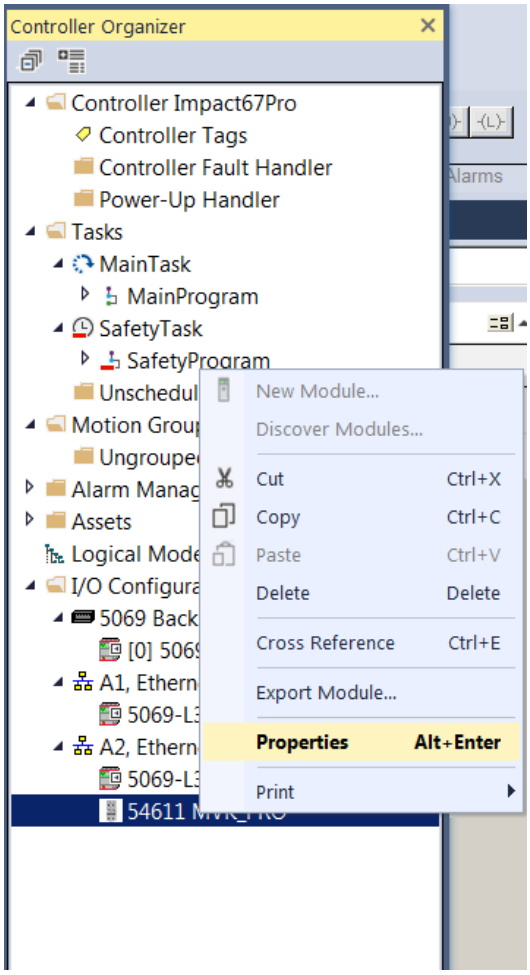


Fig. 8-4: Searching a device

Setting the RPI values

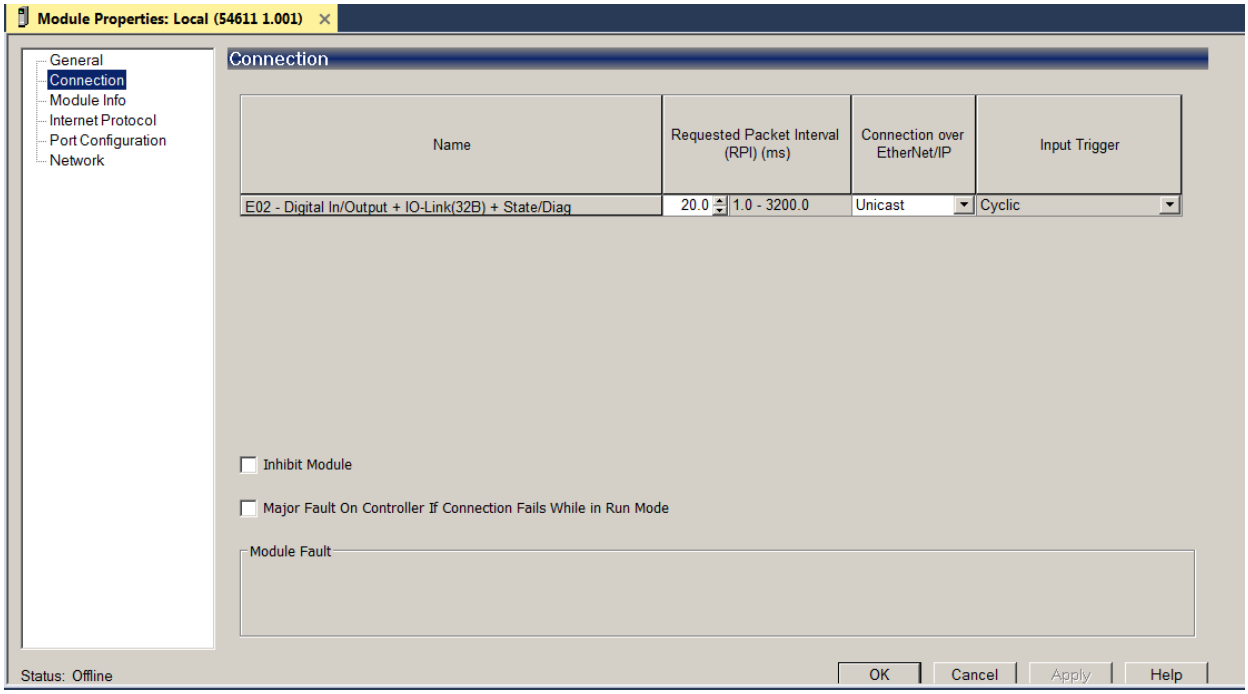


Fig. 8-5: Setting the RPI values

➔ Click the ***Connection*** tab.

➔ Set the desired RPI values in the column **Requested Packet Interval (RPI) (ms)**.

NOTE
The minimum RPI is 1 ms.

8.4 Device Level Ring (DLR) configuration

Device Level Ring (DLR) is a protocol which allows a ring topology with EtherNet/IP devices. The ring network consists of at least one ring supervisor and any desired number of users. The device supports beacon-based DLR technology. DLR is automatically enabled as soon as the device is connected to the ring.

8.5 IO-Link configuration

With the IMPACT67 device, the IO-Link devices can be configured and parameterized in two different ways:

1 | IO-Link device configuration Explicit Messages in EtherNet/IP
2 | Murrelektronik IO-Link Device Tool

IO-Link device configuration throughEtherNet/IP Explicit Messages

It is possible to parameterize the connected IO-Link devices through EtherNet/IP Explicit Messages.

For further information see to chap. 9.2.1 "Diagnostics structure in the control system"

Murrelektronik IO-Link Device Tool

The Murrelektronik IO-Link Device Tool enables parameterization of IO-Link devices.

A hardware catalog is displayed via a graphical interface.

This is where you can assign and set an IO-Link device for the IMPACT67 IO-Link port.

The parameterization can then be sent to the IO-Link device.

8.6 Industrial Internet of Things (IIoT)

8.6.1 JSON

General JSON settings

No.	REST API URL	Description	Supported
1	GET /iolink/v1/gateway/identification	Identification of the gateway	✓
2	GET /iolink/v1/gateway/capabilities	Capabilities of the gateway	✓
3	GET /iolink/v1/gateway/configuration	Read network configuration of the gateway	✓
4	POST /iolink/v1/gateway/configuration	Write network configuration of the gateway	✓
5	POST /iolink/v1/gateway/reset	Reset the gateway including all masters	-
6	POST /iolink/v1/gateway/reboot	Reboot the gateway including all masters	-
7	GET /iolink/v1/gateway/events	Event log containing all events from gateway, masters, ports and devices	✓
8	GET /iolink/v1/masters	Get all available master number keys and identification information	✓
9	GET /iolink/v1/masters/$MASTER_NUMBER/capabilities	Capabilities of the master	✓
10	GET /iolink/v1/masters/$MASTER_NUMBER/identification	Read identification of the master	✓
11	POST /iolink/v1/masters/$MASTER_NUMBER/identification	Write identification of the master	✓
12	GET /iolink/v1/masters/$MASTER_NUMBER/ports	Get all available port number keys	✓
13	GET /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/capabilities	Read capability information of the specified port	✓
14	GET /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/status	Read status of the master	✓
15	GET /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/configuration	Read configuration of the specified port	✓
16	POST /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/configuration	Write configuration of the specified port	✓
17	GET /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/datastorage	Read data storage content of the specified port	✓
18	POST /iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/datastorage	Write data storage content of the specified port	✓
19	GET /iolink/v1/devices	Address all devices of all masters	✓
20	GET /iolink/v1/devices/{deviceAlias}/capabilities	Read capability information of the specified device	✓
21	GET /iolink/v1/devices/{deviceAlias}/identification	Read identification information of the specified device	✓
22	POST /iolink/v1/devices/{deviceAlias}/identification	Write identification information of the specified device	-
23	GET /iolink/v1/devices/{deviceAlias}/processdata/value?format=byteArray	Read process data value from the specified device	✓
24	GET /iolink/v1/devices/{deviceAlias}/processdata/getdata/value?format=byteArray	Read process data input value from the specified device	✓
25	GET /iolink/v1/devices/{deviceAlias}/processdata/setdata/value?format=byteArray	Read process data output value from the specified device	✓
26	POST /iolink/v1/devices/{deviceAlias}/processdata/value	Write the process data output value to the specified device	✓
27	GET /iolink/v1/devices/{deviceAlias}/parameters/{index}/value/?format=byteArray	Read a specific parameter value and its subparameter values (if the parameter has complex type) with the given index of the device	✓

No.	REST API URL	Description	Supported
28	GET /iolink/v1/devices/{deviceAlias}/parameters/{index}/subindices/{subindex}/value/?format=byteArray	Read the value of a specific sub-parameter with the given index and subindex	✓
29	GET /iolink/v1/devices/{deviceAlias}/parameters/{parameterName}/value/?format=byteArray	Read a specific parameter value with the given name	-
30	POST /iolink/v1/devices/{deviceAlias}/parameters/{index}/value	Write the parameter with the given index to the device	✓
31	POST /iolink/v1/devices/{deviceAlias}/parameters/{parameterName}/value	Write the parameter with the given name to the device	-
32	POST /iolink/v1/devices/{deviceAlias}/parameters/{index}/subindices/{subindex}/value	Write the sub-parameter with the given index and subindex to the device	✓
33	POST /iolink/v1/devices/{deviceAlias}/parameters/{parameterName}/subindices/{subParameterName}/value	Write the sub-parameter with the given parameter name and sub-parameter name to the device	-
34	POST /iolink/v1/devices/{deviceAlias}/blockparametrization/?format=byteArray	Read or write one or more parameters as a block	✓
35	GET /iolink/v1/devices/{deviceAlias}/events	Read event log from the specified device	✓
36	GET /iolink/v1/mqtt/configuration	Read configuration of MQTT clients	✓
37	POST /iolink/v1/mqtt/configuration	Write configuration of MQTT clients	-
38	GET /iolink/v1/mqtt/topics	Read list of MQTT topics	-
39	POST /iolink/v1/mqtt/topics	Write list of MQTT topics	-
40	DELETE /iolink/v1/mqtt/topics/{topicID}	Delete a specific MQTT topic	-
41	GET /iolink/v1/mqtt/topics/{topicID}	Read a specific MQTT topic	-
42	GET /iolink/v1/mqtt/connectionstatus	Read connection status	✓

Vendor-specific JSON settings

No.	REST API URL	Description	Supported
43	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/diagnostics/configuration	Diagnostic configuration of the master	✓
44	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/diagnostics/value	Diagnostic values of the master	✓
45	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/current	Current statistic values of the specified port of IO-Link master	✓
46	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/voltage	Voltage statistic values of the specified port of the master	✓
47	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/temperature	Temperature statistic values of the specified port of the master	✓
48	GET /iolink/v1/vendor/masters/1/ports/1/statistics/stack	IO-Link stack statistic values of the specified port of the master	-
49	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/configuration	Diagnostic configuration of the specified port of the master	✓
50	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/current	Diagnostic current value of the specified port of the master	✓
51	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/voltage	Diagnostic voltage value of the specified port of the master	✓
52	GET /iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/temperature	Diagnostic temperature value of the specified port of the master	✓

8.6.2 MQTT

If MQTT is enabled, the activation of JSON is required.

MQTT settings

No.	MQTT topics	Description
1	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/gateway/identification	Identification of the gateway
2	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/gateway/capabilities	Capabilities of the gateway
3	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/gateway/configuration	Network configuration of the gateway
4	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters	Get all available master number keys and identification information
5	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/diagnostics/value	Diagnostic values of the master
6	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/diagnostics/configuration	Diagnostic configuration of the master
7	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/capabilities	Capabilities of the master
8	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/identification	Identification of the master
9	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/ports	Get all available port number keys
10	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/capabilities	Read capability information of the specified port
11	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/status	Read actual status of the specified port
12	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/configuration	Read/Write configuration of the specified port
13	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/configuration	Diagnostic configuration of the specified port of the master
14	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/current	Diagnostic current value of the specified port of the master
15	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/voltage	Diagnostic voltage value of the specified port of the master
16	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/diagnostics/temperature	Diagnostic temperature value of the specified port of the master
17	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/current	Current statistic values of the specified port of the master
18	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/voltage	Voltage statistic values of the specified port of the master
19	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/vendor/masters/$MASTER_NUMBER/ports/$PORT_NUMBER/statistics/temperature	Temperature statistic values of the specified port of the master
20	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/devices/$DEVICE_ALIAS/processdata/value	Read/Write process data value from/to the specified device
21	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/devices/$DEVICE_ALIAS/processdata/getdata/value	Read process data input value from the specified device
22	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/devices/$DEVICE_ALIAS/processdata/setdata/value	Read process data output value from the specified device
23	$MQTT_CLIENT_HEAD_TOPIC/iolink/v1/devices/$DEVICE_ALIAS/events	Read event log from the specified device
24	$MQTT_CLIENT_HEAD_TOPIC/Asset	Information about the publisher (network, vendor, firmware)

No.	MQTT topics	Description
25	$MQTT_CLIENT_HEAD_TOPIC/Online	Status of the publisher (online when connected)

8.6.3 OPC UA

The device has an OPC UA server. An OPC UA client can establish a connection to the device and access the following parameters:

- device identification,
- configuration parameters,
- process data,
- measured values,
- diagnostic information,
- statistical information, etc.

The OPC UA client establishes a connection via the following URL:

opc.tcp://IP address:4840

The device's ***IP address*** is used.

The client can access the device parameters anonymously (read access) or with user name/password
(read and write access). The user name and the password are set with the Webserver.

The following figure shows an excerpt of the device's information model.

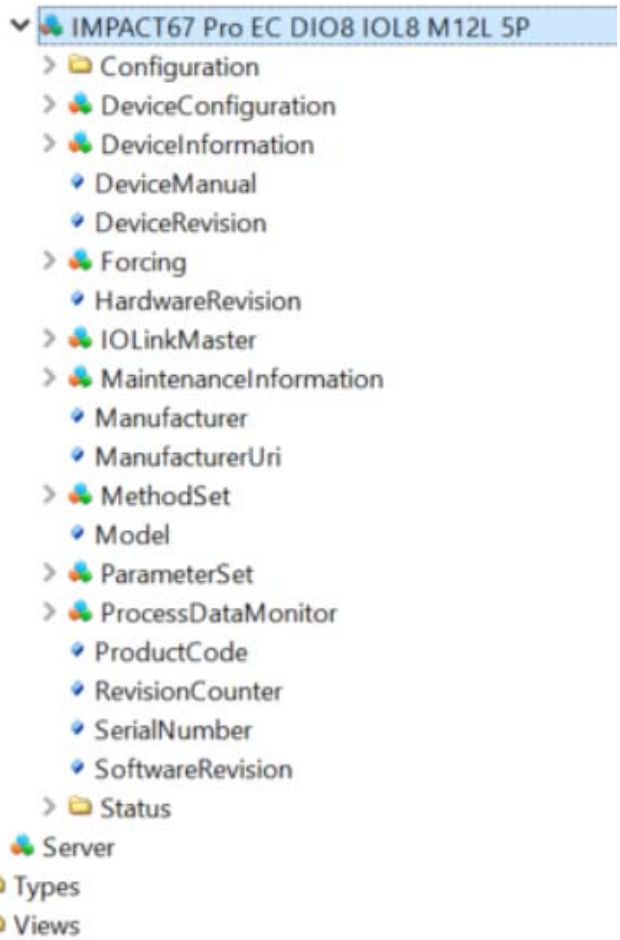


Fig. 8-6: OPC UA server - Information model of the device

The following figure shows an excerpt of an IO-Link port's information model.

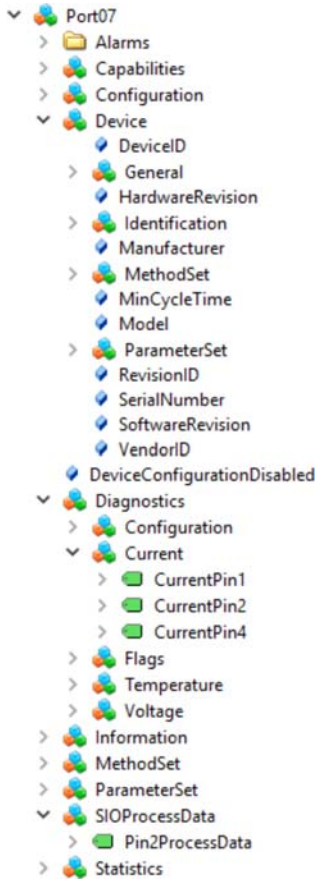


Fig. 8-7: OPC UA server - Information model of a port

8.6.3.1 Authentication

User login

For OPC UA, the same users and passwords as those documented in the web server description are used 10 "Web server"

A connection with the OPC UA server is started using the user “guest”, which allows read access to the OPC UA objects.

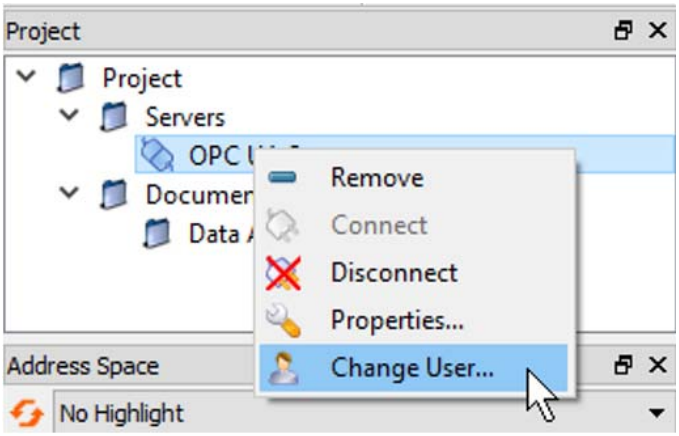


Fig. 8-8: Changing the user

For further actions, another user must be selected.

a | User name <admin>
b | Password <private>

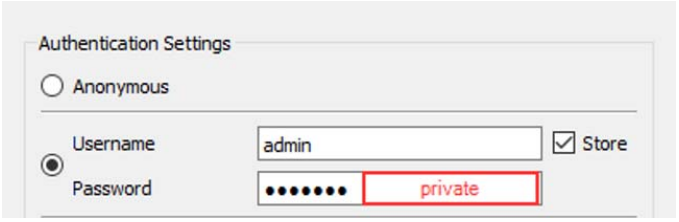


Fig. 8-9: User name and password

Forcing

Digital outputs can be switched manually via OPC UA (forcing).

Step 1

Create an ID from the device using the *GetForcingId* method.

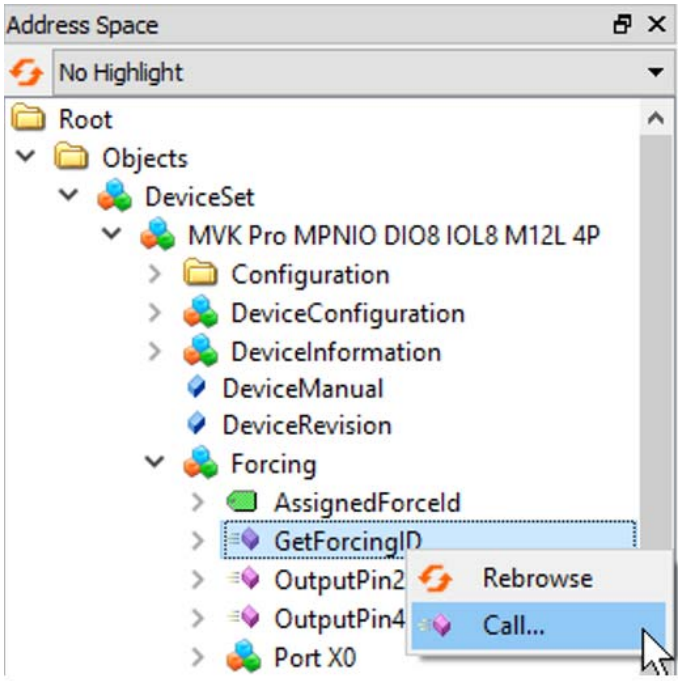


Fig. 8-10: Calling the GetForcingID method

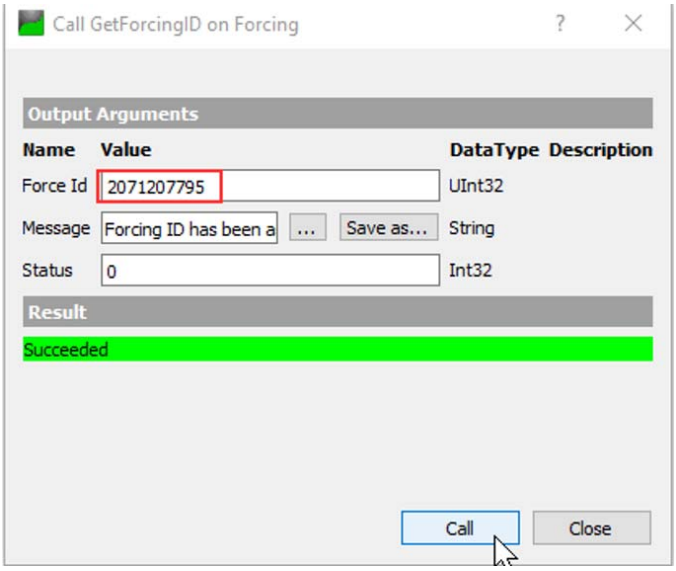


Fig. 8-11: Dialog window of the GetForcingID method

The forcing ID is only valid for 10 seconds. Every call of the forcing function will extend the validity again to 10 seconds.

Step 2

Set the digital outputs using the **OutputPin2** and **OutputPin4** methods.

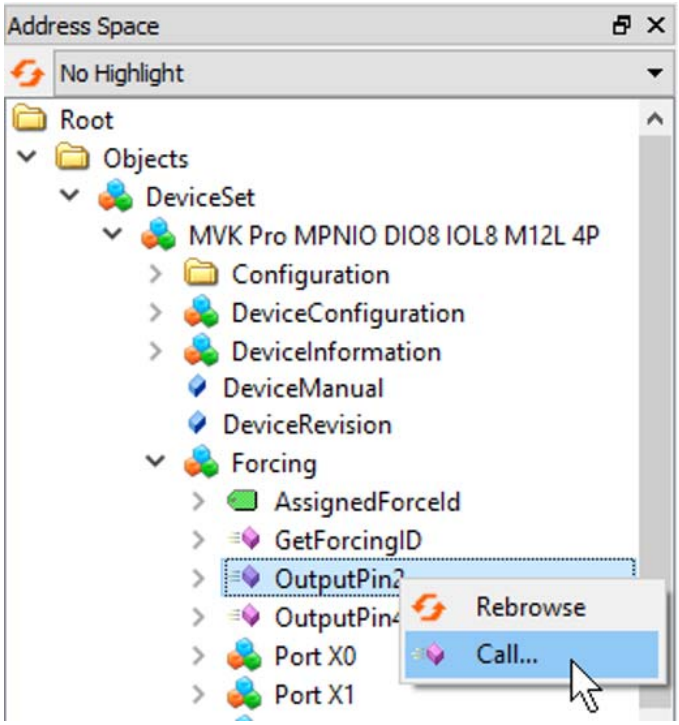


Fig. 8-12: Calling the OutputPin2 method

For this method, the following parameters must be entered: forcing ID that has been received, a bit mask and the data to be written.

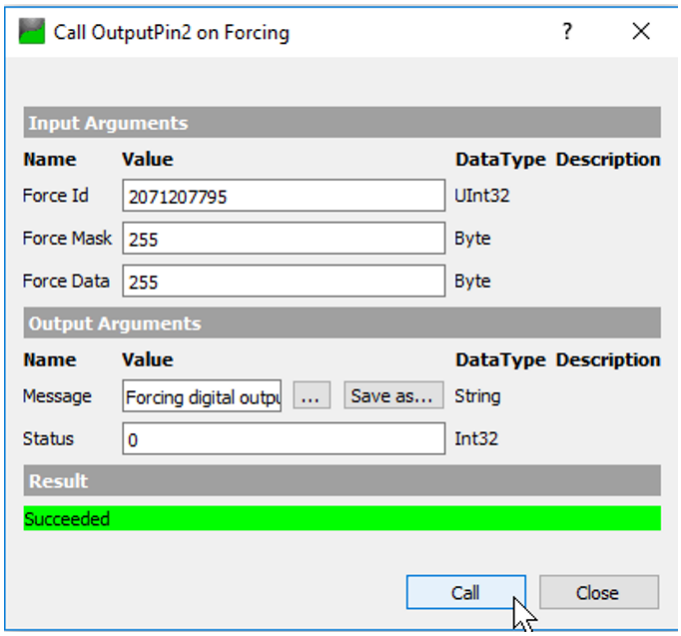


Fig. 8-13: Dialog window for Output method

8.6.3.2 Device identification

Nodes for the device identification are provided by the device. The OPC UA client, for example, can read the version of the device firmware from the ***SoftwareRevision*** node.

Node name	Node class	Access	Description
Manufacturer	Variable	Read	Device manufacturer
ManufacturerUrl	Variable	Read	URL of the device manufacturer
Model	Variable	Read	Model name of the device
ProductCode	Variable	Read	Product code of the device
RevisionCounter	Variable	Read	Hardware revision of the device
SerialNumber	Variable	Read	Serial number of the device
SoftwareRevision	Variable	Read	Revision/version of the device firmware

Tab. 8-1: Device identification

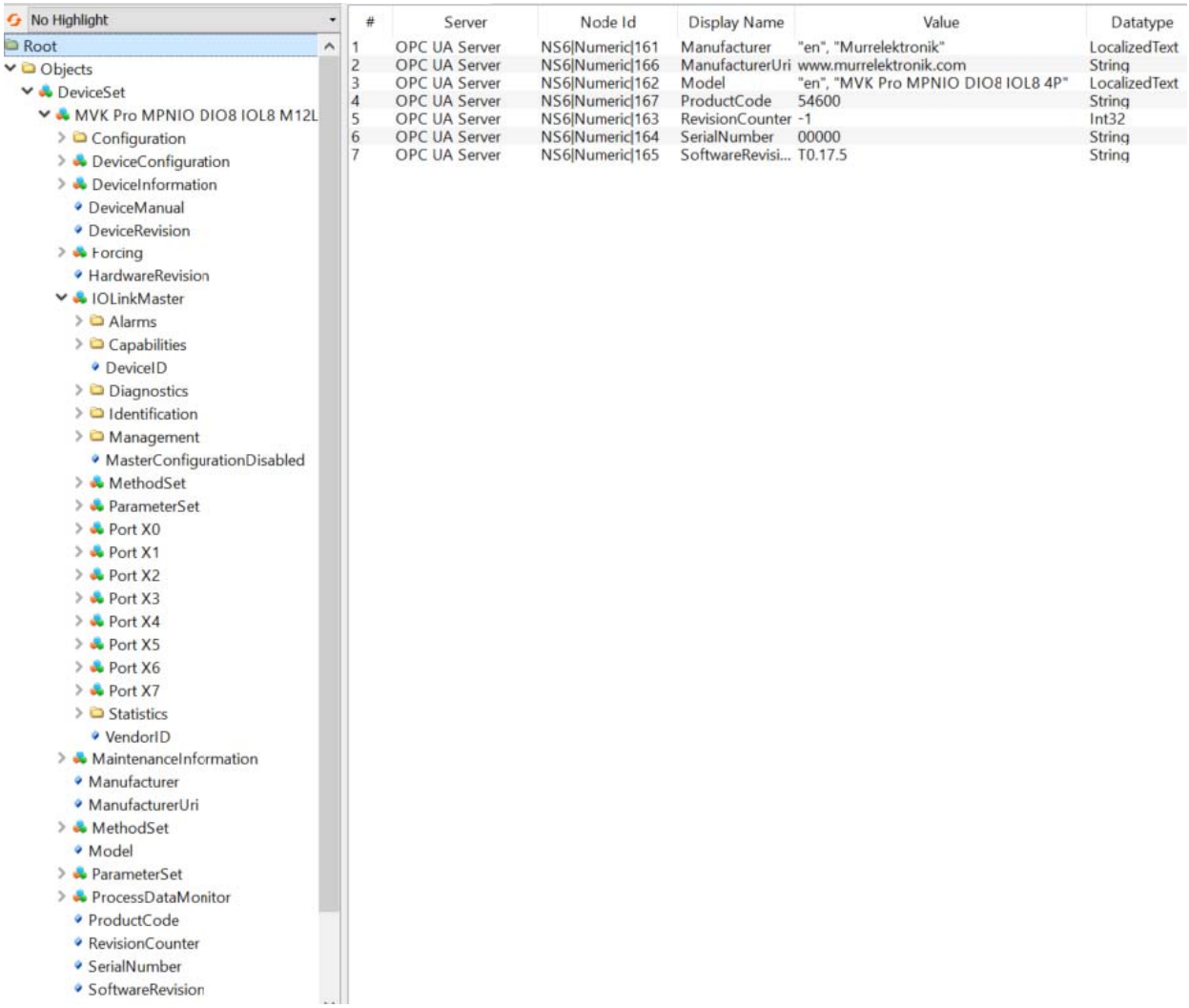


Fig. 8-14: Device identification

8.6.3.3 Configuration parameters

The OPC UA server provides nodes with configuration parameters of the device. In the node ***OverTemperature***, the OPC UA server can, for example, read the upper limit value for the temperature.

Device specific configuration parameter

Node name	Node class	Access	Default	Description
CurrentHysteresis	Variable	Read	10 mA	Current hysteresis, unit: mA If the current exceeds the limit value, the current must fall below the limit value by the hysteresis value in order to cancel the diagnostic.
OverTemperature	Variable	Read	70 °C	Upper limit value for the temperature of a port, unit: 0.1 °C
OverVoltageL	Variable	Read	30 V	Upper limit value for the voltage in the supply line 1, pins with the function L+, DI, DO, DIO, IO-Link can be monitored, unit: mV
OverVoltageL2	Variable	Read	30 V	Upper limit value for the voltage in the supply line 2, unit: mV
TemperatureHysteresis	Variable	Read	2 °C	Temperature hysteresis, unit: 0.1 °C If the temperature exceeds the limit value, the temperature must fall below the limit value by the hysteresis value in order to cancel the diagnostic.
UnderTemperature	Variable	Read	-25 °C	Lower limit value for the temperature of a port, unit: 0.1 °C
UnderVoltage L	Variable	Read	18 V	Lower limit value for the voltage in the supply line 1, pins with the function L+, DI, DO, DIO, IO-Link can be monitored, unit: mV
UnderVoltage L2	Variable	Read	18 V	Lower limit value for the voltage in the supply line 2, unit: mV
Voltage Hysteresis	Variable	Read	300 mV	Voltage hysteresis, unit: mV If the voltage exceeds the limit value, the voltage must fall below the limit value by the hysteresis value in order to cancel the diagnostic.

Tab. 8-2: Device specific configuration parameters

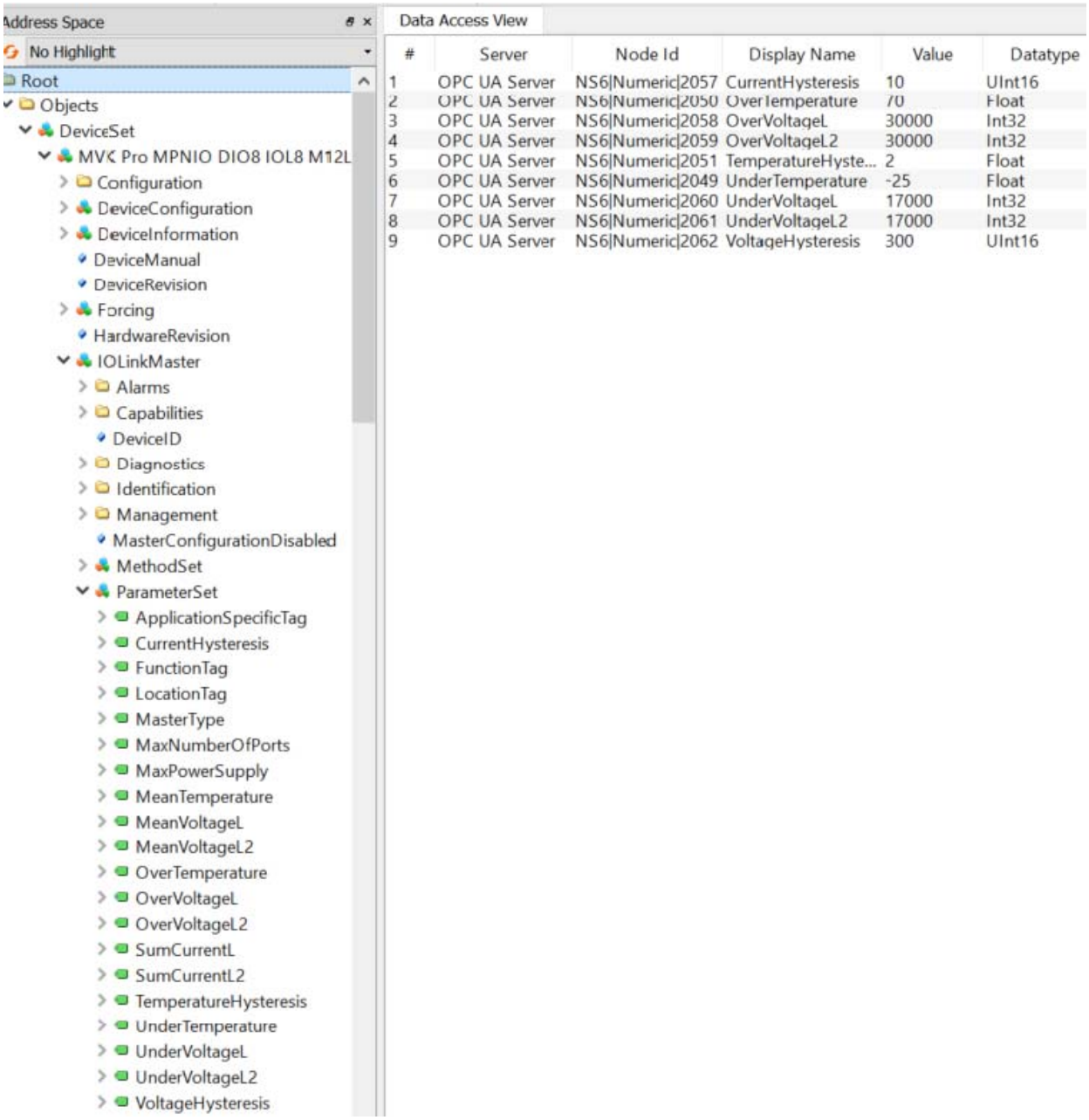


Fig. 8-15: Device-specific configuration parameters

Device-specific configuration parameters

No.	Node name	Node class	Access	Default	Description
	OverCurrentPin1, OverCurrentPin2, OverCurrentPin4	Variable	Read	0	Warning level for upper current limit at pin 1, pin 2 or pin 4, unit: 1mA 0: Monitoring not activated
	UnderCurrentPin1, UnderCurrentPin2, UnderCurrentPin4	Variable	Read	0	Warning level for lower current limit at pin 1, pin 2 or pin 4, unit: 1mA 0: Monitoring not activated

Tab. 8-3: Device-specific configuration parameters

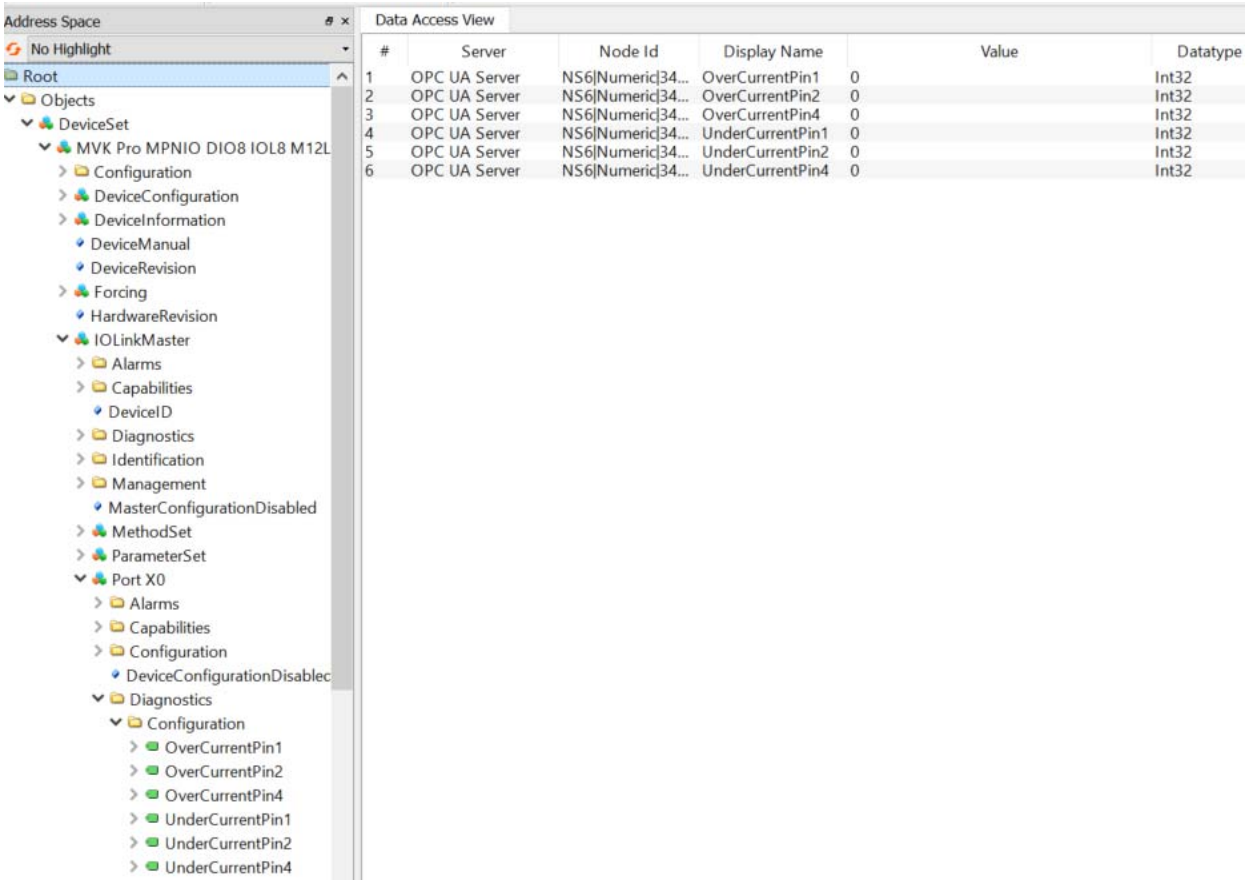


Fig. 8-16: Device-specific configuration parameters

8.6.3.4 Process data

The OPC UA server provides nodes with process data. In the node ***Pin2ProcessData***, the OPC UA client can, for example, read the value at pin 2 of a port.

Node name	Node class	Access	Description
Pin2ProcessData	Variable	Read	Process data at pin 2
Pin4ProcessData	Variable	Read	Process data at pin 4

Tab. 8-4: Process data

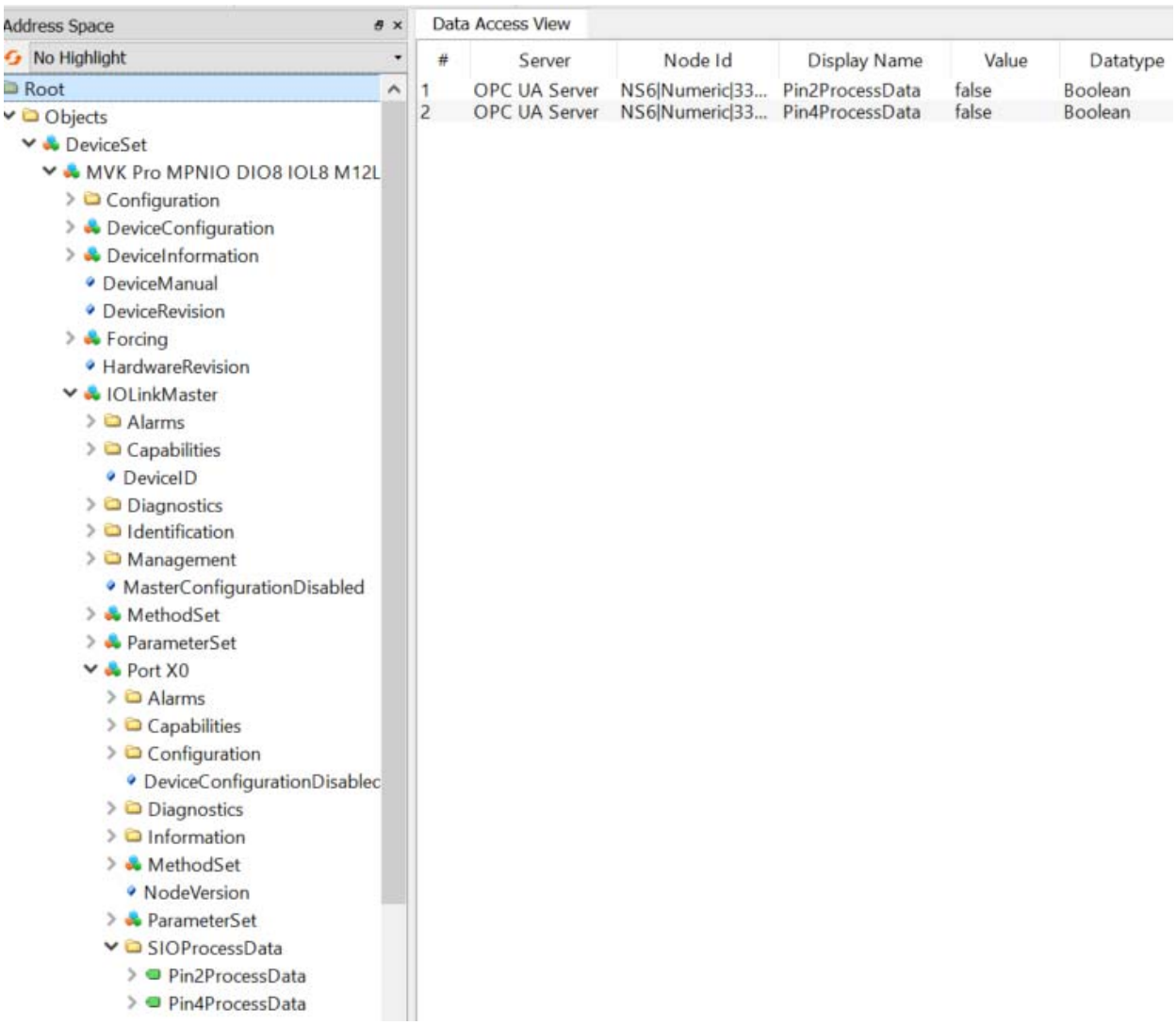


Fig. 8-17: Process data

8.6.3.5 Measured values

The OPC UA server provides nodes with calculated results. The OPC UA client, for example, can read in the node ***SumCurrentL*** the calculated total current of the supply line 1.

Device specific results

Node name	Node class	Access	Description
SumCurrentL	Variable	Read	The total current calculated from individual measurements in the supply line 1, unit: mA
SumCurrentL2	Variable	Read	The total current calculated from individual measurements in the supply line 2, unit: mA
MeanTemperature	Variable	Read	Average value for the temperature of the subassembly calculated from the temperature values measured individually at the three chips, unit: °C
MeanVoltageL	Variable	Read	Average voltage in the supply line 1, unit: mV
MeanVoltageL2	Variable	Read	Average voltage in the supply line 2, unit: mV

Tab. 8-5: Device specific (calculated) results

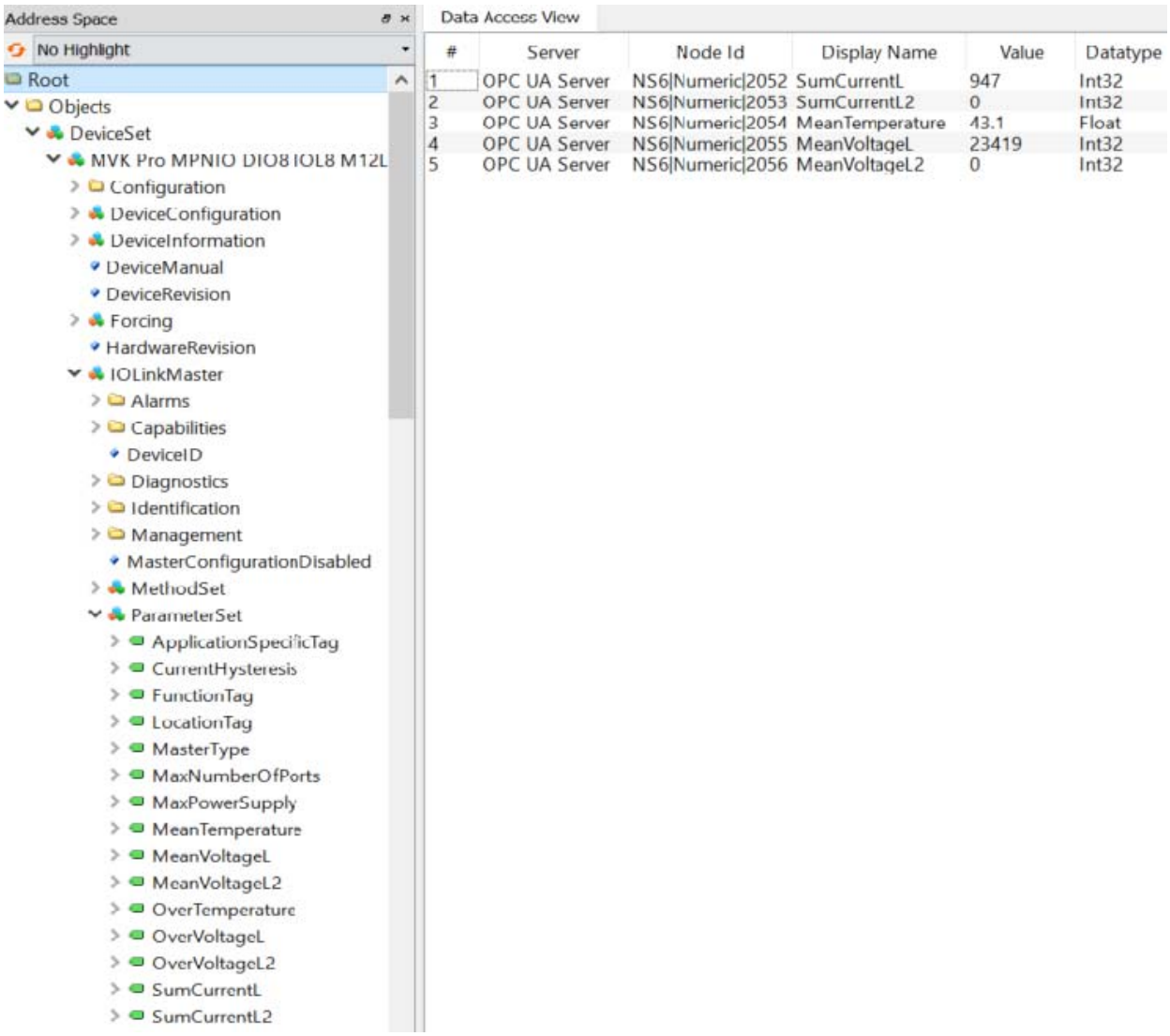


Fig. 8-18: Device specific (calculated) results

Port specific measuring values

Node name	Node class	Access	Description
CurrentPin1, CurrentPin2, CurrentPin4	Variable	Read	Current measured at pin 1, pin 2 or pin 4, unit: mA
TemperaturePin1, TemperaturePin2, TemperaturePin4	Variable	Read	Temperature measured at pin 1, pin 2 or pin 4, unit: °C
VoltagePin1, VoltagePin2, VoltagePin4	Variable	Read	Voltage measured at pin 1, pin 2 or pin 4, unit: mA

Tab. 8-6: Port specific measuring values

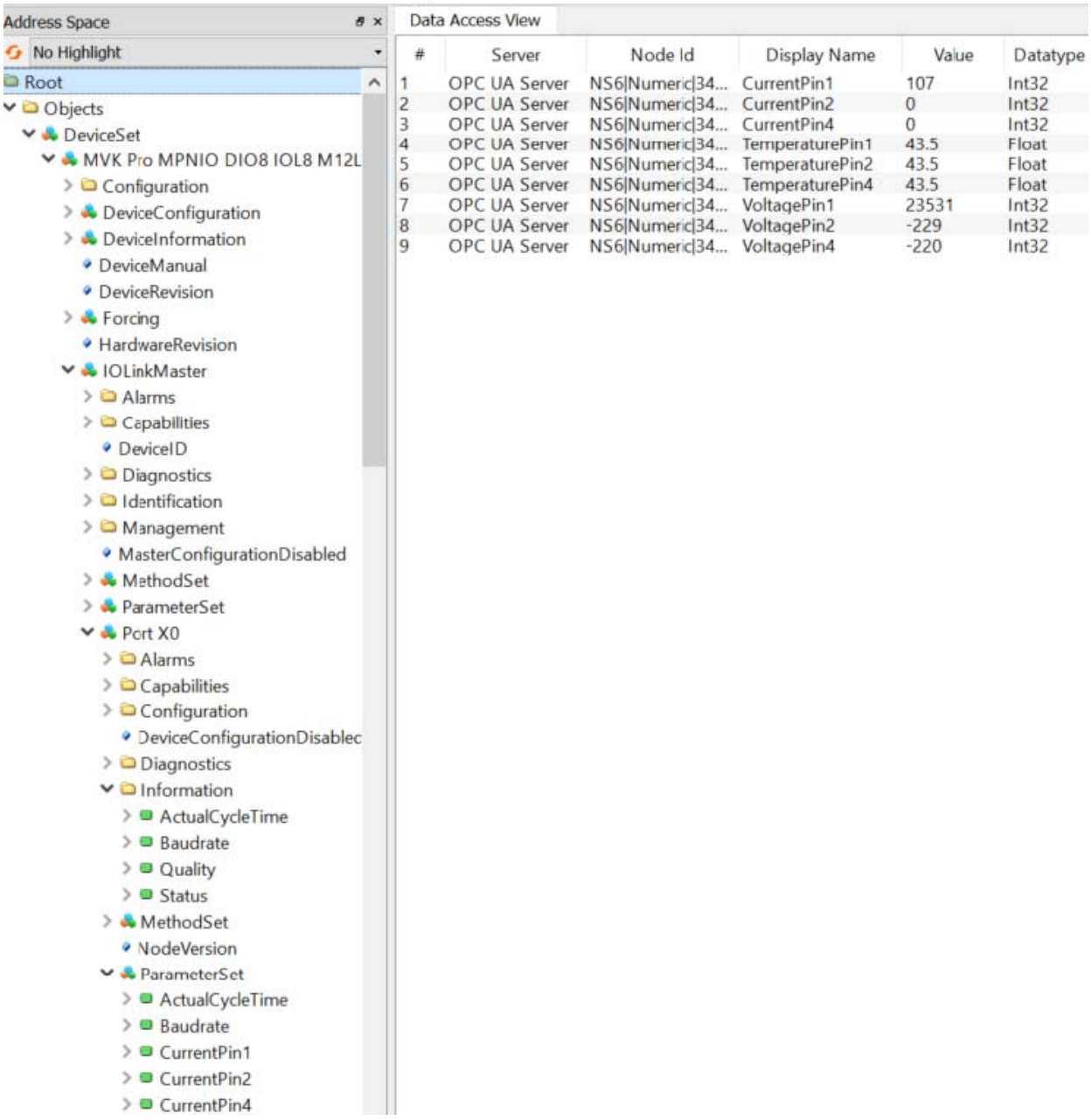


Fig. 8-19: Port specific measuring values

8.6.3.6 Diagnostic

The OPC UA server provides nodes with diagnostic information. In the node ***DiagnosticsPin1***, the OPC UA client can read, for example, whether the device has detected an overcurrent at pin 1 of a port.

Node name	Node class	Access	Description
DiagnosticsPin1, DiagnosticsPin2, DiagnosticsPin4	Variable	Read	Diagnostic at pin 1, pin 2 or pin 4. The numeric value contains bit-coded information: ■ Bit 0: Short circuit, ■ Bit 1: Overload protection, ■ Bit 2: Excess temperature protection, ■ Bit 3: Overvoltage protection, ■ Bit 4: Overcurrent, ■ Bit 5: Undercurrent ■ Bit 0: Excess temperature ■ Bit 1: Undertemperature ■ Bit 2: Overvoltage ■ Bit 3: Undervoltage ■ Bit 4: Watchdog 0: Diagnostic not active 1: Diagnostic active

Tab. 8-7: Port specific diagnostics

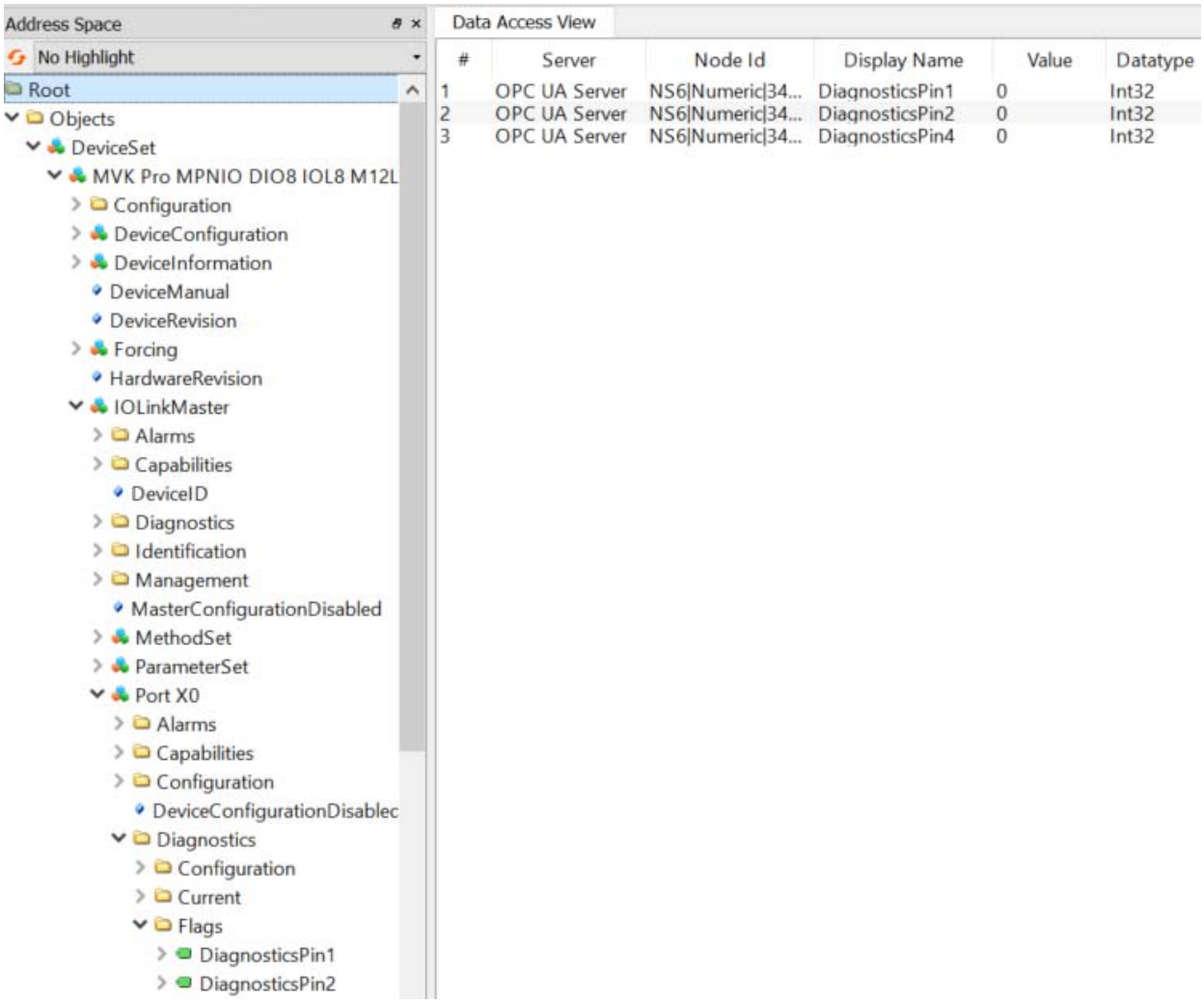


Fig. 8-20: Port specific diagnostics

8.6.3.7 Statistics

The OPC UA server provides nodes with statistical information. In the node ***MaxCurrentPin1,*** the OPC UA client can, for example, read the maximum measured current at pin 1 of a port.

Node name	Node class	Access	Description
MaxCurrentPin1, MaxCurrentPin2, MaxCurrentPin4	Variable	Read	Maximum current at pin 1, pin 2 or pin 4 since reset of the value, unit: mA
MinCurrentPin1, MinCurrentPin2, MinCurrentPin4	Variable	Read	Minimum current at pin 1, pin 2 or pin 4 since reset of the value, unit: mA
MaxTemperaturePin1, MaxTemperaturePin2, MaxTemperaturePin4	Variable	Read	Maximum temperature at pin 1, pin 2 or pin 4 since reset of the value, unit: °C
MinTemperaturePin1, MinTemperaturePin2, MinTemperaturePin4	Variable	Read	Minimum temperature at pin 1, pin 2 or pin 4 since reset of the value, unit: °C
MaxVoltagePin1, MaxVoltagePin2, MaxVoltagePin4	Variable	Read	Maximum voltage at pin 1, pin 2 or pin 4 since reset of the value, unit: mV
MinVoltagePin1, MinVoltagePin2, MinVoltagePin4	Variable	Read	Minimum voltage at pin 1, pin 2 or pin 4 since reset of the value, unit: mV

Tab. 8-8: Port specific statistical information

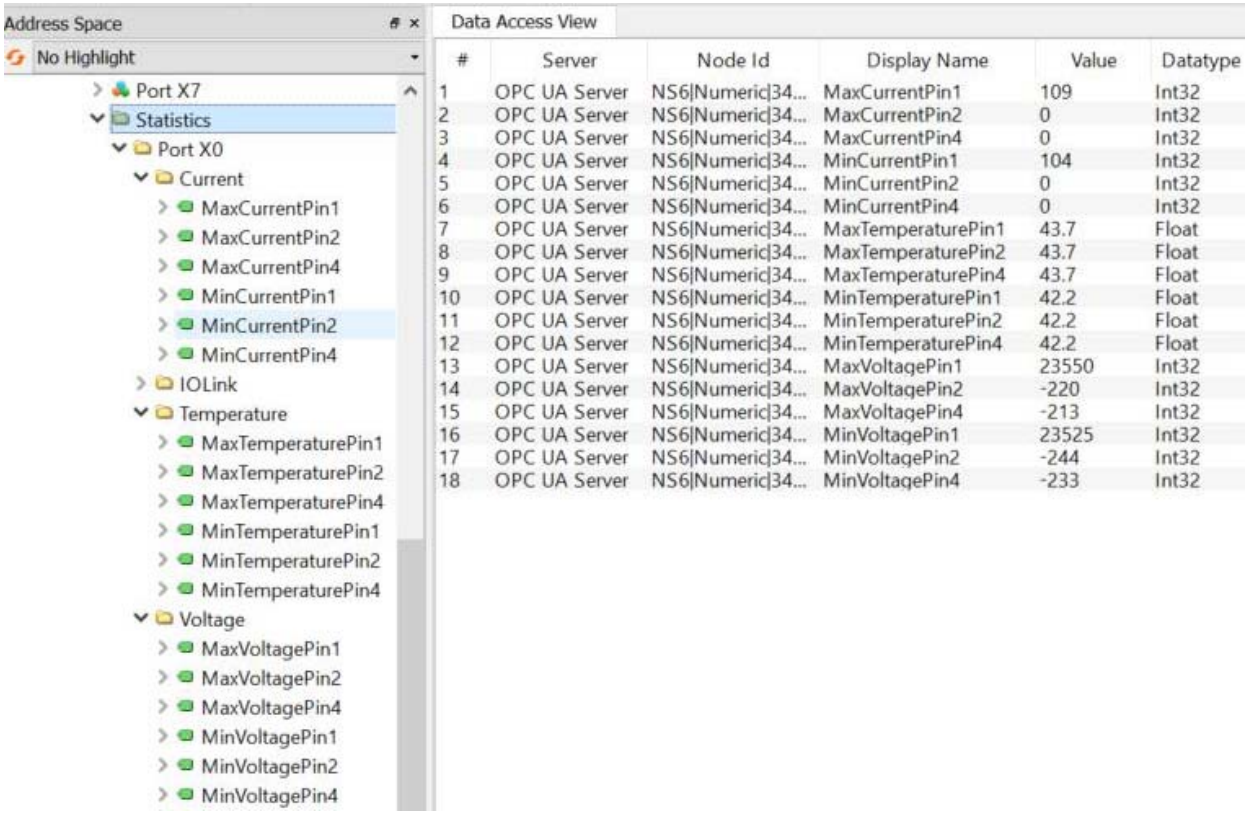


Fig. 8-21: Port specific statistical information

8.6.3.8 NTP client configuration

The OPC UA server provides nodes for the configuration of the NTP client.

Node name	Node class	Access	Description
NtpClientServerIpAddress	Variable	Read/ write	■ NTP server IP address ■ The NTP client uses the set IP address to fetch the time from an NTP server. ■ The IP address must be converted into a decimal number. The calculation is described in the table. ■ Value 0 disables the function.
NtpClientServerIpAddressFallback	Variable	Read/ write	■ IP address of the NTP server (fallback) ■ The optional IP address if the NTP server is not accessible via the IP address in node NtpClientServerIpAddress. ■ The IP address must be converted into a decimal number. The calculation is described in the table. ■ Value 0 disables the function.
NtpClientUpdateConfiguration	Variable	Write	Method to write the nodes NtpClientServerIpAddress and NtpClientServerIpAddressFallback.

Tab. 8-9: NTP client configuration

To convert the IP address into a decimal number, the following formula is used: Starting from an IP address in the format **A.B.C.D:**

```
((A * 256 + B) * 256 + C) * 256 + D = IP address as decimal number
```

Example for the IP address 192.53.103.108

```
((192 * 256 + 53) * 256 + 103) * 256 + 108 = 3224725356
```

8.6.3.9 OPC UA PC client

The IMPACT67 device has an integrated OPC UA server. An OPC UA client can be used to communicate with the IMPACT67 device.

For test purposes, e.g. the UaExpert from Unified Automation GmbH can be used: www.unifiedautomation.com

An OPC UA client has read access to the IMPACT67 device using the authentication “Anonymous”.

An OPC UA client has read and write access to the IMPACT67 device using the authentication “User name and Password” if the respective user has write rights.

Connection to the IMPACT67 device

Prerequisites

- You have an OPC UA client.
- If you want to have read access to the IMPACT67 device:
  You know the user name and the password and have write rights.
- You know the IP address of the IMPACT67 device

Without user name and password you can access anonymously to the IMPACT67 device and read data.

Step-by-step instructions

Establish a connection to the IMPACT67 device:

➔ Start UaExpert

➔ Create a new project using File > New.

➔ Add a new server by selecting Server > Add.

The Add Server dialog window with the Discovery tab is displayed.

Discovery (Default) tab . . . . . **Advanced** tab

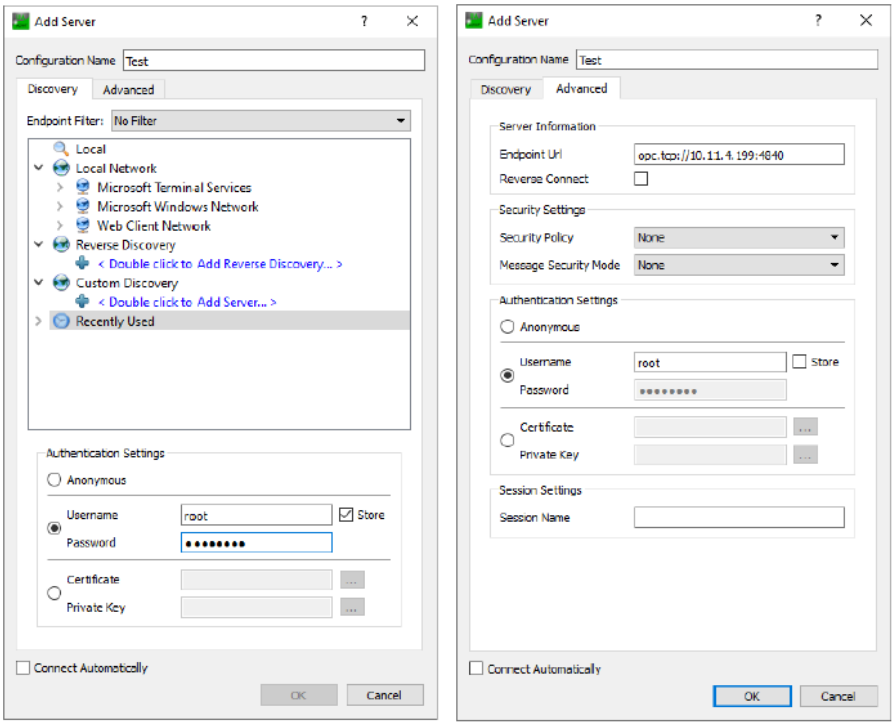


Fig. 8-22: Add Server dialog window – Discovery and Advanced tabs

➔ Enter a name for your configuration in the Configuration field, e.g. ***Test***.

➔ Select the Advanced tab.

➔ In the **Server Information** area of the Advanced tab, enter the following into the Endpoint Url data field:
opc.tcp://<IP address>:4840
For ***<IP address>***, enter the IP address of your device.

➔ In the **Authentication Settings** area, select the **Username/Password** option if you want to have write access to the device
or
Anonymous if read access is sufficient.

➔ If you have selected the **Username/Password** option, enter your user name and your password.

➔ Click **OK**.

In the project window, the UaExpert enters the server under Project >Servers, e.g. ***Test***.

➔ Open the context menu of the server (***Test***) and select **Connect.**

The connection is established.

Prerequisites

- You have an OPC UA client.
- You know the user name and the password and have write rights.
- You know the IP address of the NTP server.
- You have converted the IP address of this NTP server into a decimal number, as described below.
- You have already established a connection to the MVK device.

Example of an NTP server

NTP-Server ***ptbtime1.ptb.de*** of the German National Metrology Institute in Braunschweig with the IP address *192.53.103.108*

Spare NTP server (optional) of the NTP server ***ptbtime2.ptb.de*** of the German National Metrology Institute in Braunschweig with the IP address *192.53.103.104*

Conversion of an IP address into a decimal number

To convert the IP address into a decimal number, the following formula is used: Starting from an IP address in the format **A.B.C.D:**

*((A * 256 + B) * 256 + C) * 256 + D = IP address as decimal number*

Example for the IP address 192.53.103.108

*((192 * 256 + 53) * 256 + 103) * 256 + 108 = 3224725356*

Step-by-step instructions

➔ Open the context menu in the *Address Space* window:

Root> Objects> DeviceSet> [device name] > Configuration> NtpClient> NtpClientUpdateConfiguration.

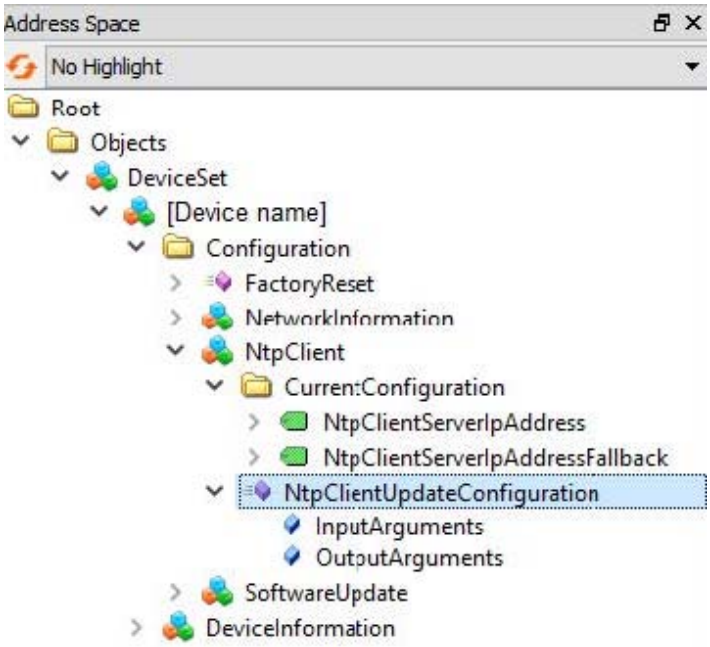


Fig. 8-23: NTP-Client update configuration

➔ Select ***Call*** from the context menu.

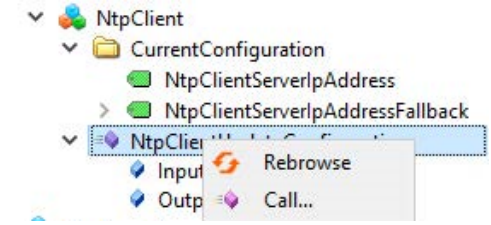


Fig. 8-24: NTP client configuration

*The dialog window **Call NtpClientUpdateConfiguration on NtpClient** is displayed:*

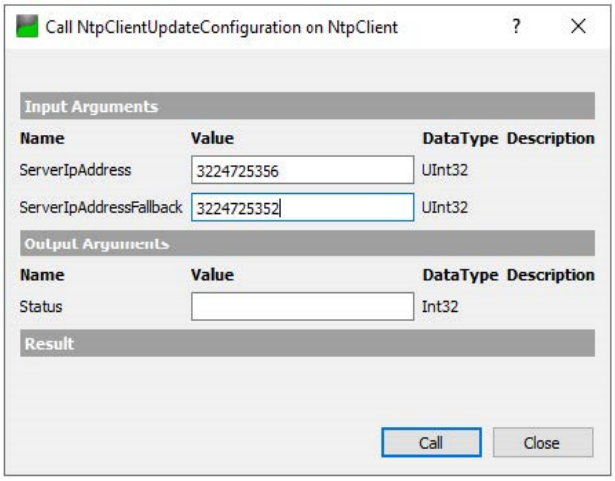


Fig. 8-25: Dialog window to configure the NTP client

- In the **Input Arguments** area, enter the value 3224725356 into the input field **ServerIpAddress** for the IP address of the NTP server.
- In the **Input Arguments** area, enter the number 3224725352 in the input field **ServerIpAddressFallback** for the IP address of the spare NTP server.
- Click **Call**.

If the function call has been successful, the output field on the right side of the status in the **Output Arguments** area shows the value 0. In the **Result** area, a green bar with the text “Succeeded” is shown.
The two variables ServerIpAddress and ServerIpAddressFallback are now set.
The device receives the current time from the time server via NTP and synchronizes its internal time.

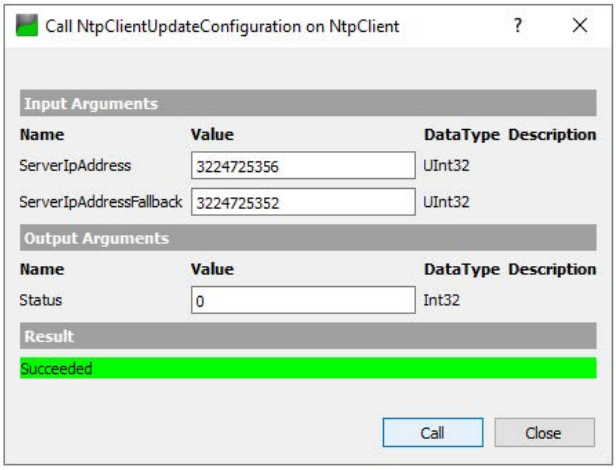


Fig. 8-26: Dialog window to configure the NTP client (successful)

9 Operation

9.1 LED indication

The module has separate and clearly arranged indicators:

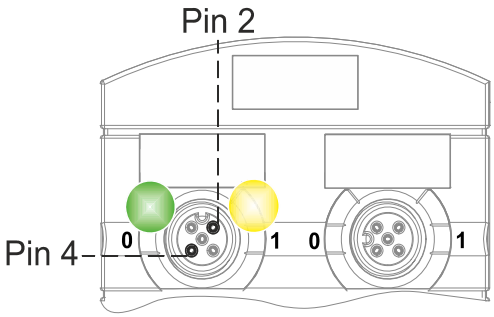
- LED indication for inputs and outputs
- LED indication for bus
- LED indication POWER
- Extended LED indications

The LEDs on the front panel of the module are labeled for clear identification of the displayed information.

9.1.1 LED assignment to channel and pin

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

- LED of channel **0**X (X = port number) is assigned to **pin 4**.
- LED of channel **1**X (X = port number) is assigned to **pin 2**.



9.1.2 LED flashing behavior

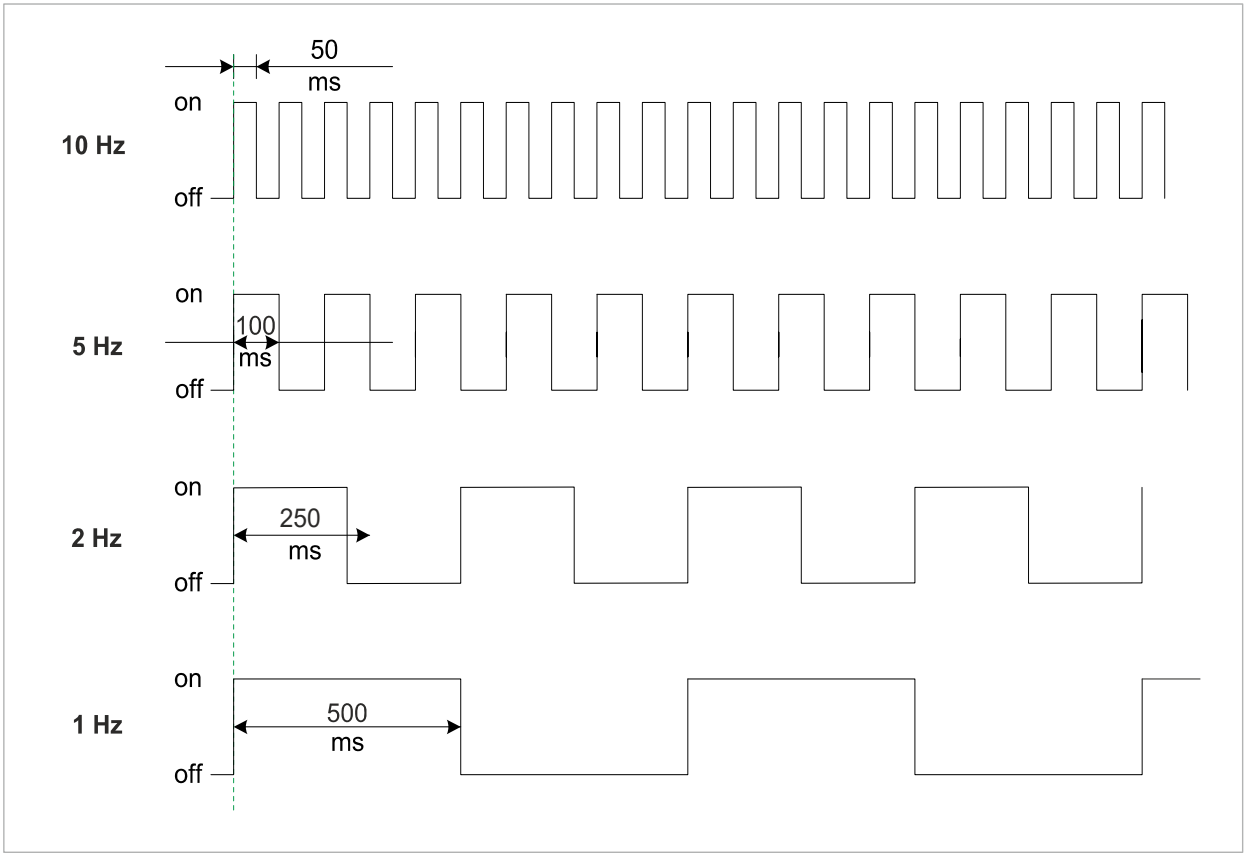
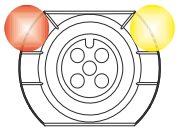


Fig. 9-1: LED flashing behavior

9.1.3 LED indication for inputs and outputs



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

Pin 2
Digital input DI

Indication	Condition	Description
Yellow	Permanently on	Fixed configuration: DI (NO) visible in process data. 24 V
Red	Flashing at 1 Hz	Overload/ short circuit in sensor supply 24 V + Pin1
	Off	Pin 2 is not used or deactivated

Tab. 9-1: LED indication DI pin 2

Pin 2
Digital output DO

Indication	Condition	Description
Yellow	Permanently on	Fixed configuration: DO switchable via process data 24 V
Red	Permanently on	Overload/ short-circuit at pin 2
Red	Flashing at 1 Hz	Overload/ short circuit in sensor supply 24 V + Pin1
	Off	Pin 2 is not used or deactivated

Tab. 9-2: LED indication DO pin 2

Error at input or output

If an error occurs at an input or output, the associated LED at the M12 port lights up red.

Pin 4
Digital input DI

Indication	Condition	Description
Yellow	Permanently on	Fixed configuration: DI (NO) visible in process data 24 V
Red	Flashing at 1 Hz	Overload/ short circuit in sensor supply 24 V + Pin1
	Off	Pin 4 is not used or deactivated

Tab. 9-3: LED indication DI pin 4

Pin 4
Digital output DO

Indication	Condition	Description
Yellow	Permanently on	Fixed configuration: DO switchable via process data 24 V
Red	Permanently on	Overload/ short-circuit at pin 4
Red	Flashing at 1 Hz	Overload/ short circuit in sensor supply 24 V + Pin1
	Off	Pin 4 is not used or deactivated

Tab. 9-4: LED indication DO pin 4

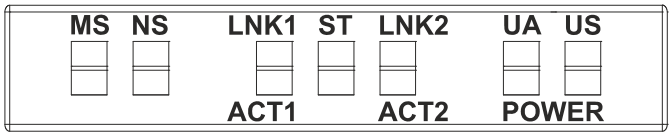
Pin 4
IO-Link mode

Display	State	Description
Green	Permanently on	IO-Link in Operate status.
Green	Flashing at 1 Hz	- Device is not connected - No communication with the connected device.
Green	Flashing at 10 Hz	- IO-Link in Pre-Operate status during data storage - Validation failed. Incompatible IO-Link device connected.
Red	Permanently on	Overload/ short-circuit at pin 4
Red	Flashing at 2 Hz	- Validation failed. - Incompatible IO-Link device connected for data storage. - Data storage failed.
	Off	IO-Link connection deactivated.

Tab. 9-5: LED indication IO-Link mode pin 4

9.1.4 LED display MS and NS

LED indication overview



- NS (network status) - indicates the state of the fieldbus system
- MS (device status) - indicates the state of the device in the PLC configuration

LED indication MS

Indication	Condition	Description
Green	Permanently on	Device in operation
Green	Flashing at 1 Hz	Standby: The device has not been configured.
Green Red	Flashing at 1 Hz	Self-test
Red	Flashing at 1 Hz	Major recoverable fault.*
Red	Permanently on	Major unrecoverable fault.
Off		No power supply.

Tab. 9-6: LED indication MS

*** Major recoverable fault.**
Incorrect or inconsistent configuration is considered a fatal correctable error.

LED indication red

This is what you can do:

➔ Check for IP address conflict.

LED indicator NS

Display	State	Description
Green	Permanently on	- Connection to the master available, - IP address is being configured.
Green	Flashing at 1 Hz	- No connection to master. - IP address is configured.
Green Red	Flashing at 1 Hz	Self-test
Red	Flashing at 1 Hz	At least one connection has timed out.
Red	Permanently on	Double IP address: the device has detected that its IP address is already in use.
Off		- No power supply, - no configured IP address.

Tab. 9-7: LED indicator NS

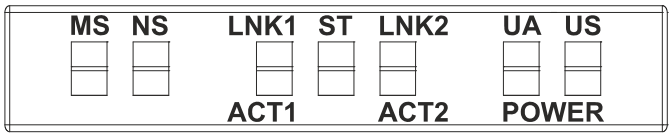
LED indication red

This is what you can do:

➔ Check for IP address conflict.

9.1.5 LED indication for LNK/ACT

LED indication overview



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

LNK

Indicates the state of the EtherNet/IP communication on the respective each port.

Indication	Status	Description
Green	On	■ Connection to network available
	Off	■ No connection to network.

ACT

Indicates the state of the EtherNet/IP communication on the respective each port.

Indication	Status	Description
Yellow	Flashing	■ The device sends/receives Ethernet frames
	Off	■ No Ethernet frames ➔ Check the line connections.

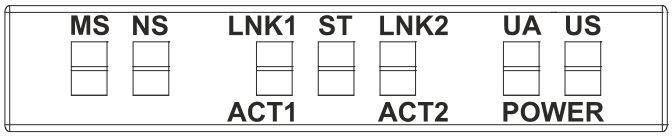
LED indication Off

This is what to do:

➔ Check the line connections.

9.1.6 LED indication for state

LED indication overview



- ST - indicates the state of the overall device.

LED indicator ST

Indication	Condition	Description
Green	Permanently on	The regular firmware is running. Normal operation.
Green	Flashing at 4 Hz	The operation requested by the position of the rotary switch is performed. Do not switch off the device.
Red	Flashing at 2 Hz	Invalid rotary switch position. The system does not start.
Red	Permanently on	Initialization error. Error during device initialization. a | HW problems, b | missing valid configuration, c | no COM FW found, d | rotary switch operation failed, etc.

Tab. 9-8: LED indicator ST

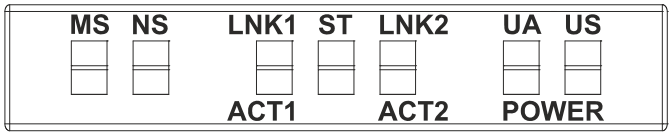
Red LED indicator flashing

This is what you can do:

- ➔ Select a valid position.
- ➔ Restart device.

9.1.7 LED indicator POWER US and UA

LED indication overview



The power LEDs indicate the state of the supply voltages

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

LED indicator POWER US

Indication	Condition	Description
Green	Permanently on	18 V ≤ US ≤30 V Error-free operation
Red	Permanently on	11 V ≤ US ≤18 V Undervoltage
Red	Flashing at 4 Hz	US >30 V Overvoltage
	Off	US <11 V No voltage

Tab. 9-9: LED indicator POWER US

NOTE
At US <18 V, an error-free operation is no longer guaranteed.

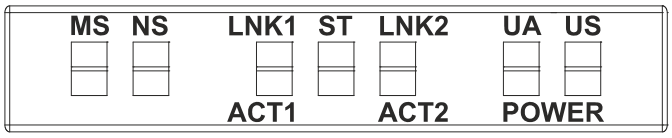
LED indicator POWER UA

Indication	Condition	Description
Green	Permanently on	18 V ≤ UA ≤30 V Error-free operation
Red	Permanently on	11 V ≤ UA ≤18 V Undervoltage
Red	Flashing at 4 Hz	UA >30 V Overvoltage
	Off	UA <11 V No voltage

Tab. 9-10: LED indicator POWER UA

9.1.8 Extended LED indication

LED indication overview



Extended LED display, identification of the device

LED	Display	State	Description
MS **NS** **ST** **POWER UA** **POWER US**	Green	Flashing 1 Hz	Identification of the device

Tab. 9-11: Extended LED display, identification of the device

Extended LED indication Update

LED	Indication	State	Description
MS **NS** **ST** **POWER UA** **POWER US**	Yellow	Cascading sequential light	Update is being transmitted
	Red		Update flashes

Tab. 9-12: Extended LED indication, update

Extended LED indication
Update

LED	Indication	State	Description
MS **POWER UA** **POWER US**	 Yellow	Flashing alternately 1 Hz	Update check in progress
	 Red	Rapid flashing	Update flashing interrupted
	 Red	Flashing alternately 1 Hz	Update failed
ST	 Off		

Tab. 9-13: Extended LED indication, update

Extended LED indication
Factory reset

LED	Indication	State	Description
MS **NS** **POWER UA** **POWER US**	 Green	Left and right sides are flashing alternately at 1 Hz	Factory reset has been completed successfully
	 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. 9-14: Extended LED indication, factory reset

Extended LED indication
Recovery firmware: system startup

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

Tab. 9-15: Extended LED indication, recovery firmware: system startup

Extended LED indication
Recovery firmware: system initialization

LED	Indication	State	Description
NS	Green	Lights continuously	
ST	Yellow	Double flash	Recovery firmware: system initialization
MS	Yellow	Flashing 1 Hz	
POWER UA **POWER US**	Off		

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

Extended LED indication
Recovery firmware: system run

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

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

Extended LED indication
Firmware update: initialization of transmission

LED	Indication	State	Description
MS **POWER UA**	Green	Lights continuously	
ST	Yellow	Double flash	Firmware update: initialization of transmission
POWER US	Yellow	Flashing 1 Hz	

Tab. 9-18: Extended LED indication, firmware update: initialization of transmission

Extended LED indication
Firmware update

LED	Indication	State	Description
ST	Yellow	Double flash	
MS **POWER UA** **POWER US**	Yellow	Cascading sequential light	The new firmware is being transmitted
	Yellow	Flashing alternately 1 Hz	The new firmware is being checked
	Red	Cascading sequential light	The new firmware is being updated
	Red	Single flash	Writing has been aborted
	Red	Flashing alternately 1 Hz	Updating the firmware failed

Tab. 9-19: Extended LED indication, firmware update

9.2 Diagnostics

9.2.1 Diagnostics structure in the control system

Byte	Description	Value
0	Last octet of the IP-address of the device	Last octet of the IP-address of the device
1	IO-Link identification	**0** = Default Code **0x40** = IO-Link Master Event Code **0x41** = IO-Link Device Event Code **0x42** = Murrelektronik IO-Link Device Event Code
2	Master channel number where the error occurred	
3	Device channel number where the error occurred	Only available if the IO-Link identification (Byte1) is set to the value 0x42
4	ErrorCode Byte1	For IO-Link, this is the LSB of the IO-Link ErrorCode, otherwise it is the Global Error Code, see Tab. 9-20: "Short-circuit diagnostic (Global Error Code 0x01)".
5	ErrorCode Byte2	For IO-Link, this is the MSB of the IO-Link ErrorCode, otherwise it is the Specific Error Code, see Tab. 9-20: "Short-circuit diagnostic (Global Error Code 0x01)".
6	Severity and active/inactive display	Bit 0: ■ 0 = Inactive diagnostic ■ 1 = Active diagnostic Bit 6 and 7: ■ 1 = Minor fault ■ 2 = Major fault ■ 3 = Information
7	Reserved	0

9.2.2 Diagnostics in the web server

Diagnostic monitoring

The device diagnostics may also be monitored using the diagnostic page of the integrated web server.

Representation

Device status is displayed as the text descriptions in the tables below:

1| Key: indicates the type of diagnostic

2| Description: shows a more detailed description of the error

3| Severity: distinguishes 3 error categories

a) **Information** 

b) **Maintenance requested** 

c) **Fault** 

4| Type: this shows whether the diagnostic has just occurred or the fault has already been eliminated.

There are two types of diagnostics.

Active 

Inactive 

9.2.3 Diagnostic value

9.2.3.1 Short-circuit diagnostic

Global Error Code 0x01

Description	Value
Sensor Short Circuit	0x01
Actuator Warning	0x17
Actuator Short Circuit	0x18

Tab. 9-20: Short-circuit diagnostic (Global Error Code 0x01)

9.2.3.2 Undervoltage diagnostic

Global Error Code 0x02

Description	Value
Undervoltage Actuator Power Supply	0x28
No Voltage Actuator Power Supply	0x29
Undervoltage External Actuator Power Supply	0x2A
No Voltage External Actuator Power Supply	0x2B
Undervoltage Sensor Power Supply	0x32
No Voltage Sensor Power Supply	0x33
Undervoltage U1	0xD0
Undervoltage U2	0xD1

Tab. 9-21: Undervoltage diagnostic (Global Error Code 0x02)

9.2.3.3 Overvoltage diagnostic

Global Error Code 0x03

Description	Value
Overvoltage Actuator Power Supply	0x2C
Overvoltage External Actuator Power Supply	0x2D
Overvoltage Sensor Power Supply	0x34
Overvoltage U1	0xD4
Overvoltage U2	0xD5

Tab. 9-22: Overvoltage diagnostic (Global Error Code 0x03)

9.2.3.4 General diagnostic

Global Error Code 0x09

Description	Value
Error	0x00
PLC Connection Of Exclusive Owner Timed Out	0x59

Tab. 9-23: General diagnostic (Global Error Code 0x09)

9.2.3.5 Buffer overflow diagnostic

Global Error Code 0xFF

Description	Value
Overflow	0xFF

Tab. 9-24: Buffer Overflow Diagnostic (Global Error Code 0xFF)

9.2.3.6 IO-Link master diagnostic

IO-Link Identification 0x40

The meaning of the IO-Link event codes can be found:

- in the Profinet specification IO-Link Integration - Edition 2, Version 1.1 (IO-Link-Integration-for-PROFINET_Ed2_2832_V11_Feb20.pdf p. 45-46)
- in the IO-Link Interface and System Specification Version 1.1.3 June 2019 (IOL-Interface-Spec_10002_V113_Jun19.pdf p. 259-260).

9.2.3.7 IO-Link device diagnostic

IO-Link identification 0x41

Description	Value
Error	0x0000
General Malfunction	0x1000
Temperature Fault	0x4000
Ambient Temperature: General Error	0x4100
Ambient Temperature: Over-Run	0x4110
Ambient Temperature: Under-Run	0x4120
Device Temperature: General Error	0x4200
Device Temperature: Over-Run	0x4210
Device Temperature: Under-Run	0x4220
Outside Temperature: General Error	0x4300
Outside Temperature: Over-Run	0x4310
Outside Temperature: Under-Run	0x4320
Device Hardware Fault	0x5000
Component Malfunction	0x5010
Non Volatile Memory Loss	0x5011
Batteries Low	0x5012
General Power Supply Fault	0x5100
Fuse Blown/Open	0x5101
Primary Supply Voltage Over-Run	0x5110
Primary Supply Voltage Under-Run	0x5111
Secondary Supply Voltage Fault	0x5112
Device Supply: Voltage Under-Run U3	0x5113
Device Supply: Voltage Under-Run U4	0x5114
Device Supply: Voltage Under-Run U5	0x5115
Device Supply: Voltage Under-Run U6	0x5116
Device Supply: Voltage Under-Run U7	0x5117
Device Supply: Voltage Under-Run U8	0x5118
Device Supply: Voltage Under-Run U9	0x5119
Device Supply: Short Circuit	0x5151
Device Supply: Error In Periphery	0x5160
Device Controller: General Error	0x5200
Device Control Section: General Error	0x5300
Device Power Section: General Error	0x5400
Device Power Section: Error In Output Driver	0x5410
Device Power Section: Fuse Blown/Open	0x5450
Device Power Section: Fuse Blown/Open S1	0x5451
Device Power Section: Fuse Blown/Open S2	0x5452
Device Power Section: Fuse Blown/Open S3	0x5453
Device Power Section: Fuse Blown/Open S4	0x5454
Device Power Section: Fuse Blown/Open S5	0x5455
Device Power Section: Fuse Blown/Open S6	0x5456
Device Power Section: Fuse Blown/Open S7	0x5457

Description	Value
Device Power Section: Fuse Blown/Open S8	0x5458
Device Power Section: Fuse Blown/Open S9	0x5459
Error In Additional Device Communication	0x5500
Error In Device Communication Interface 2	0x5510
Device Software Fault	0x6000
Device Software: Reset (Watchdog)	0x6010
Device Software: Internal Fault	0x6100
Device Software: Dataset Error	0x6300
Loss Of Parameter	0x6310
Parameter Error	0x6320
Parameter Missing	0x6321
Parameter Not Initialized	0x6330
Parameter Not Specific	0x6340
Parameter Changed	0x6350
Wire Break Of A Subordinate Device	0x7700
Wire Break Of Subordinate Device 1	0x7701
Wire Break Of Subordinate Device 2	0x7702
Wire Break Of Subordinate Device 3	0x7703
Wire Break Of Subordinate Device 4	0x7704
Wire Break Of Subordinate Device 5	0x7705
Wire Break Of Subordinate Device 6	0x7706
Wire Break Of Subordinate Device 7	0x7707
Wire Break Of Subordinate Device 8	0x7708
Wire Break Of Subordinate Device 9	0x7709
Wire Break Of Subordinate Device 10	0x770A
Wire Break Of Subordinate Device 11	0x770B
Wire Break Of Subordinate Device 12	0x770C
Wire Break Of Subordinate Device 13	0x770D
Wire Break Of Subordinate Device 14	0x770E
Wire Break Of Subordinate Device 15	0x770F
Short Circuit	0x7710
Ground Fault	0x7711
Communication Monitoring: General Error	0x8100
Process Data Monitoring: General Error	0x8110
Technology Specific Application Fault	0x8C00
Simulation Active	0x8C01
Process Variable Range Over-Run	0x8C10
Measurement Range Over-Run	0x8C20
Process Variable Range Under-Run	0x8C30
Maintenance Required - Cleaning	0x8C40
Maintenance Required - Refill	0x8C41
Maintenance Required - Wear And Tear	0x8C42

Tab. 9-25: IO-Link device diagnostic (IO-Link identification 0x41)

9.3 Acyclic IO-Link device access

IO-Link Device Parameter Object (Class Code 0x83)

The fieldbus device allows the configuration of the connected IO-Link devices with acyclic write and read access via the IO-Link Device Parameter Object (Class Code 0x83).

The IO-Link Device Parameter Object can be used to access parameters of an IO-Link device via ISDU (Index Service Data Unit). The object provides services that map CIP services to IO-Link services. An IO-Link port is addressed via the CIP instance of the “IO-Link Device Parameter Object”.

9.3.1 Reading an IO-Link device index

Read ISDU Request

Read IO-Link device index

➔ To read the index of a connected IO-Link device, use the EtherNet/IP service Read_ISDU 75 (0x4B).

➔ To do so, send the service to the correct attribute of the IO-Link device parameter object (class code 0x83).

➔ An attribute represents the IO-Link port to which the IO-Link device is connected.

Structure of a read ISDU service request

Name	Value	Type	Description
CIP Service	75 (0x4B)	-	ISDU read service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	Index	UINT	IO-Link ISDU object index
	Subindex	USINT	IO-Link ISDU object subindex

Tab. 9-26: Structure of a read ISDU service request

Read ISDU Response

Positive Response (CIP Status in service response == 0)

Name	Value	Type	Description
CIP Service	75 (0x4B)	-	ISDU read service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	ISDU Data	ARRAY of BYTE	IO-Link object data retrieved from the IO-Link device. Maximum number of bytes: 0 - 232

Tab. 9-27: Positive Response (CIP Status in service response == 0)

Negative Response (CIP Status in service response != 0)

Name	Value	Type	Description
CIP Service	75 (0x4B)	-	ISDU read service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	The structure of the error codes can be found in chapter 9.3.3 "CIP status codes"	UINT	IO-Link Master Error
		USINT	IO-Link Device Error
		USINT	IO-Link Device Additional Error

Tab. 9-28: Negative Response (CIP Status in service response != 0)

9.3.2 Writing an IO-Link device index

Write ISDU Request

Writing an IO-Link device index

- To write the index of a connected IO-Link device, use the EtherNet/IP service Write_ISDU 76 (0x4C).
- To do so, send the service to the correct attribute of the IO-Link device parameter object (class code 0x83).
- An attribute represents the IO-Link port to which the IO-Link device is connected.

Structure of a write ISDU service request

Name	Value	Type	Description
CIP Service	76 (0x4C)	-	ISDU write service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	Index	UINT	IO-Link ISDU object index
	Subindex	USINT	IO-Link ISDU object subindex
	Data	ARRAY of BYTE	Data that shall be written to IO-Link device. Maximum number of bytes: 0 - 232

Tab. 9-29: Structure of a write ISDU service request

Write ISDU Response

Positive Response (CIP Status in service response == 0)

The positive response to this service does not hold any CIP data.

Name	Value	Type	Description
CIP Service	76 (0x4C)	-	ISDU write service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	The positive response to this service does not hold any CIP Data (Number of bytes: 0).		

Tab. 9-30: Positive Response (CIP Status in service response == 0)

Negative Response (CIP Status in service response != 0)

Name	Value	Type	Description
CIP Service	76 (0x4C)	-	ISDU write service
CIP Class	131 (0x83)	-	IO-Link Device Parameter Object
CIP Instance	1 ... Number of available IO-Link Ports	-	Addresses the IO-Link Port the IO-Link device is connected to
CIP Data	The structure of the error codes can be found in chapter 9.3.3 "CIP status codes"	UINT	IO-Link Master: Error code
		USINT	IO-Link Device: Error code
		USINT	IO-Link Device: Additional error code

Tab. 9-31: Structure of a write ISDU service request

9.3.3 CIP status codes

CIP error codes

The following table provides a brief overview of which CIP status code can be returned when accessing the “IO-Link Device Parameter Object” via a CIP service. The table does not claim to be complete.

CIP status	Description
0 (0x00)	Success. Service was successfully performed.
5 (0x05)	Path destination unknown. Addressed CIP Class or CIP Instance is not known.
8 (0x08)	Service not supported. The requested service is not implemented or was not defined for this Object Class/Instance.
19 (0x13)	Not enough data. The service did not supply enough data to perform the specified operation.
20 (0x14)	Attribute not supported. The attribute specified in the request is not supported.
21 (0x15)	Too much data. The service supplied more data than was expected.
30 (0x1E)	An embedded service resulted in an error. The IO-Link specific error codes within the CIP response data might provide more information about what went wrong.

Tab. 9-32: CIP status codes

10 Web server

The web server of the Pro module is a graphical user interface.

With the web server, it is possible to obtain information about the device and the connected IO-Link devices quickly and intuitively.

With the IO-Link IODD interpreter integrated in the web server (logged in as administrator and activated JSON (REST API) it is possible to upload IODDs of connected devices and to parameterize them in the simplest way or to monitor and control process data.

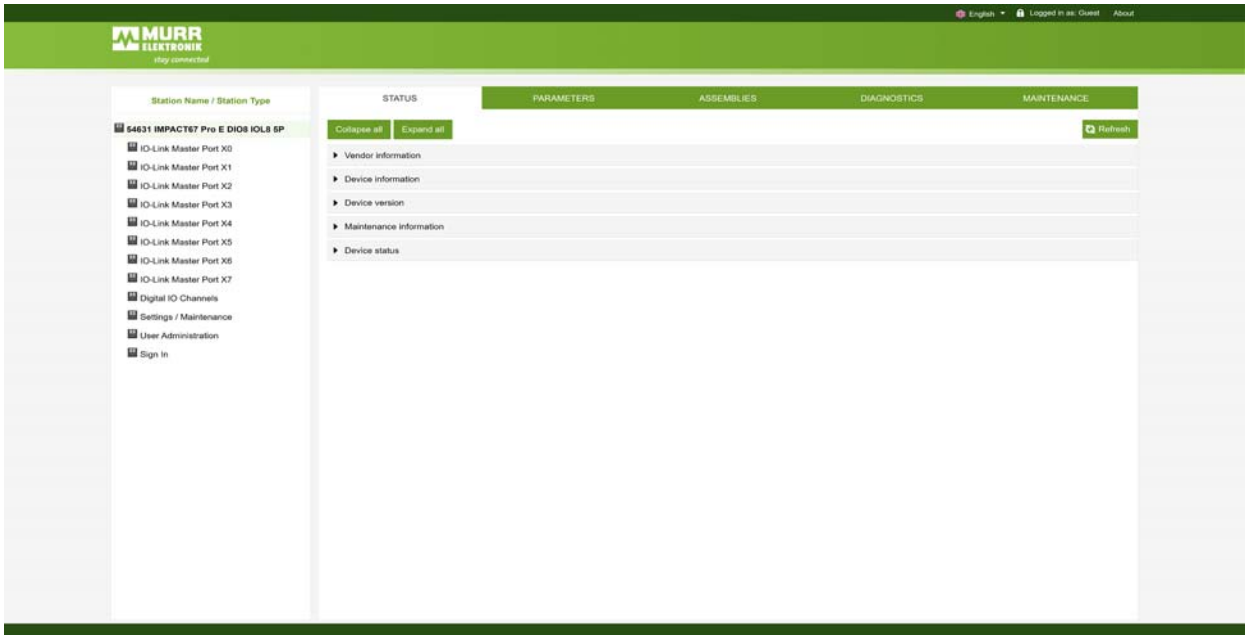


Fig. 10-1: Murrelektronik web server

The listed devices are an example of the application of the Murrelektronik web server.

10.1 Starting the web server

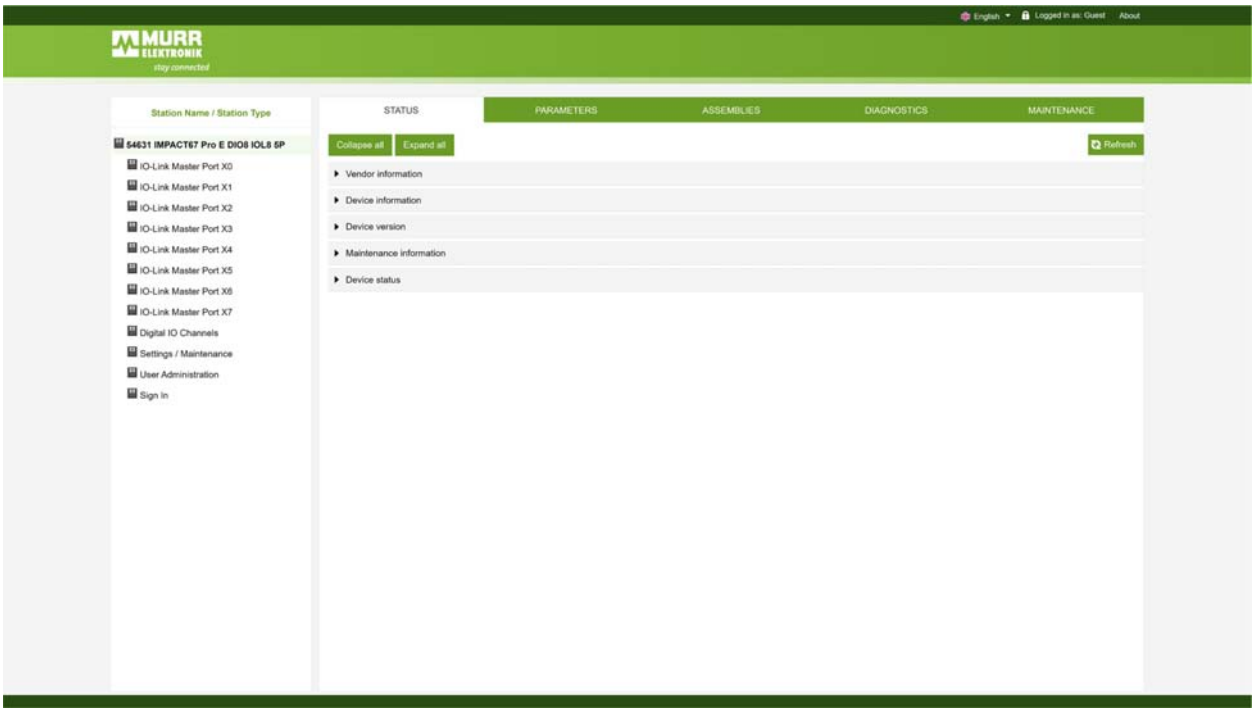
Prerequisite for a correct graphic display of the web server:
The following browsers with HTML5 and ES5 are supported by

- Mozilla Firefox
- Microsoft Edge
- Google Chrome

To start the web server, proceed as follows:

➔ Start the web browser.

➔ Enter the IP address of the device in the web browser.
The web server start screen is displayed.



10.2 Access and login

Username and password

1 | Click on "Log in" in the system tree to go to the login page.

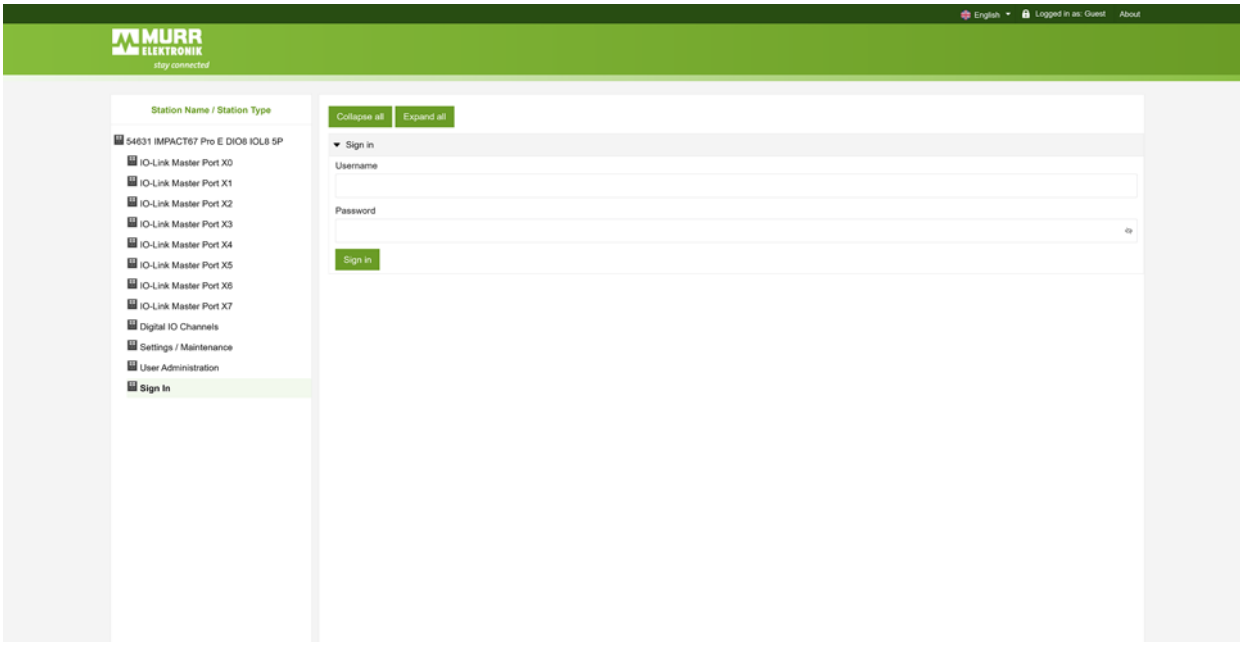


Fig. 10-2: Login

2 | Enter your username and password to "log in".
   a) Username: admin
   b) Password: private

3 | Click on "Login".

➔ Not all menus and functions are visible to guests.

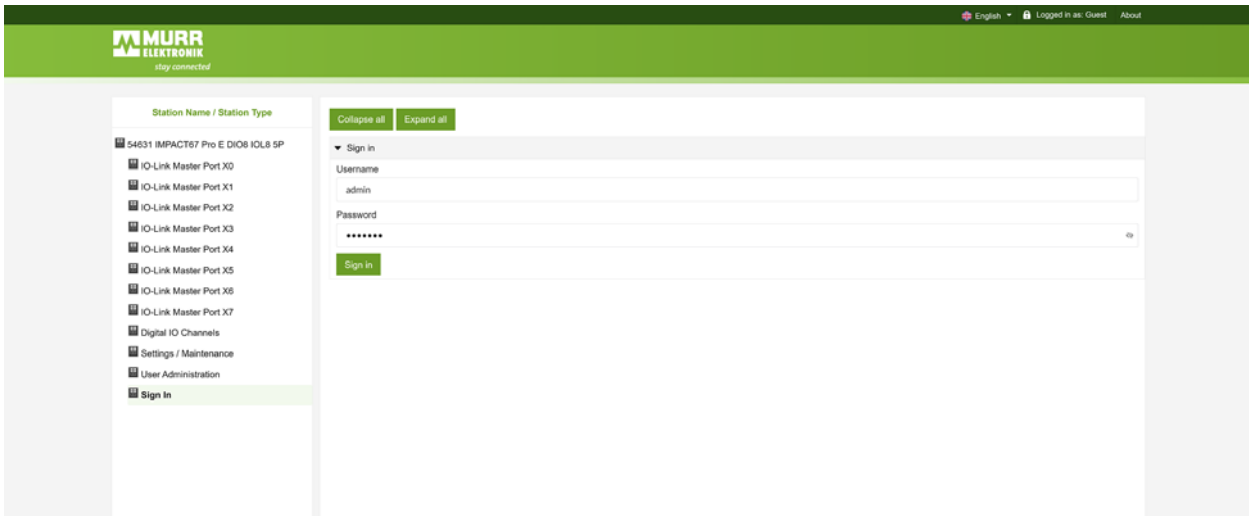


Fig. 10-3: Logindata

Change Password

NOTEEnsure data security!

➔ You will be prompted to change your password upon first login or after a factory reset.

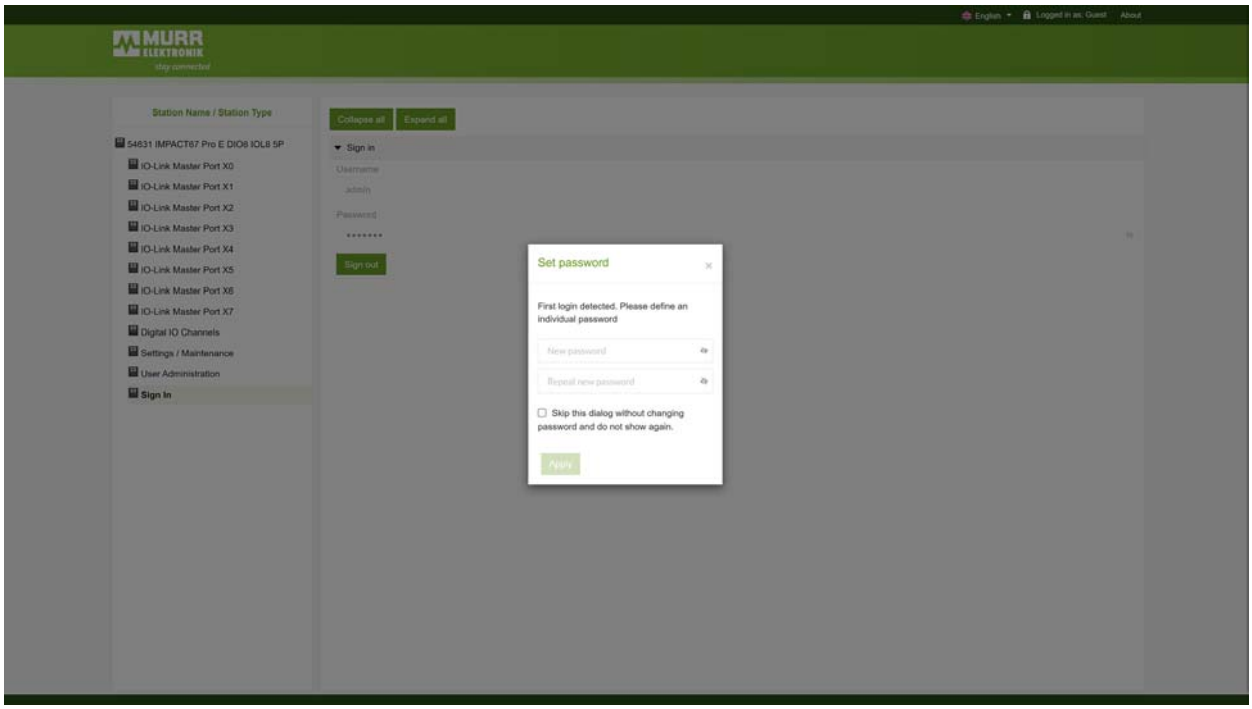


Fig. 10-4: Change Password

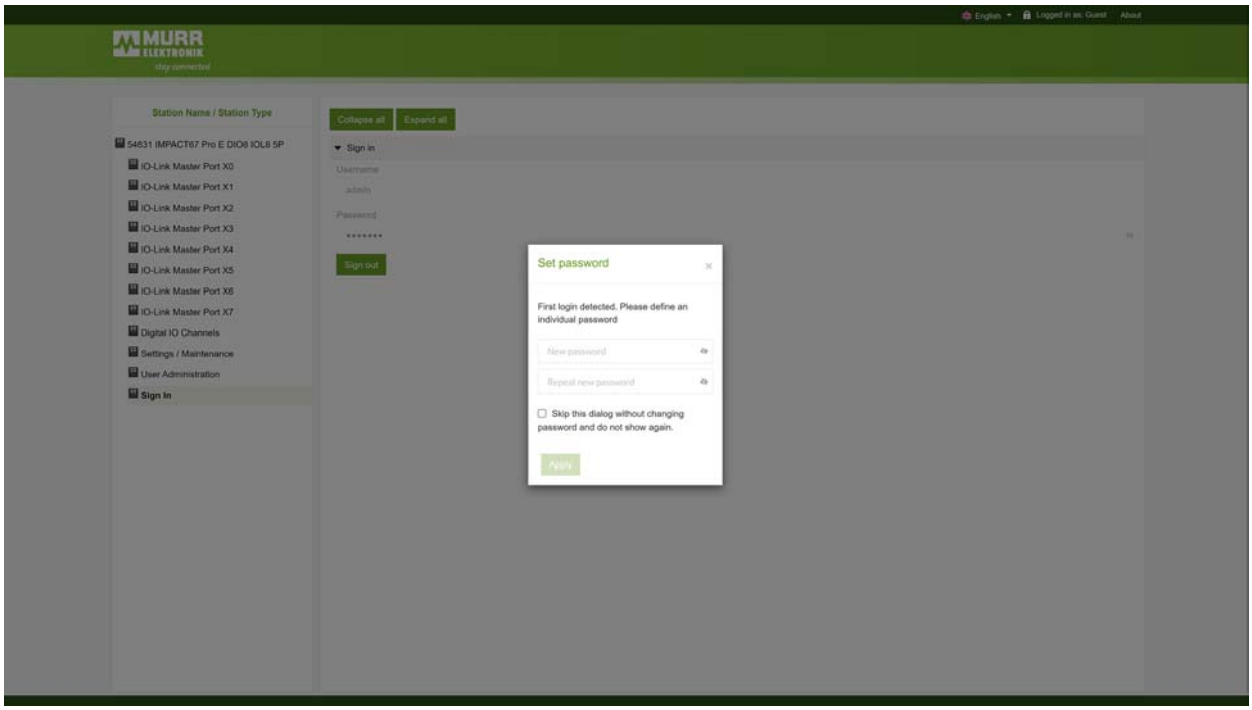


Fig. 10-5: Enter password

➔ To skip changing the password, you can check the box in the input field.

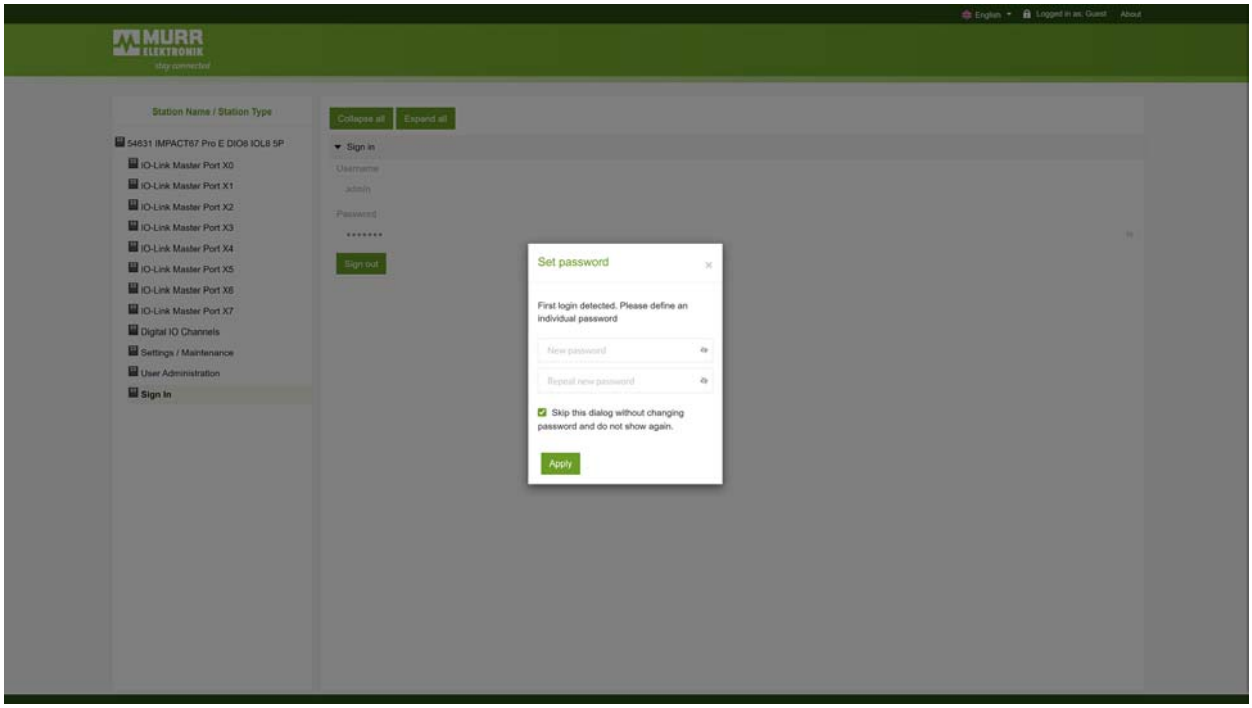


Fig. 10-6: Skip changing password

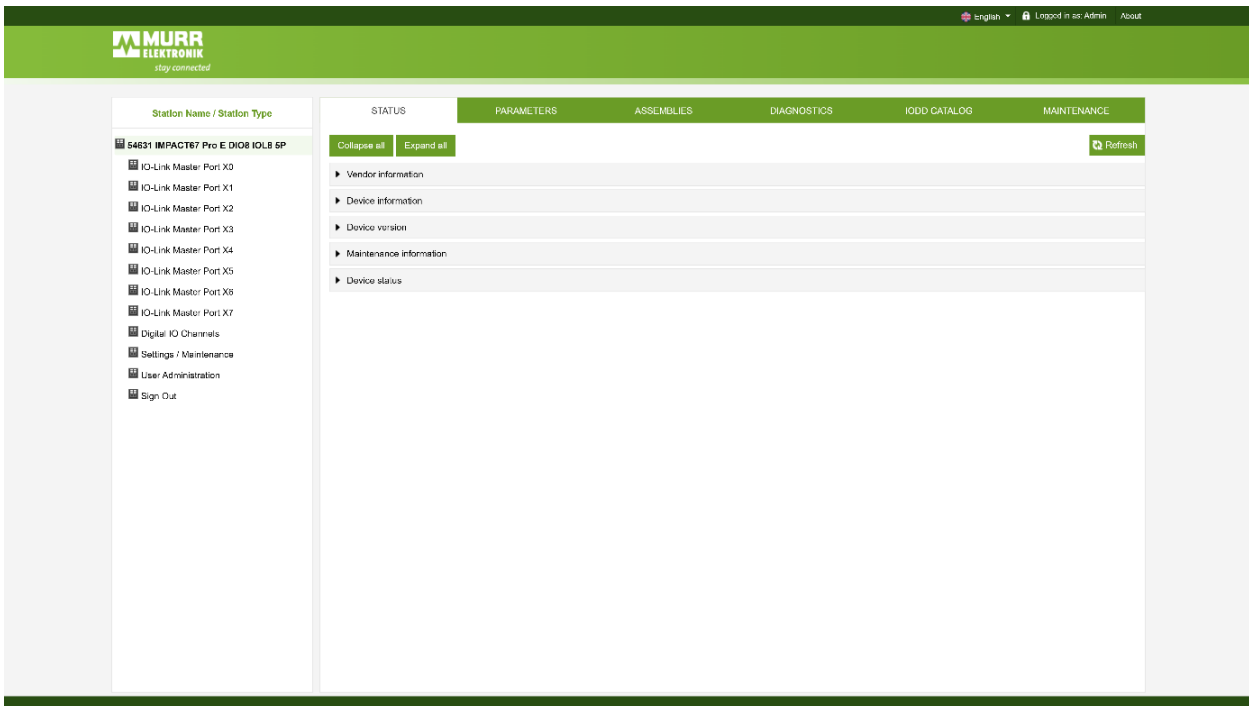


Fig. 10-7: Startpage after login

10.3 Start screen

The web server is divided into 5 operating areas, which can differ depending on the user or whether they are logged in or not.

Fig. 10-8: Operating areas

1 | **User interface**
Murrelektronik web server with all elements.

2 | **System or device tree**
All available sub-functions and connected IO-Link devices are displayed here.

3 | **Menu bar**
The menu bar enables you to switch between the different pages of the device or the sub-function. In addition, the white tab highlights the current page.

4 | **Page content**
This area shows the contents of the selected page.

5 | **Header bar**
Language and interface settings, system information.

10.4 Menu bar

In the first line of the system tree, the device is displayed with article number and product name.

The menu bar comprises the following menu items:

- STATUS
- PARAMETERS
- ASSEMBLIES
- DIAGNOSTICS
- IODD CATALOG (The menu is only visible after logging in as an administrator)
- MAINTENANCE

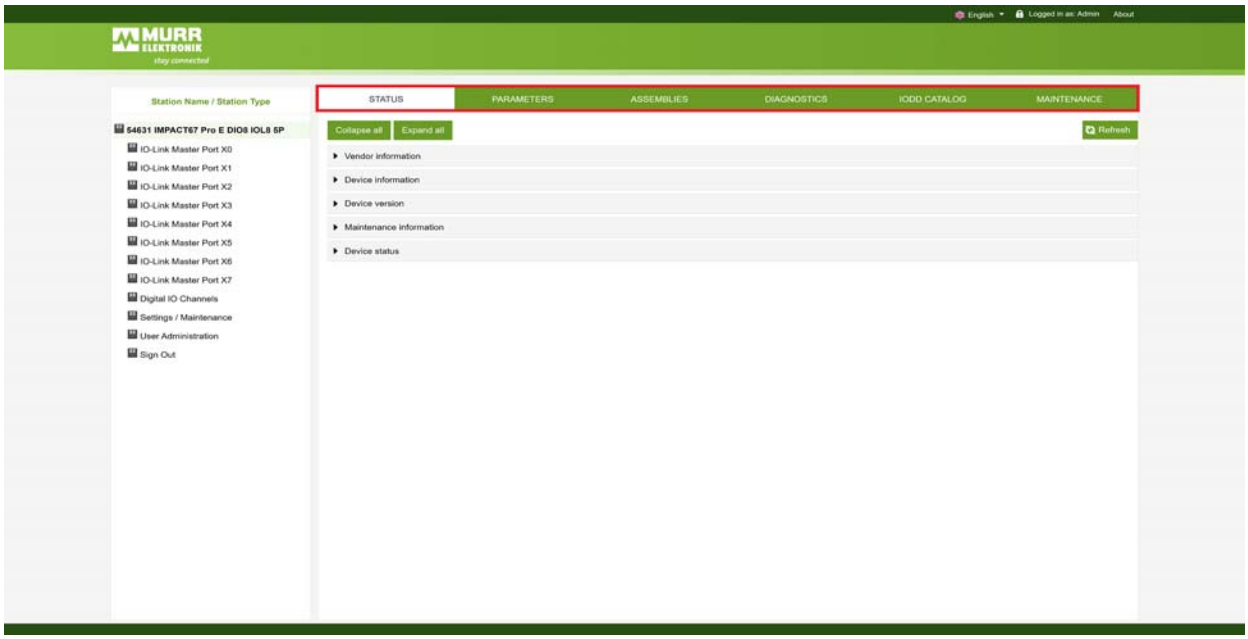


Fig. 10-9: Menu bar

10.4.1 STATUS menu

STATUS contains the following sub-items:

- Manufacturer information
- Device information
- Device version
- Maintenance information
- Device status

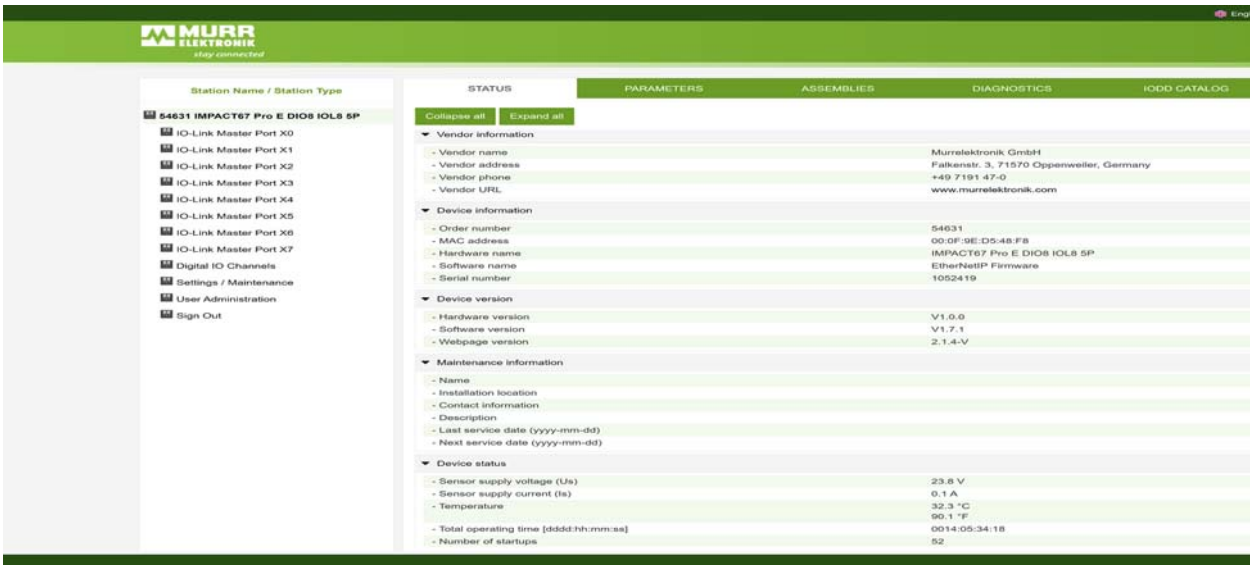


Fig. 10-10: STATUS menu

Manufacturer information

Parameter	Meaning
Manufacturer name	Murrelektronik GmbH
Manufacturer address	Falkenstraße 3 D-71570 Oppenweiler
Manufacturer's phone	+49 7191 47-0
Manufacturer URL	https://www.murrelektronik.com/de/

Device information

Parameter	Meaning
Order number	Device item number
Hardware name	Fixed article name of the device
Software name	Device fieldbus designation
Software number	Serial number of the device

Device version

Parameter	Meaning
Hardware version	Hardware version
Software version	Currently running software version on the device
Website version	currently running version of the web server on the device

Maintenance information

The maintenance information can only be read here. Entering or changing the fields is done via the STATUS menu → Maintenance Information submenu.

Parameter	Meaning
Name	Device name, free text
Installation location	Place name, free text
Contact information	Contact, free text
Description	Description, free text
Last maintenance date (yyyy-mm-dd)	free date entry
Next maintenance date(yyyy-mm-dd)	free date entry

IO-Link device information

Parameter	Meaning
1L voltage [V]	Display of sensor voltage in volts
1L current [A]	Display of sensor voltage in amperes
2L voltage [V]	Display of actuator voltage in volts
2L current [A]	Display of actuator voltage in amperes
temperature [°C]	Display of device temperature in Celsius
Total operating time [hh:mm:ss]	Operating time since the device was switched on
Number of starts	Number of device restarts

10.4.2 PARAMETER menu

PARAMETER contains the following sub-items:

- Diagnostic configuration
- I/O Layout Digital Channels
- OPC UA settings
- MQTT settings
- JSON settings
- HTTP General Settings
- Diagnostic buffer settings
- SNTP

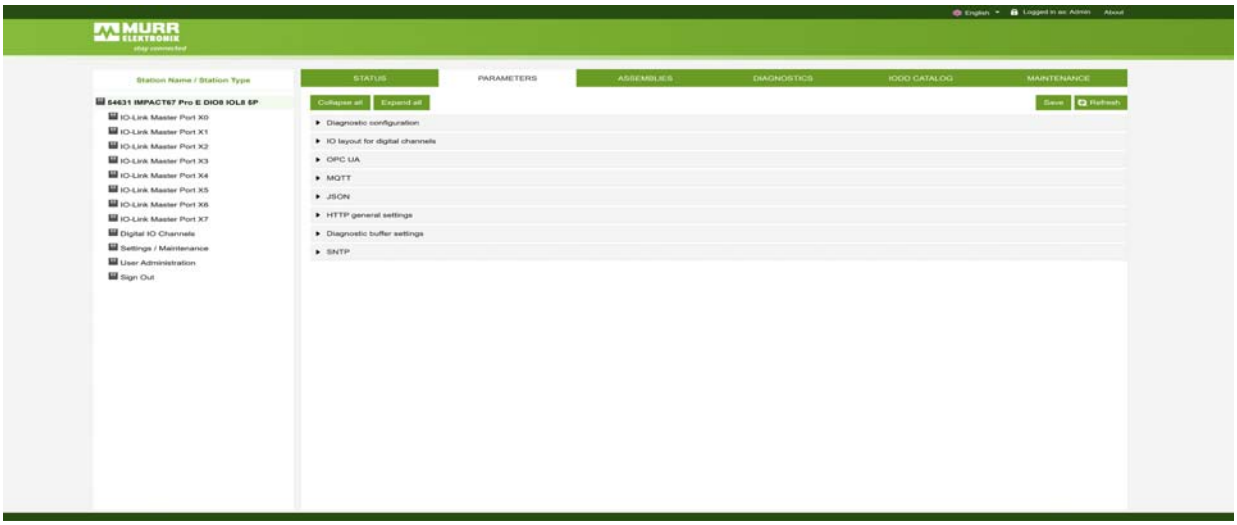


Fig. 10-11: Menu PARAMETERS

Diagnostic configuration

In the diagnostic menu, as in the diagnostic assembly, the diagnostics for US, UA, etc. can be enabled or disabled.

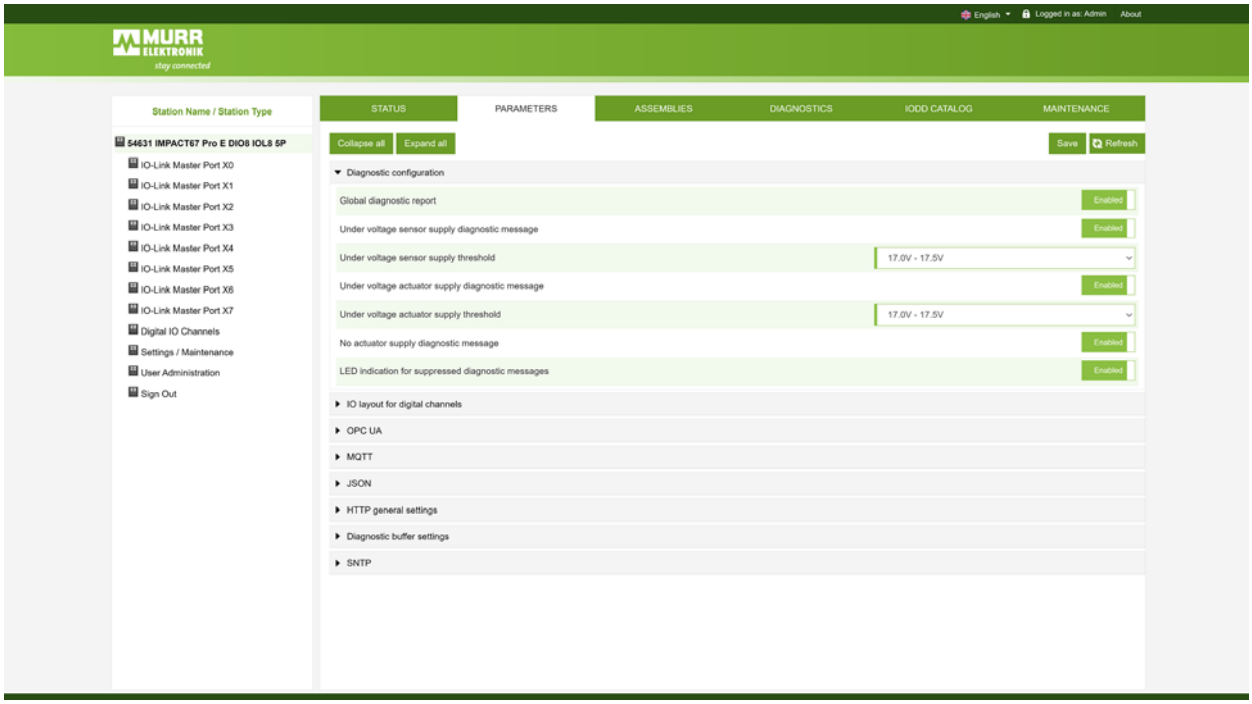


Fig. 10-12: Diagnostic configuration

I/O Layout for Digital Channels

Switching of the IO layout is based on port and pin.

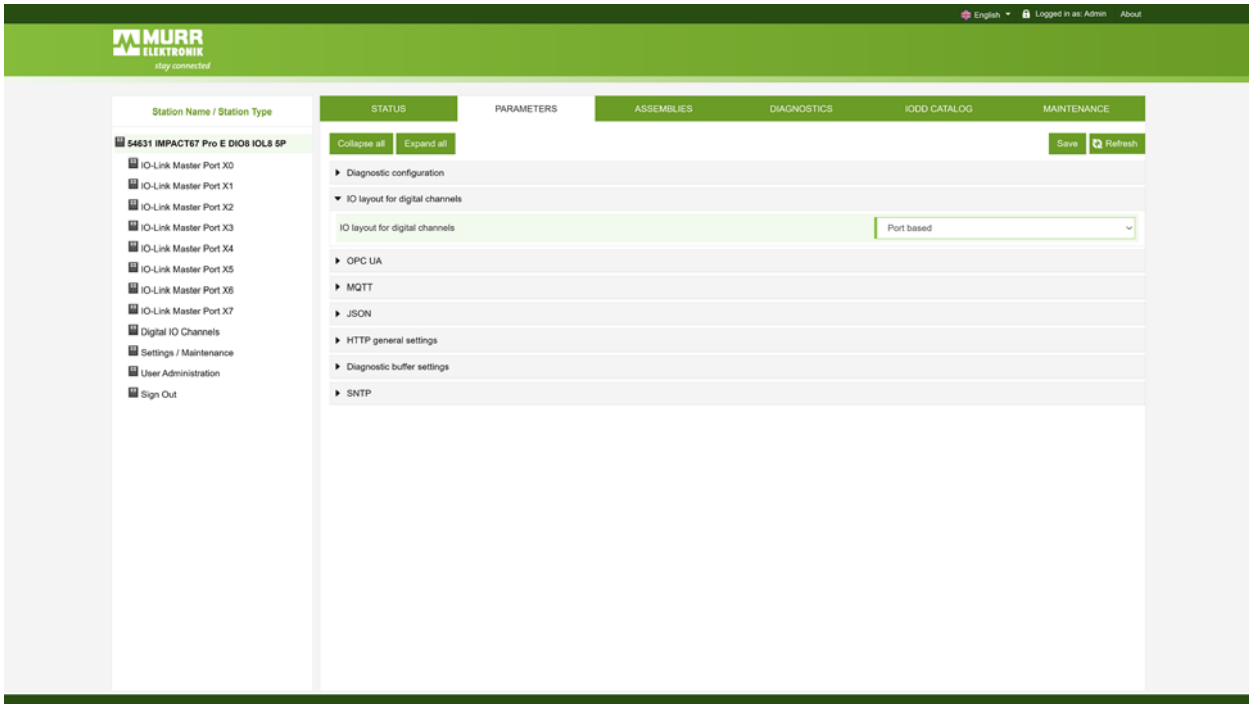


Fig. 10-13: I/O Layout for Digital Channels

Explanation of the process data, see 12.2 "Explanation of the process data"

OPC UA

Users with administrator and operator rights can change settings and enter the OPC UA port number. Guest users have read rights.

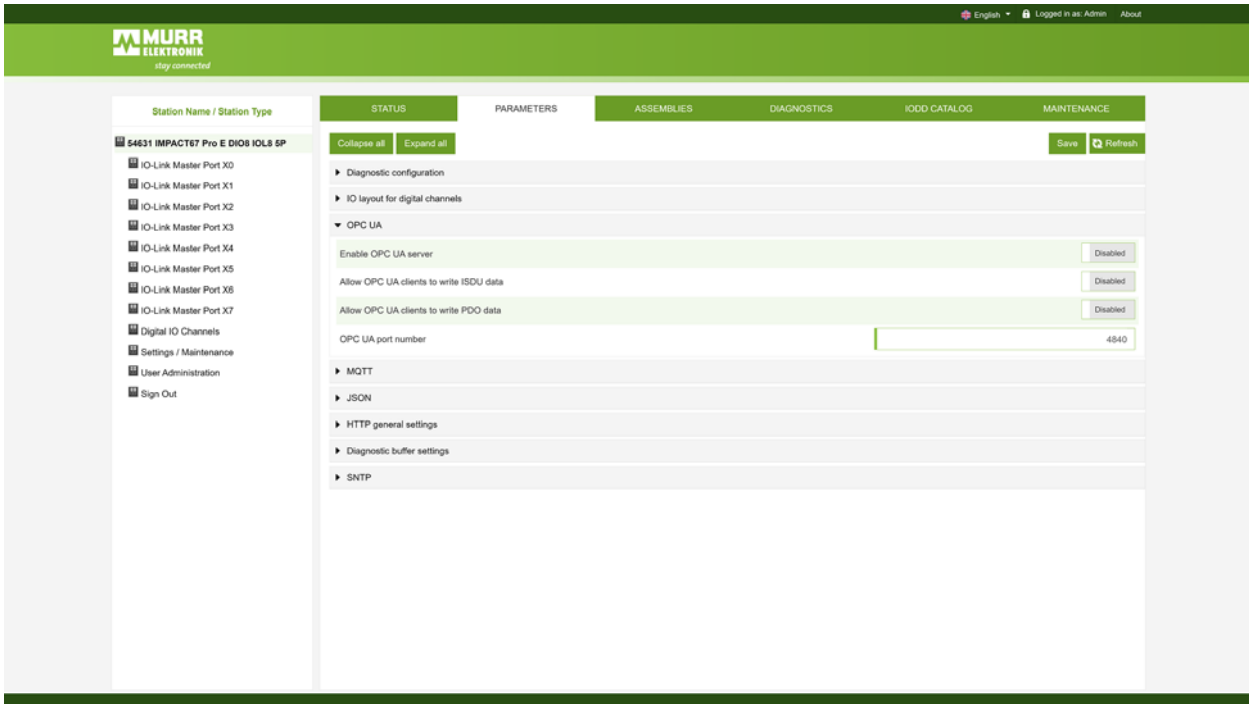


Fig. 10-14: OPC UA

OPC UA displays the following information:

Parameter	Meaning
Enable OPC UA Server	Enable/disable OPC UA server on the assembly
Allow OPC UA clients to write ISDU data	The OPC UA client is allowed to write ISDU (Indexed Service Data Unit) data to the module on the IO-Link master.
Allow OPC UA clients to write PDO data	The OPC UA client is allowed to write process data objects (PDOs) to the module on the IO-Link master.
OPC UA port number	Display/Setting the OPC UA port

MQTT

Users with administrator and operator rights can change settings and enter the IP address of the MQTT server. Guest users have read-only rights.

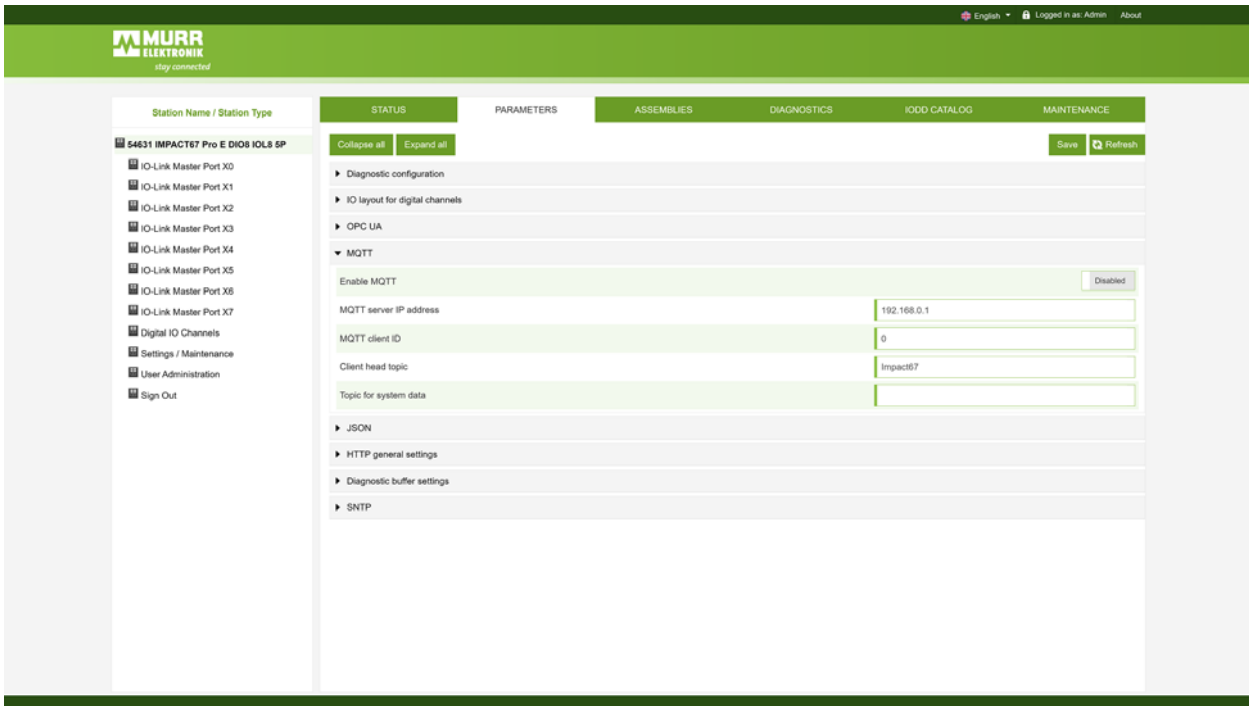


Fig. 10-15: MQTT

MQTT displays the following information:

Parameter	Meaning
Enable MQTT	Enable/disable MQTT client on the assembly
MQTT Server IP Address	IP address of the MQTT server
MQTT Client ID	Reading/writing the MQTT client ID
Client head topic	Reading/writing an MQTT topic
Topic for system data	Reading/writing an MQTT topic

JSON

Users with administrator and operator rights can enable and disable JSON. Guest users have read-only access.

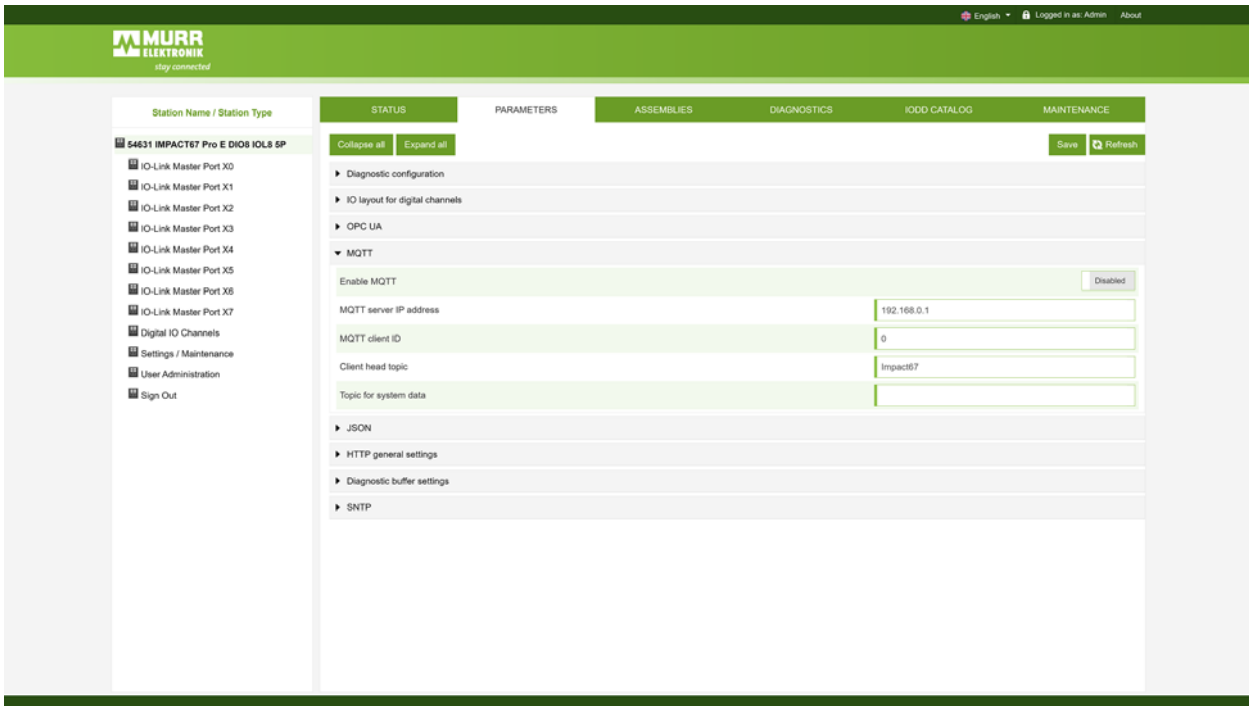


Fig. 10-16: JSON

JSON displays the following information:

Parameter	Meaning
Enable JSON	JSON interface on the assembly active / passive

➔ JSON is necessary for the IODD interpreter and catalog functions, as well as for transmitting MQTT in JSON format.

HTTP settings

This parameter allows you to disable the WebUI. Once the WebUI is no longer accessible, it can only be accessed via the following methods.

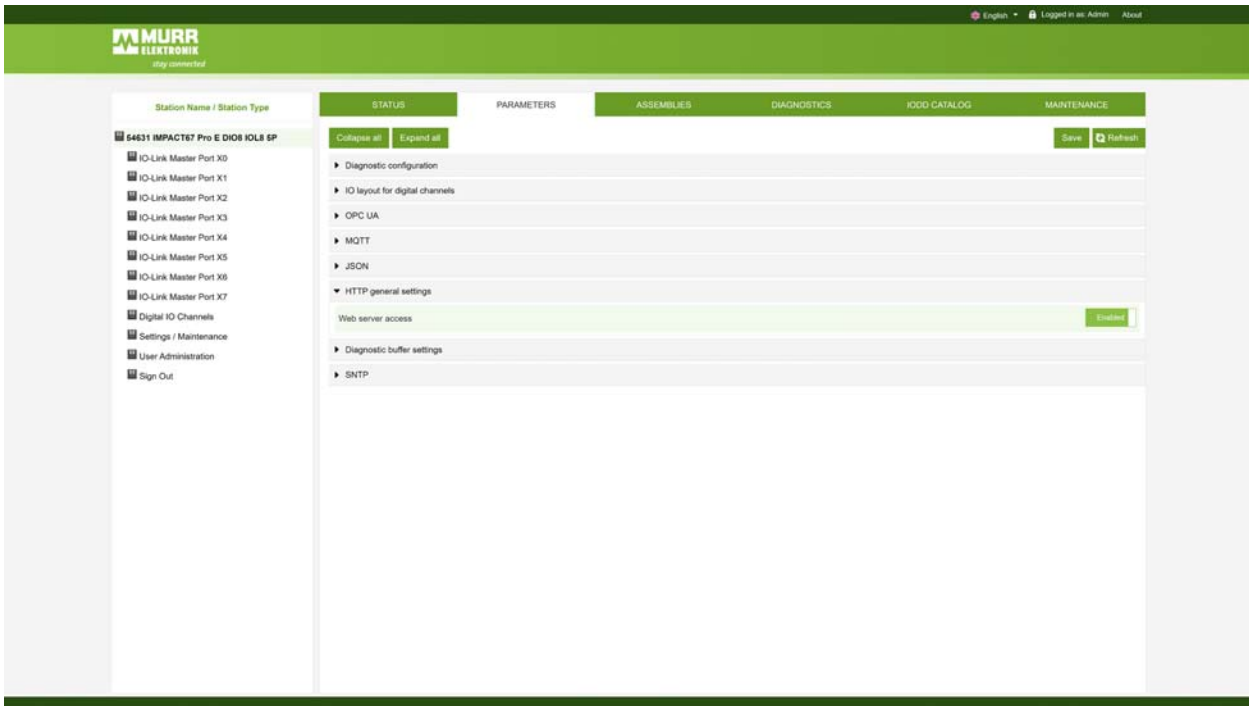


Fig. 10-17: HTTP

Activating the web server via:Aktivieren des Webservers über:

- ➔ Rotary switch position 914.
- ➔ Rotary switch position 979 (Factory Reset)
- ➔ EDS configuration

Diagnostic buffer Parameterizes the behavior of the displayed diagnoses.
Confirm activated diagnoses before deleting them from the diagnosis buffer.

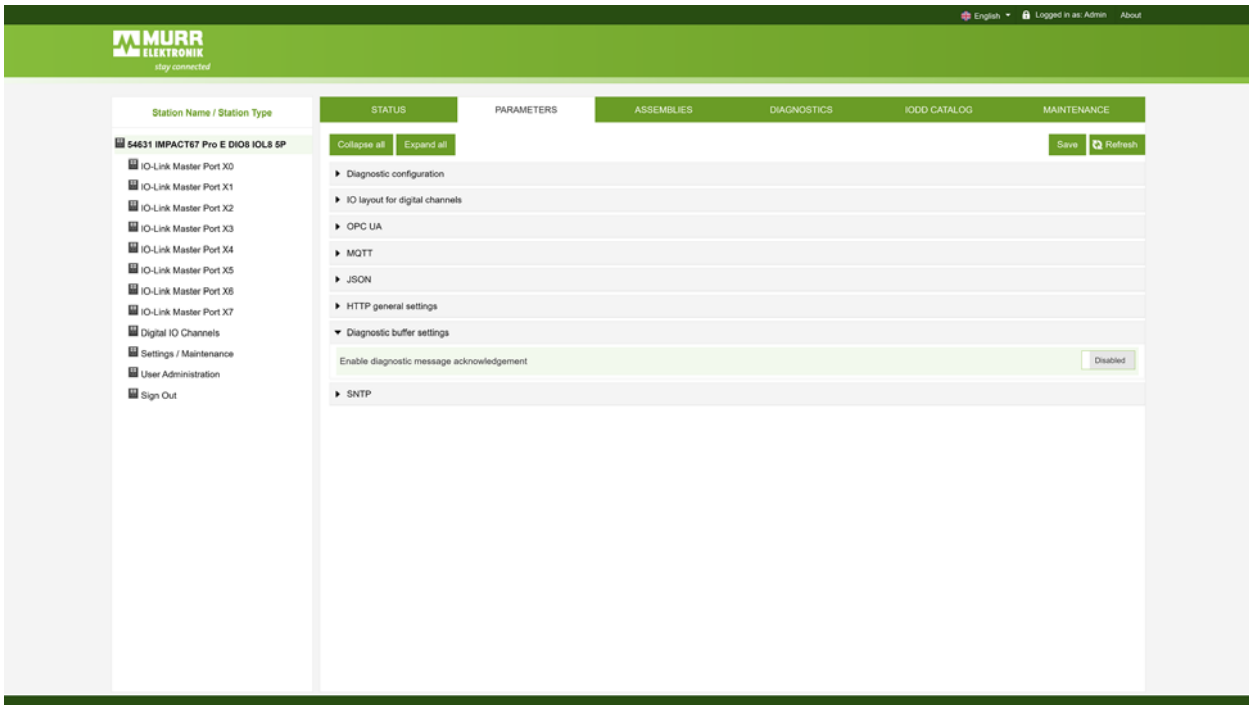


Fig. 10-18: Diagnostic buffer

SNTP

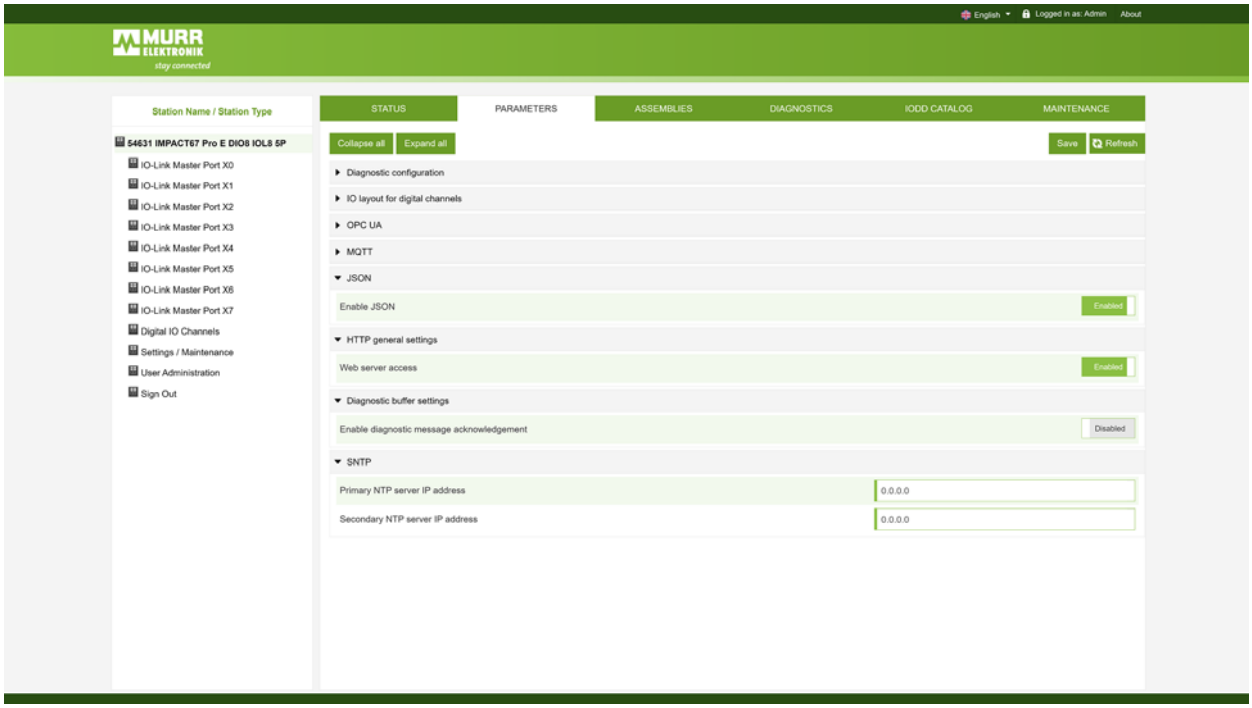


Fig. 10-19: SNTP

IP address of primary NTP server	0.0.0.0 (Default)	Enter the IP address (IPv4) for the primary NTP server in decimal format, e.g., 134.130.4.17
IP address of secondary NTP server	0.0.0.0 (Default)	Enter the IP address (IPv4) for the primary NTP server in decimal format

NOTE

➔ The device does not automatically switch between summer and winter time.

10.4.3 Menü ASSEMBLIES

The Assemblies menu displays the assemblies of the module connections.

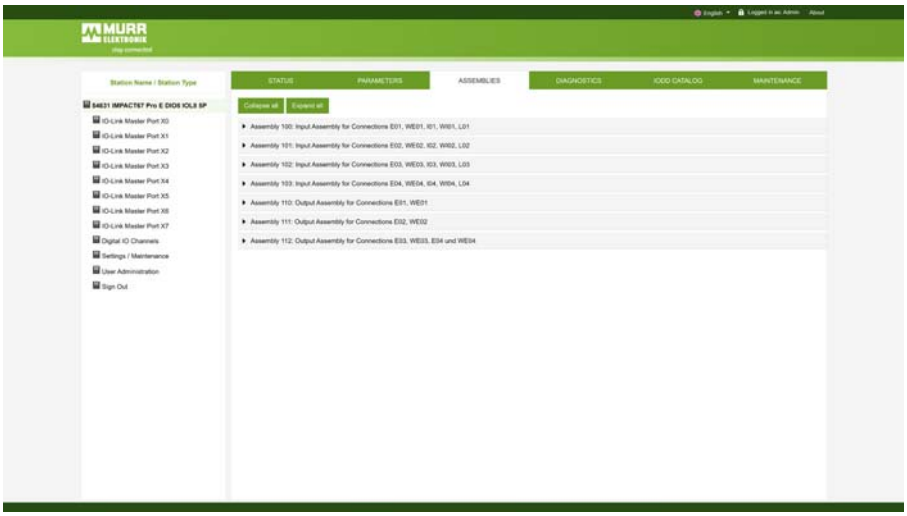


Fig. 10-20: Menu Assemblies

When the IO-Link data lengths are changed, new data lengths are calculated and displayed for assemblies 102, 103 and 112.

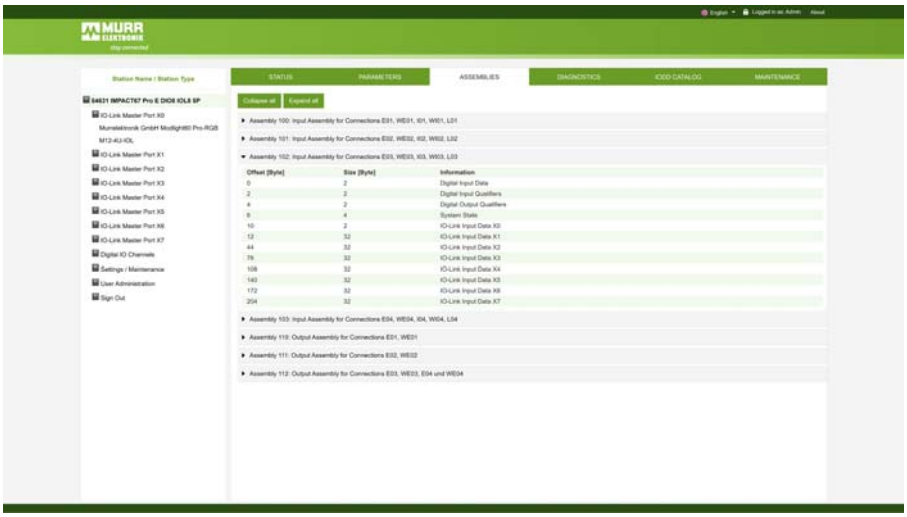


Fig. 10-21: Menu Assemblies 102

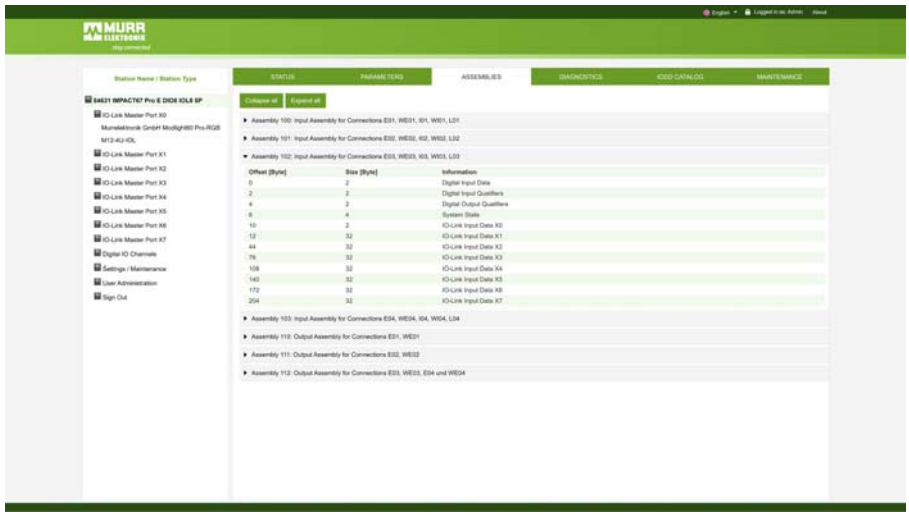


Fig. 10-22: Menu Assemblies 112

Display of 8 bytes of input data X0 instead of 32.

For configuration, see EDS parameters or Pin4 configuration in the web server.

10.4.4 DIAGNOSTICS menu

The Diagnostics menu displays all incoming and outgoing diagnostics of the master and the connected devices.

The dropdown menu allows you to switch between active and historical entries.

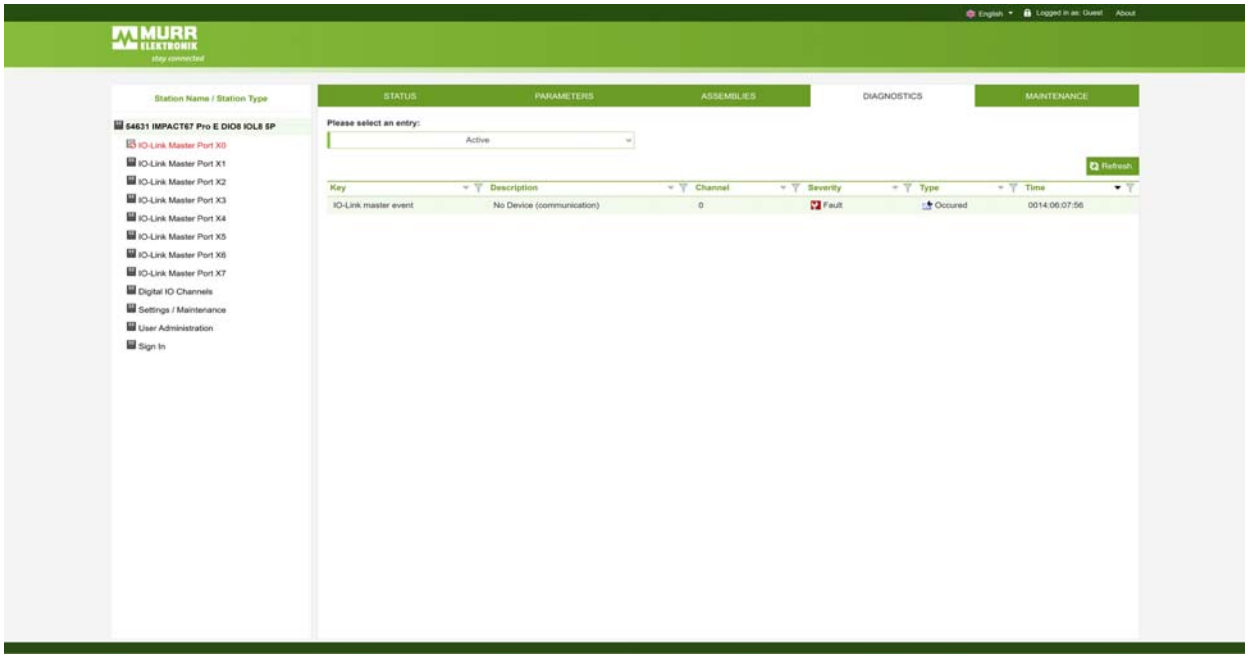


Fig. 10-23: Active Diagnostics Menu

- Active

✓ All diagnoses pending at the time the "Diagnosis" menu item is accessed.

✓ The display can be updated via Refresh / Update.

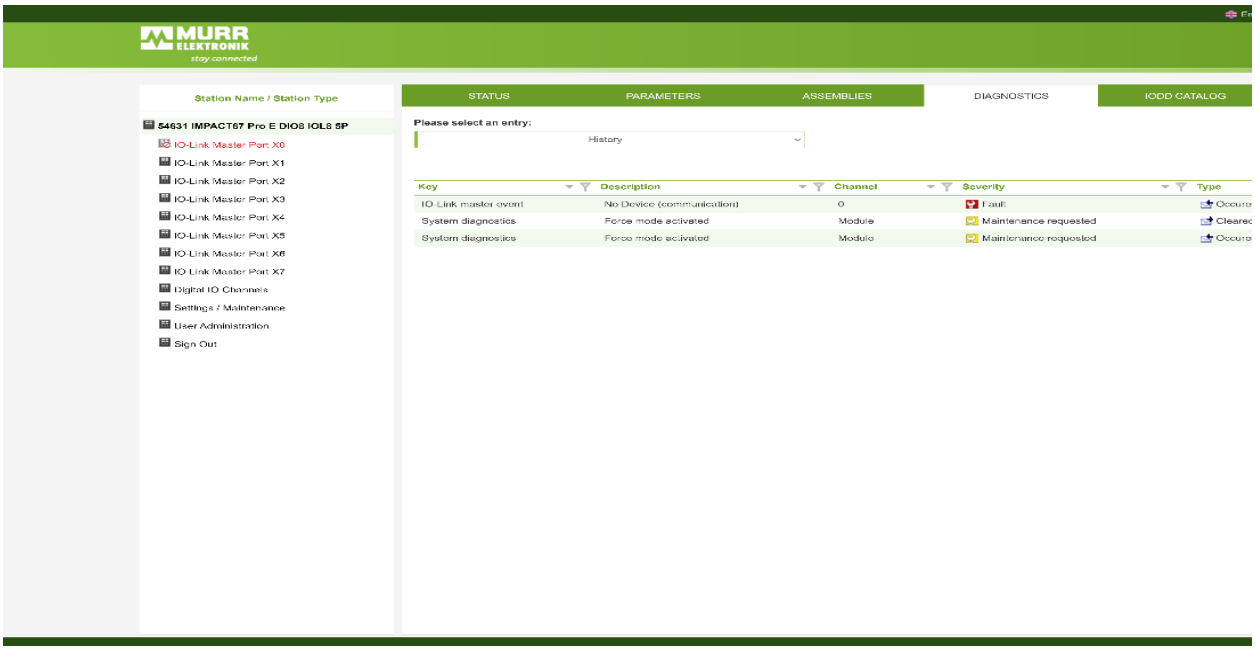


Fig. 10-24: Menü Diagnosen in der History

- History

✓ All diagnoses that are no longer present in the persistent diagnostic memory are displayed.

✓ More than 40 diagnoses are stored. The newest diagnosis overwrites the oldest one.

10.4.5 IODD CATALOG menu

Under the menu item “IODD CATALOG”, users can manage the IODD files on the device.

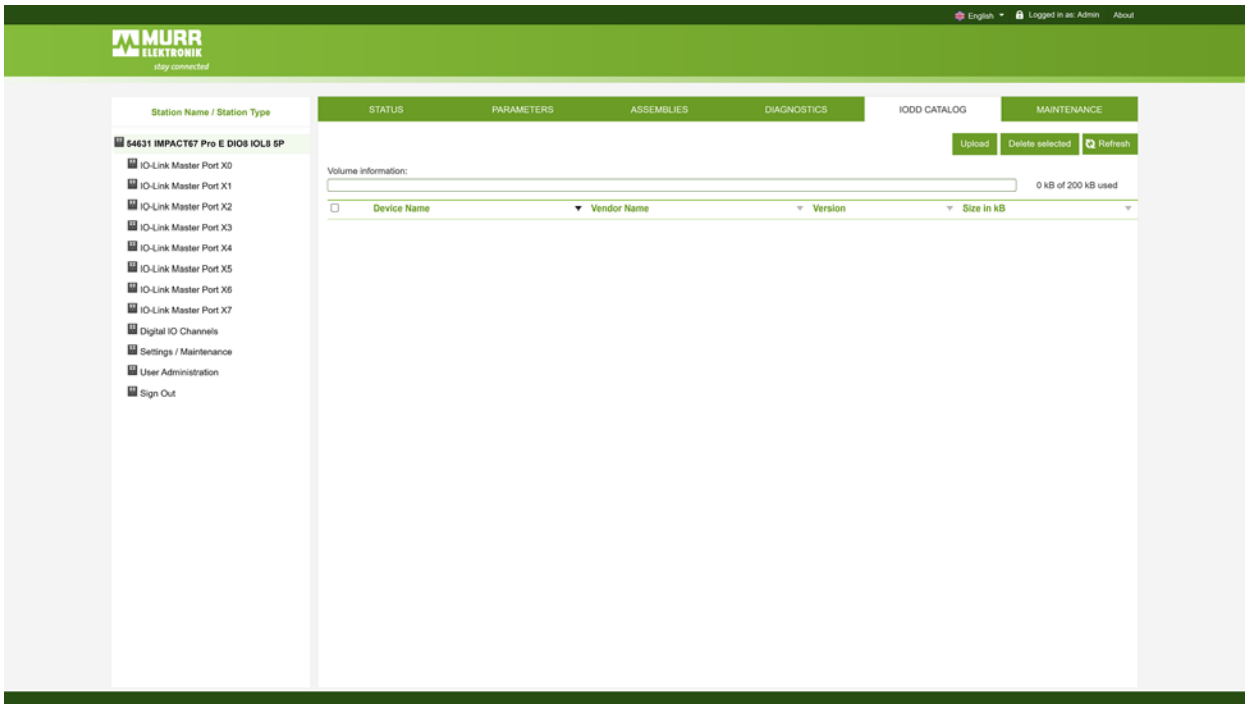


Fig. 10-25: Menu IODD CATALOG

The Upload button allows you to upload IODD files (*.zip).

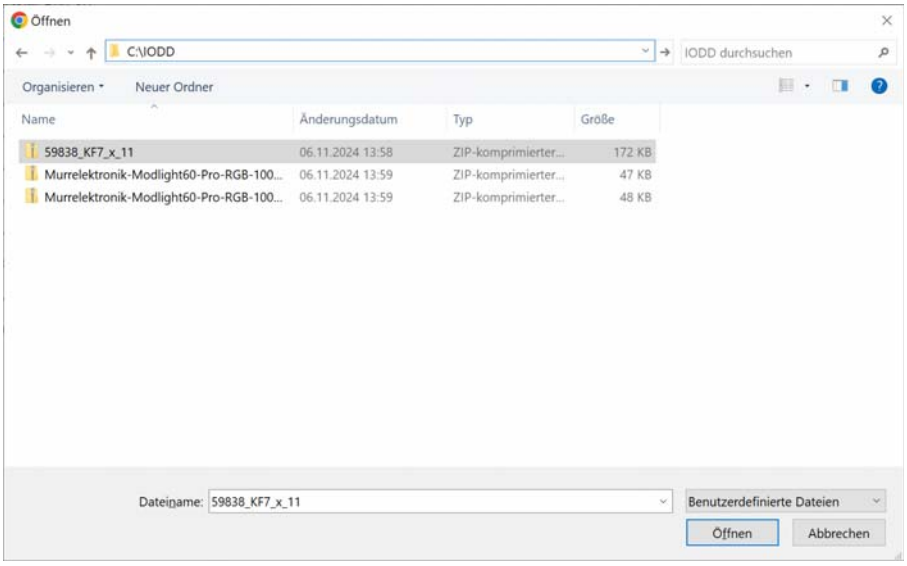


Fig. 10-26: Select IODD

After clicking the "Upload" button, you can select a file. Once selected, the IODD file is extracted from the archive and compressed for upload to the device.

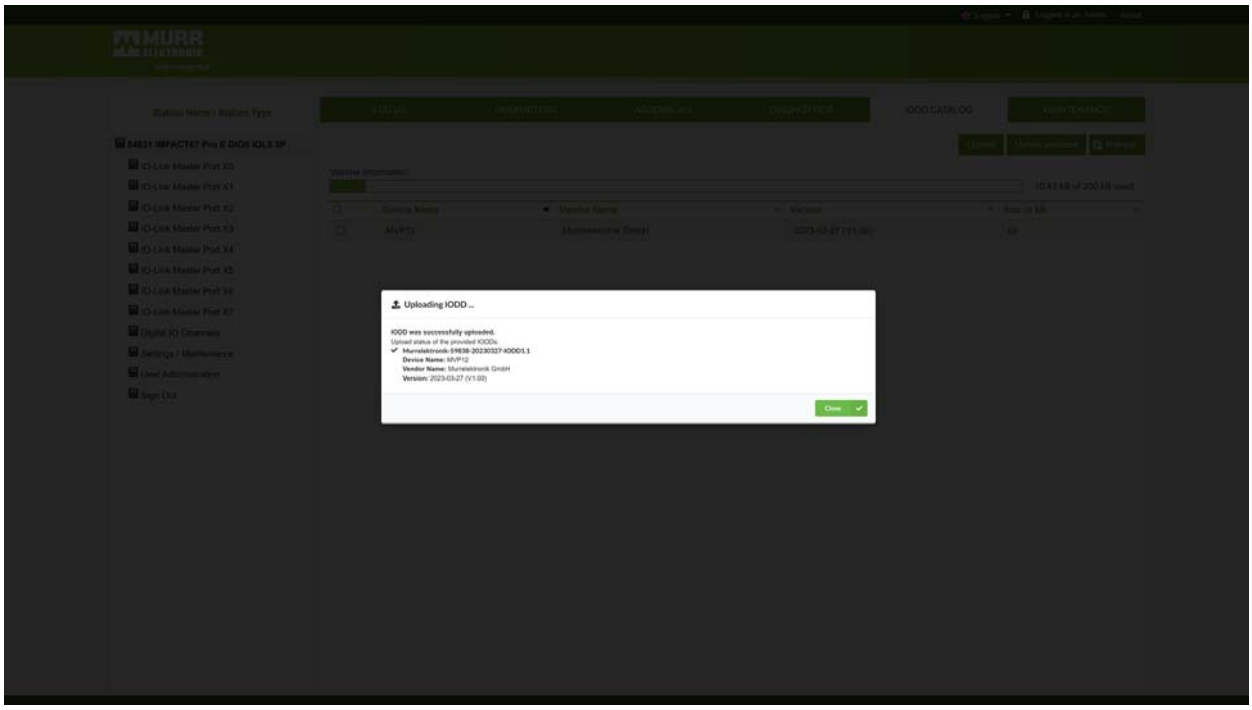


Fig. 10-27: Successful IODD file upload

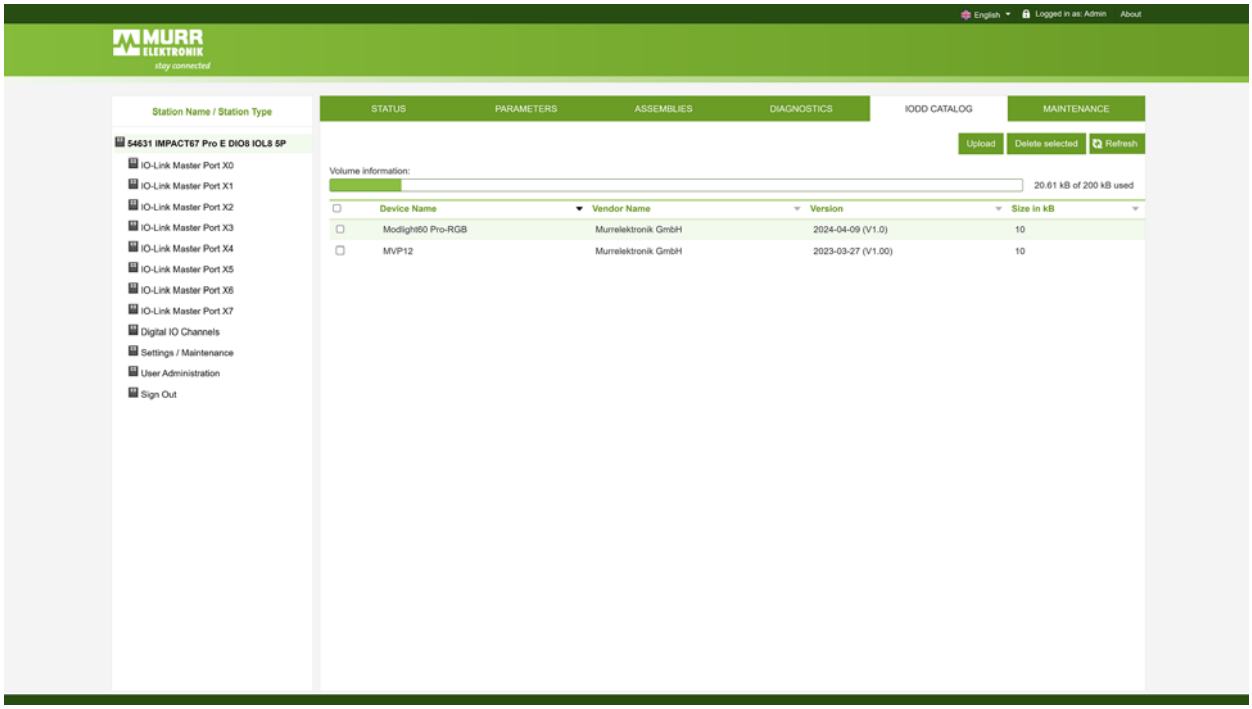


Fig. 10-28: IODD catalog

Several files are located in the IODD catalog.

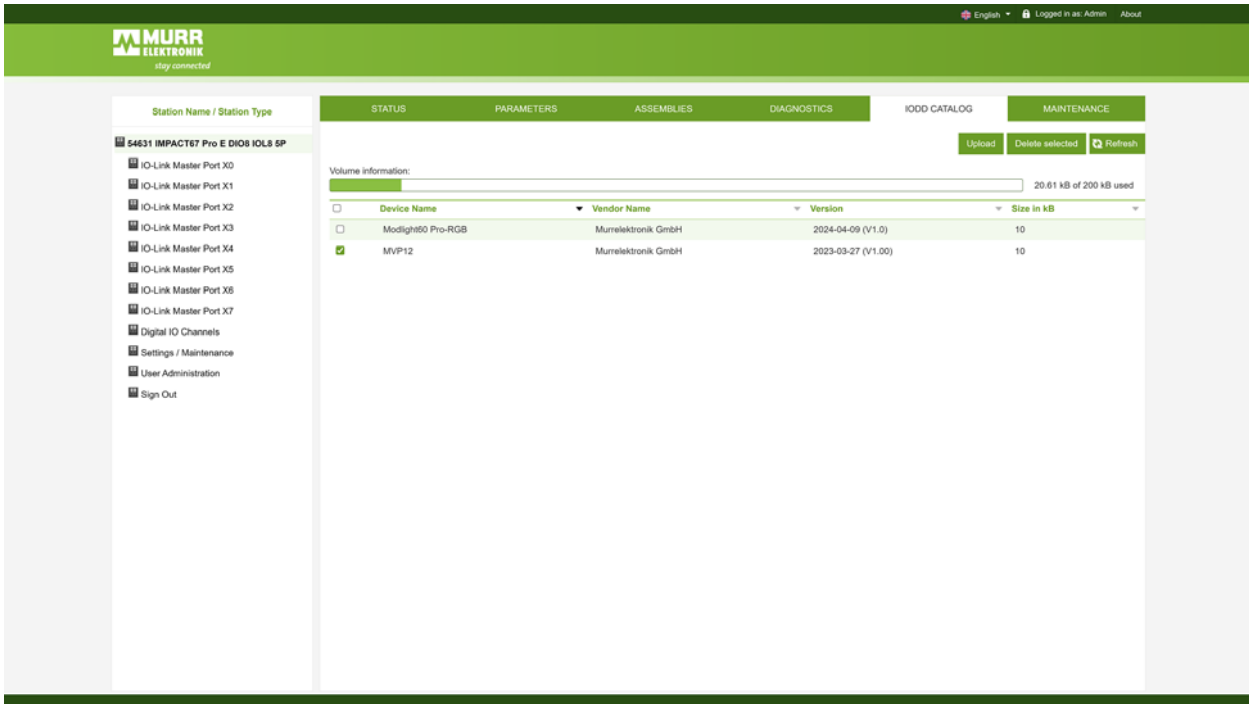


Fig. 10-29: Remove IODD

To delete the IODD file from the device, the file can be selected by checking the box and deleted with "delete selected".

10.4.6 MAINTENANCE menu

In the "Maintenance" menu, users with admin and operator rights can delete the diagnostic memory.

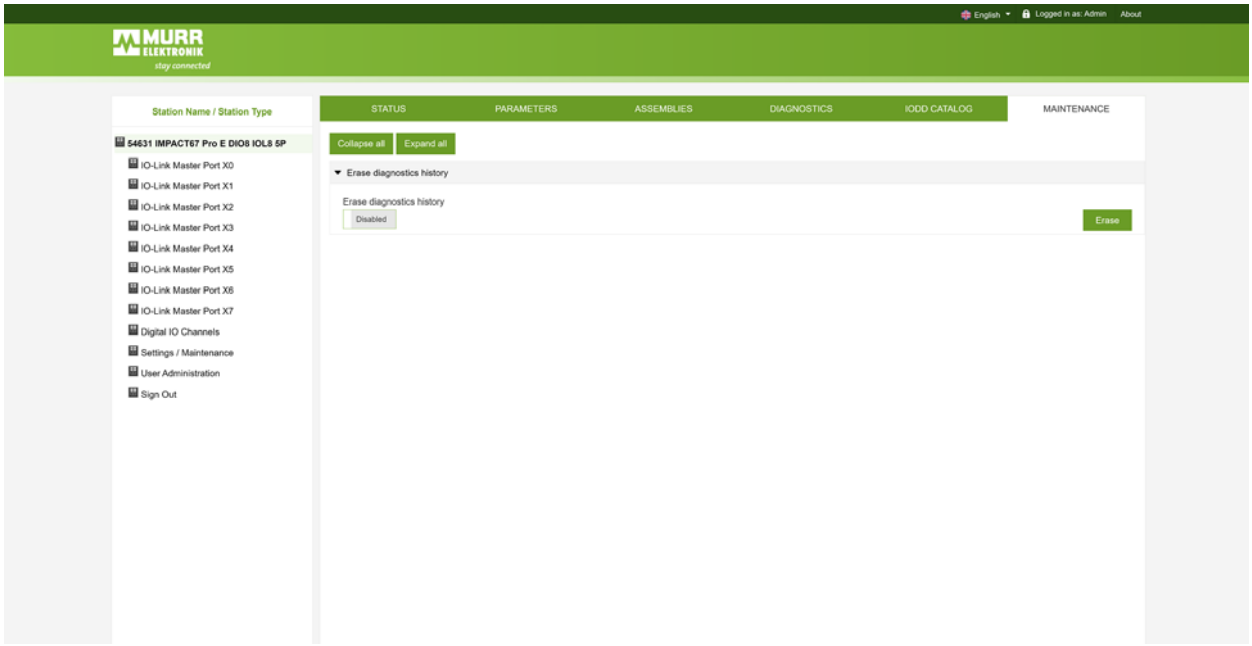


Fig. 10-30: Menu MAINTENANCE Clear diagnostic memory

10.5 IO-Link master port

The system tree displays eight IO-Link master ports (X0 ... X7), each of which can be selected individually. Depending on the user role, information can be read or functions configured here. When IO-Link communication is active, the IO-Link device name automatically appears below the corresponding port.

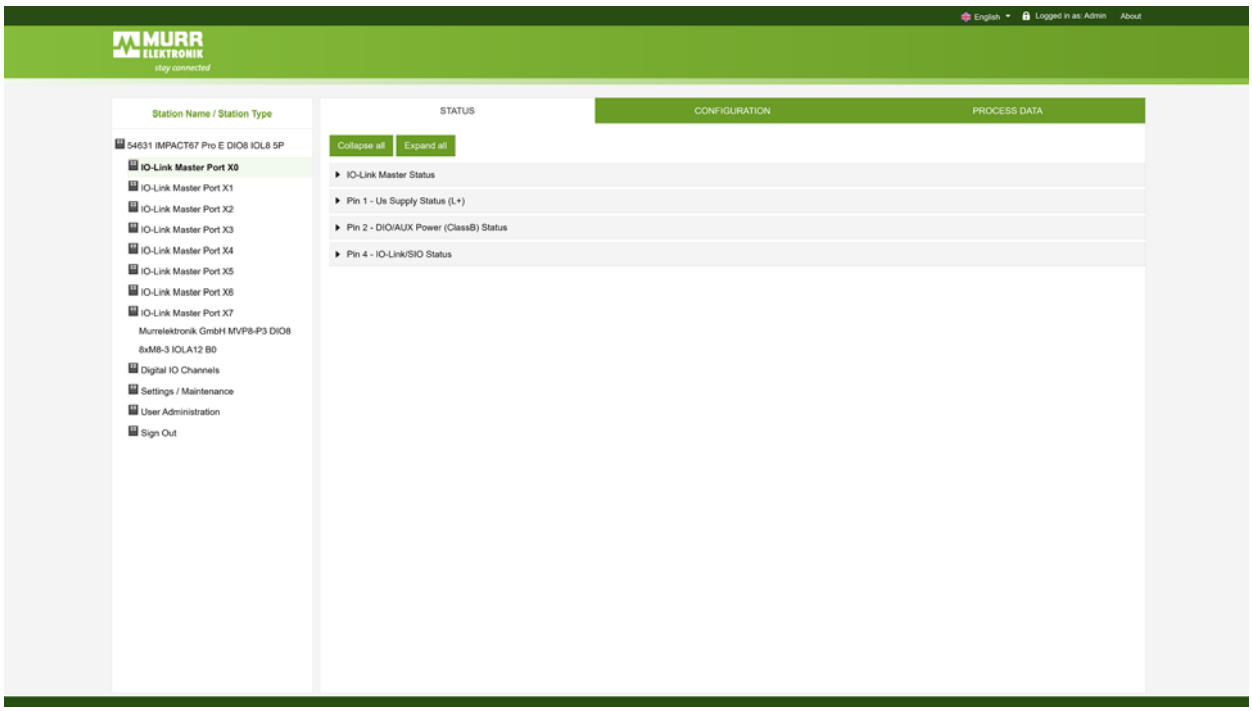


Fig. 10-31: System tree

The menu bar of the IO-Link Master Port includes the following menu items:

- STATUS
- INFORMATION (only when an IO-Link device is connected)
- CONFIGURATION
- IO-LINK PARAMETERS (only when an IO-Link device is connected)
- PROCESS DATA

10.5.1 STATUS menu

Status IO-Link master X0 to X7

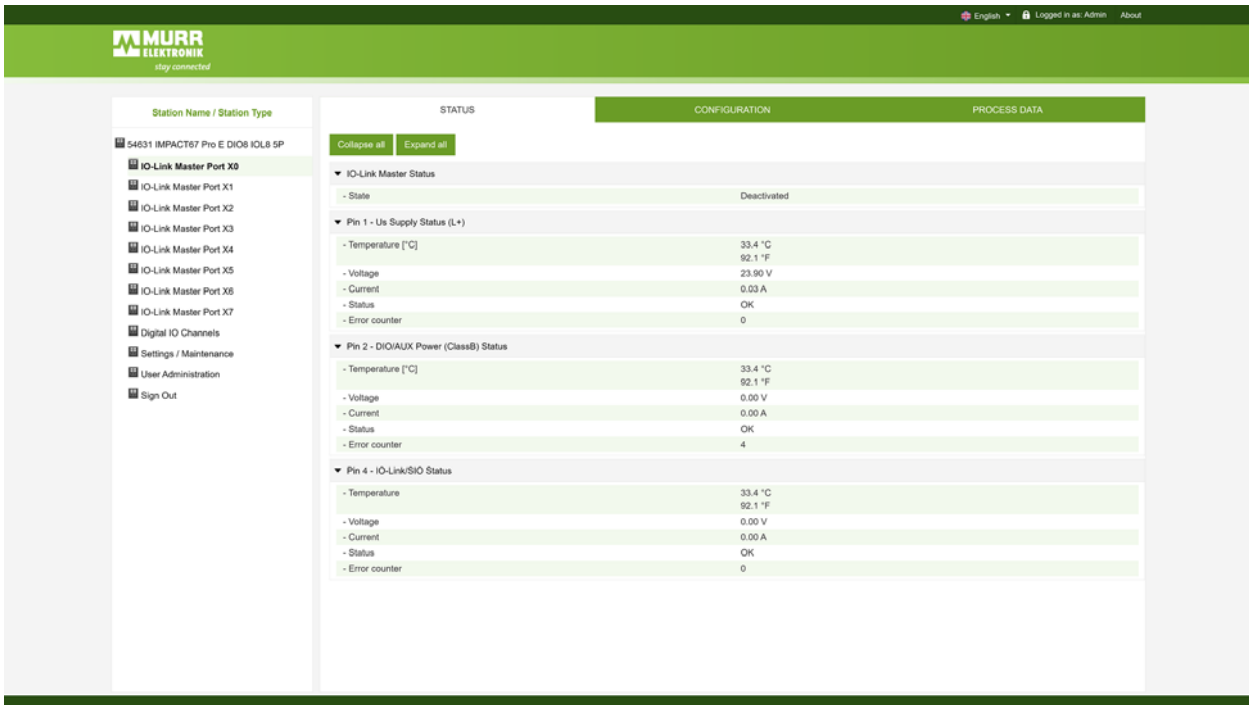


Fig. 10-32: IO-Link Master status

The current IO-Link master status is located in the Status menu.

Possible displays include:

- Disabled
- Digital input
- Digital output
- IO-Link (no device)
- IO-Link operating mode including further information about the connected device

Furthermore, the following general information is displayed for each pin.

- Temperature in °C and °F
- Voltage in V
- Current in A
- Pin status
- Error counter

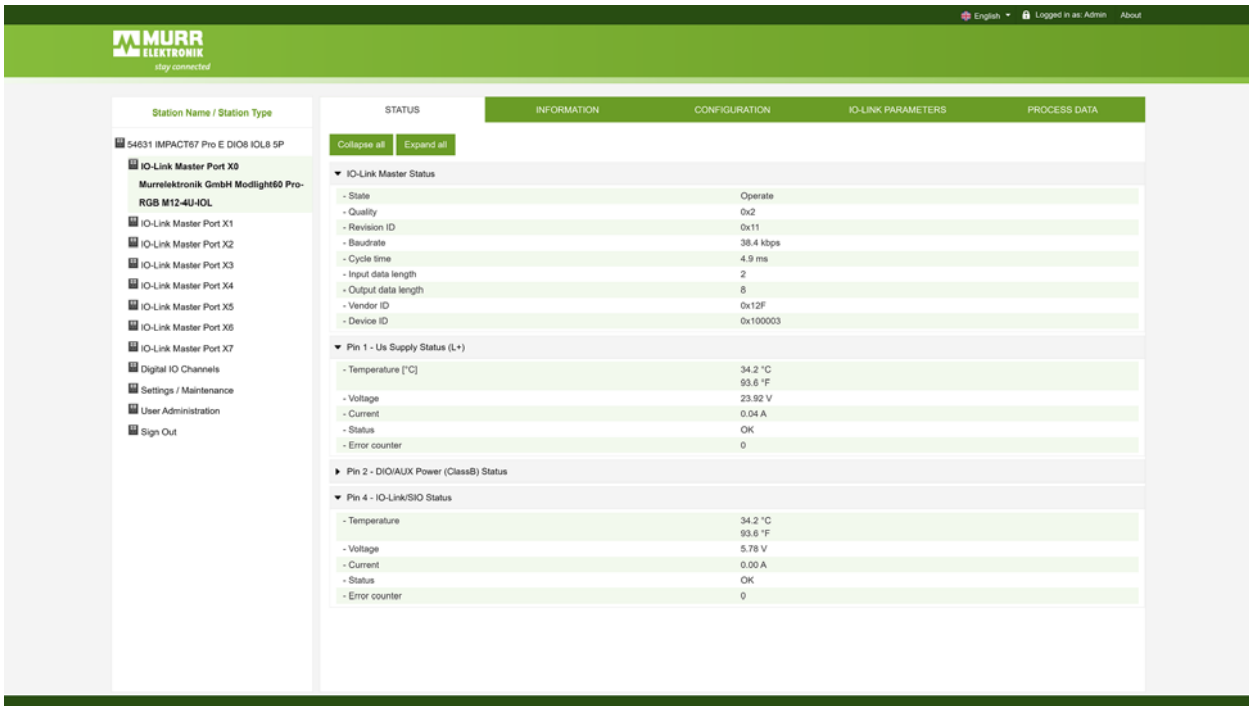


Fig. 10-33: IO-Link master with connected device

In IO-Link mode and with a connected device, all communication-relevant IO-Link data, including the device's I/O bytes, are displayed.

10.5.2 INFORMATION menu

INFORMATION IO-Link Device

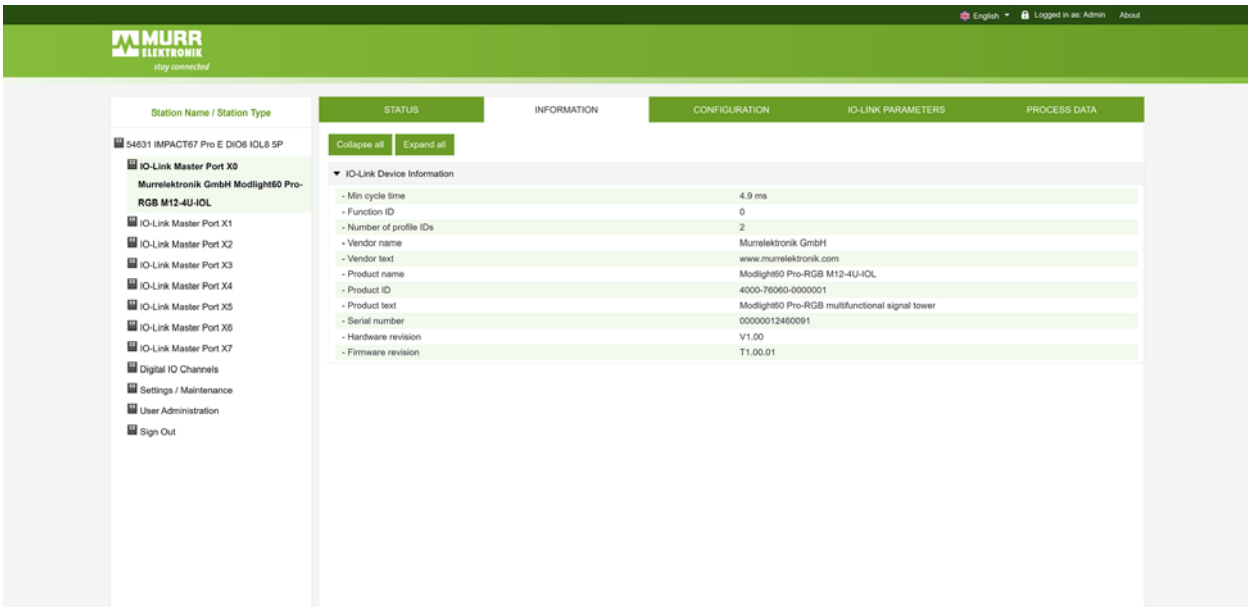


Fig. 10-34: IO-Link Device Information

Here, the technical data and manufacturer information of a connected and active IO-Link device are displayed on the corresponding master port.

Parameter	Meaning
Minimum cycle time	minimum process cycle time of the IO-Link device
Function ID	Function ID of the IO-Link device
Number of profile IDs	Number of profiles supported by the IO-Link device
Manufacturer name	Manufacturer name of the IO-Link device
Manufacturer's text	Manufacturer's text for the IO-Link device
Product name	Product name of the IO-Link device
Product ID	IO-Link device part number
Product text	Additional description of the IO-Link device
Serial number	Serial number
Hardware version	Hardware version
Firmware version	Firmware version

10.5.3 CONFIGURATION menu

Here, the technical data and manufacturer information of a connected and active IO-Link device are displayed on the corresponding master port.

CONFIGURATION

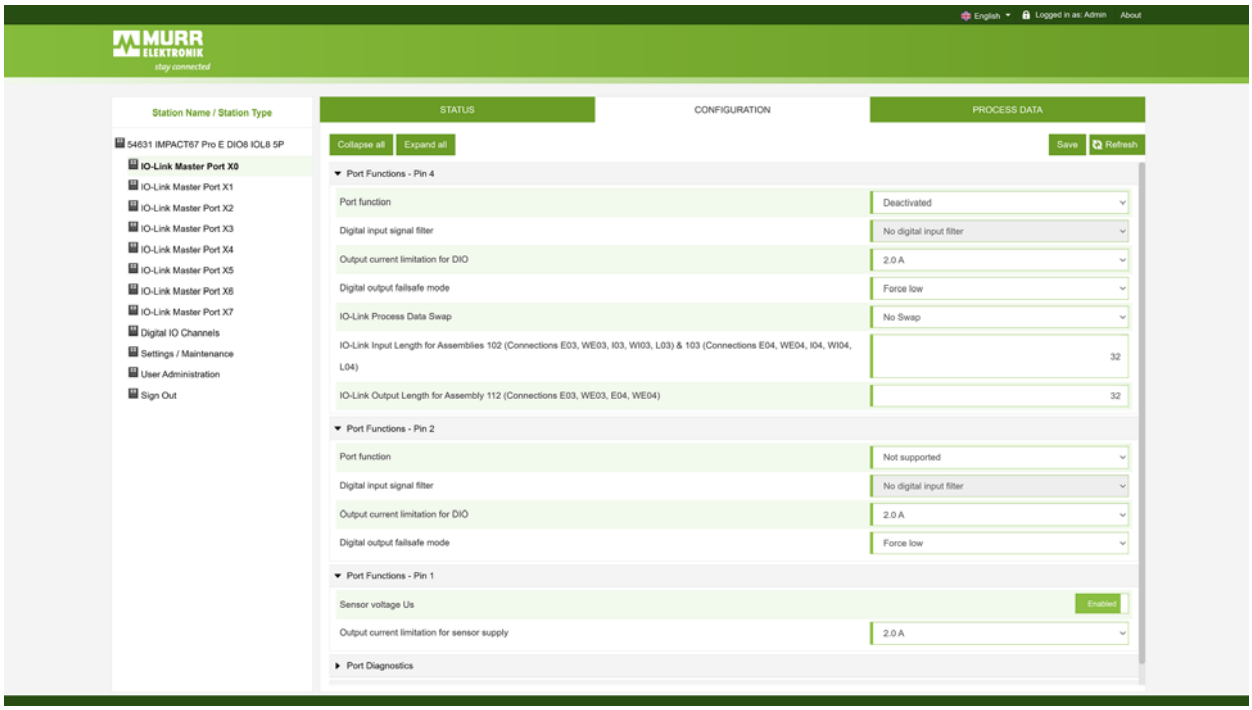


Fig. 10-35: IO-Link configuration

The configuration menu contains all parameters for the individual pins and ports. These values can be modified and saved in the web server. Values that cannot be changed are grayed out.

The values remain unchanged for connections WExx, Ixx, and Lxx. For connection Exx, the values are taken from the configuration assembly.

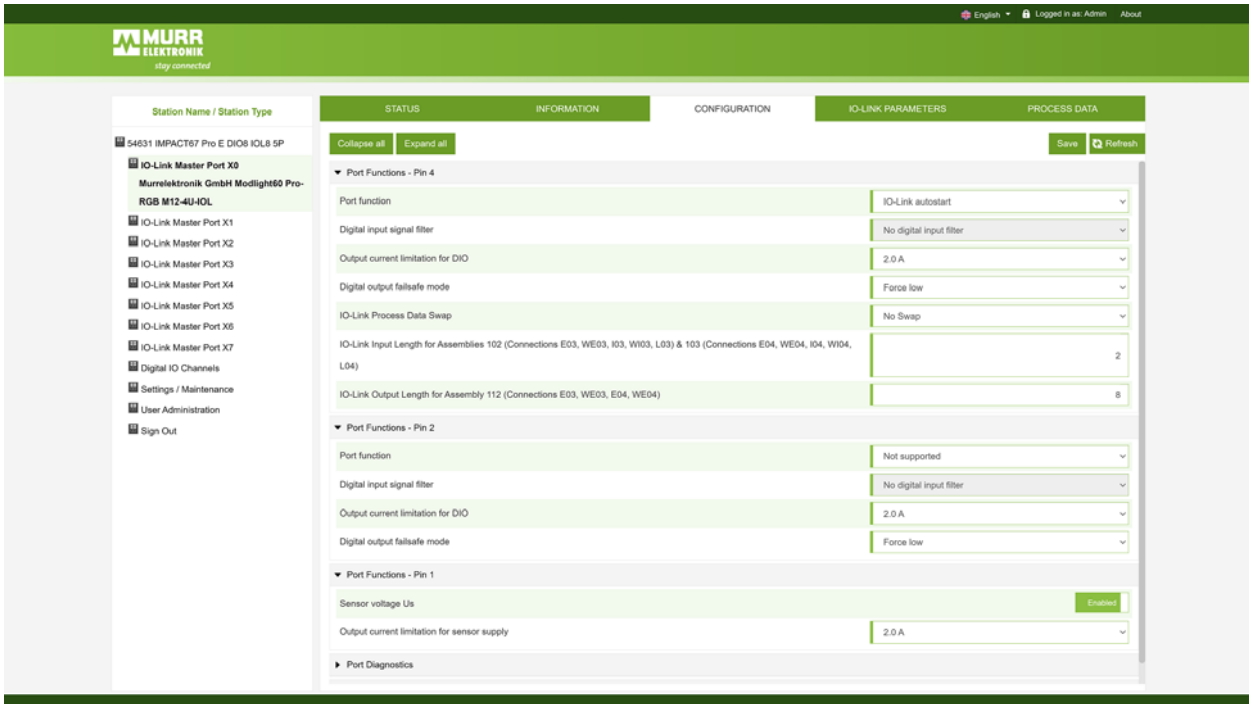


Fig. 10-36: Master Port Configuration

Masterport switched to IO-Link Start.

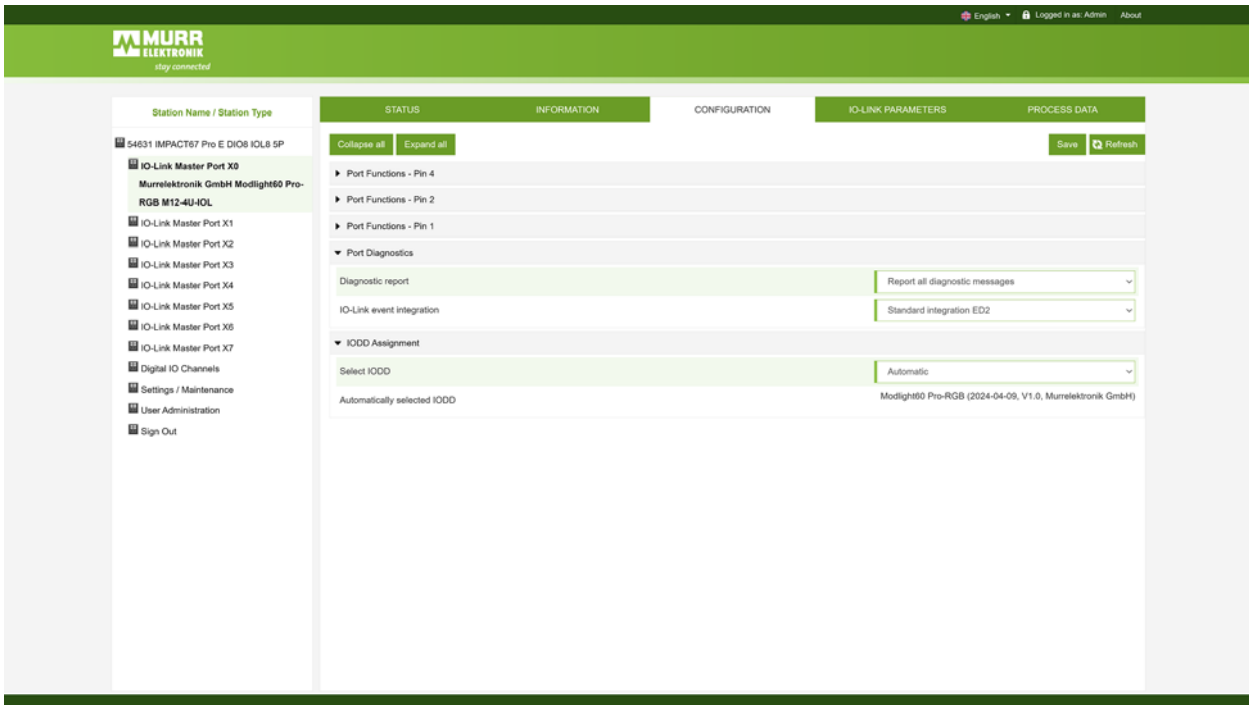


Fig. 10-37: Port diagnostics and IODD assignment

If an IODD is installed, set the selection to Automatic. The device will then select the appropriate IODD.

Visible here. After selecting the IODD, these are visible under IO-Link Parameters and Process Data.

10.5.4 IO-LINK PARAMETER menu

The menu is only visible if an IO-Link device is available.

NOTE
Refer to the information in the IO-Link device manufacturer's manual.

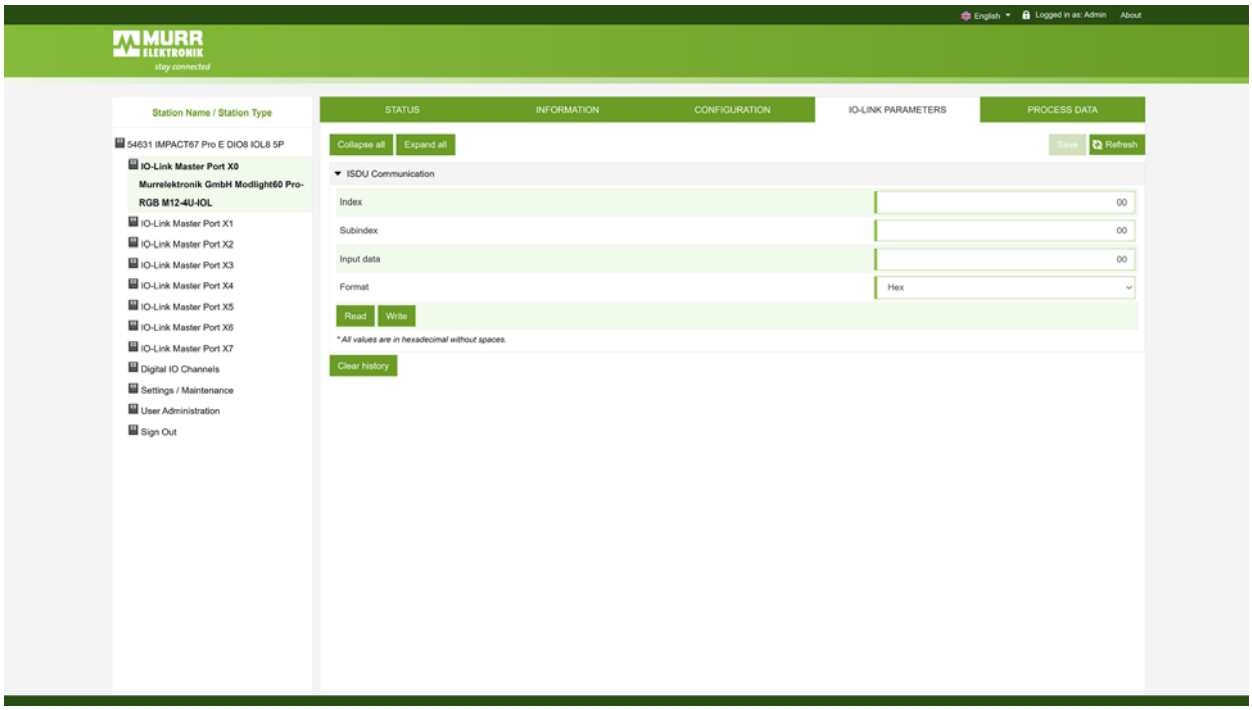


Fig. 10-38: IO-Link parameters ISDU communication

This menu item allows you to read and write the ISDU (IndexService Data Unit) of the device during IO-Link operation. This primarily allows you to evaluate or parameterize an IO-Link device without a controller.

Without IODD, input can be in both hexadecimal and ASCII formats. Refer to the IO-Link device manufacturer's manual for instructions.

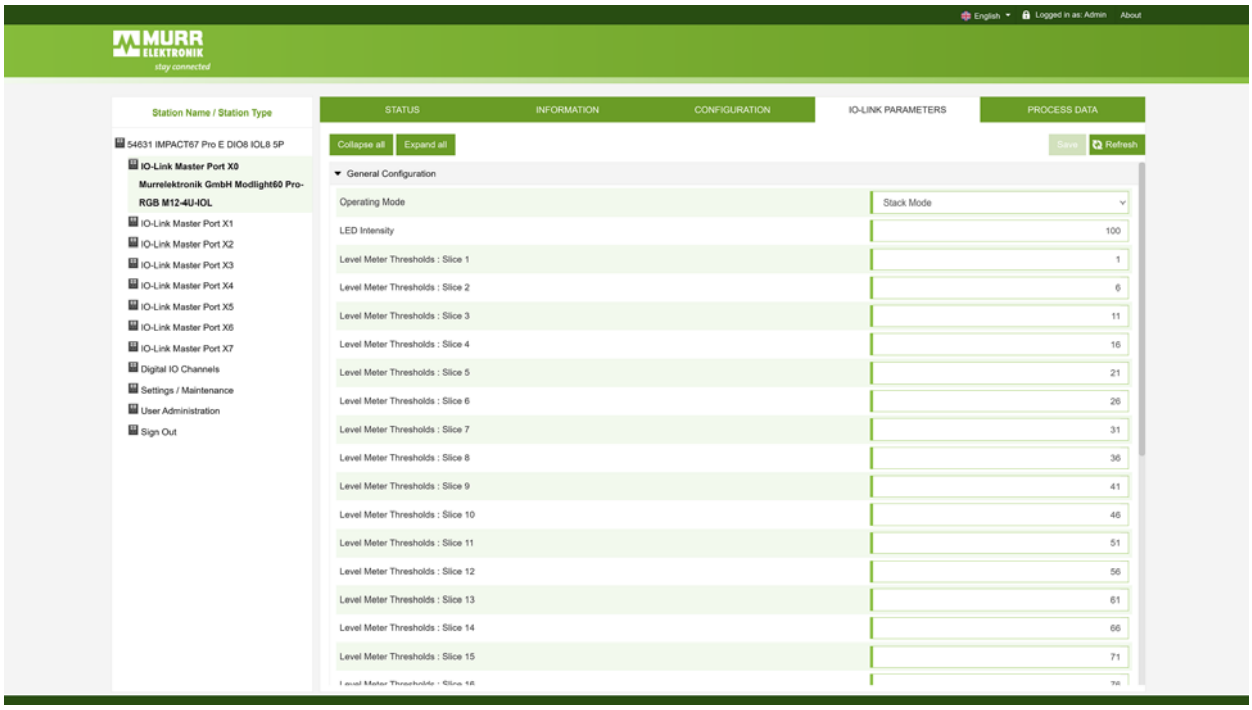


Fig. 10-39: IO-Link parameters ISDU communication

With IODD, input can be done according to the IODD design.

10.5.5 PROCESS DATA menu

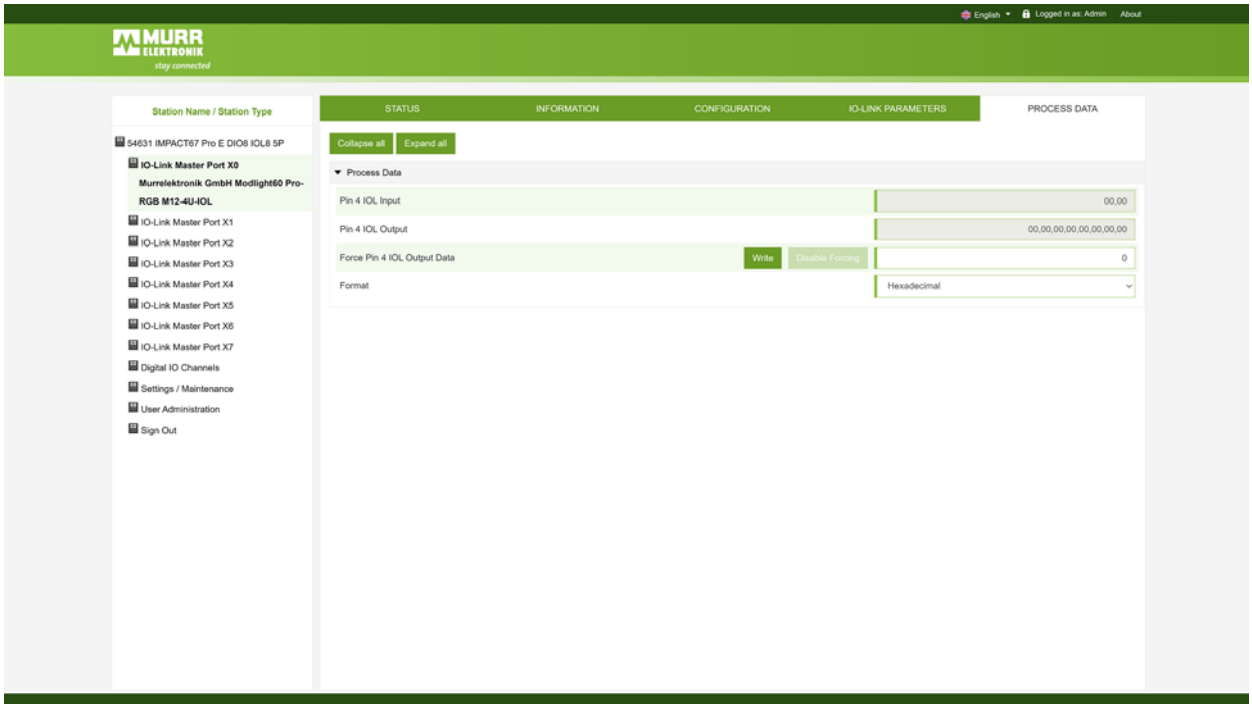


Fig. 10-40: PROCESS DATA menu in raw format

The current process data of the connected IO-Link device is continuously displayed in the "Process data" menu item if pin 4 of the corresponding port has been configured as an IOL port.

During IO-Link operation, the device's process data can be read and written. This primarily allows process data from the IO-Link device to be read or written without a controller.

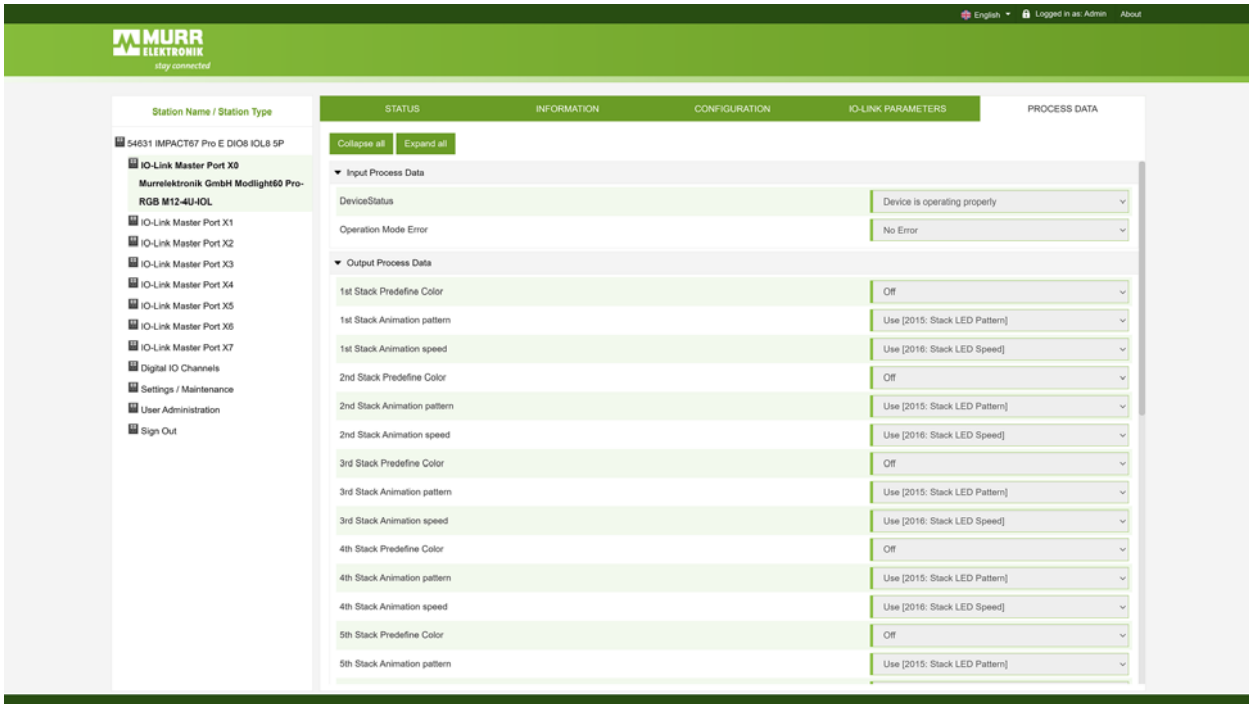


Fig. 10-41: Menu PROCESS DATA in IODD format

With IODD, the view can be customized according to the IODD design.

10.6 Digital IO Channels / IO Overview

The CONFIGURATION menu of the selected IO-Link port displays the settings for pins 2 and 4 on the selected port. Outputs can be set under certain conditions.

10.6.1 Input data

Each user can observe the digital states of the inputs configured on the device.

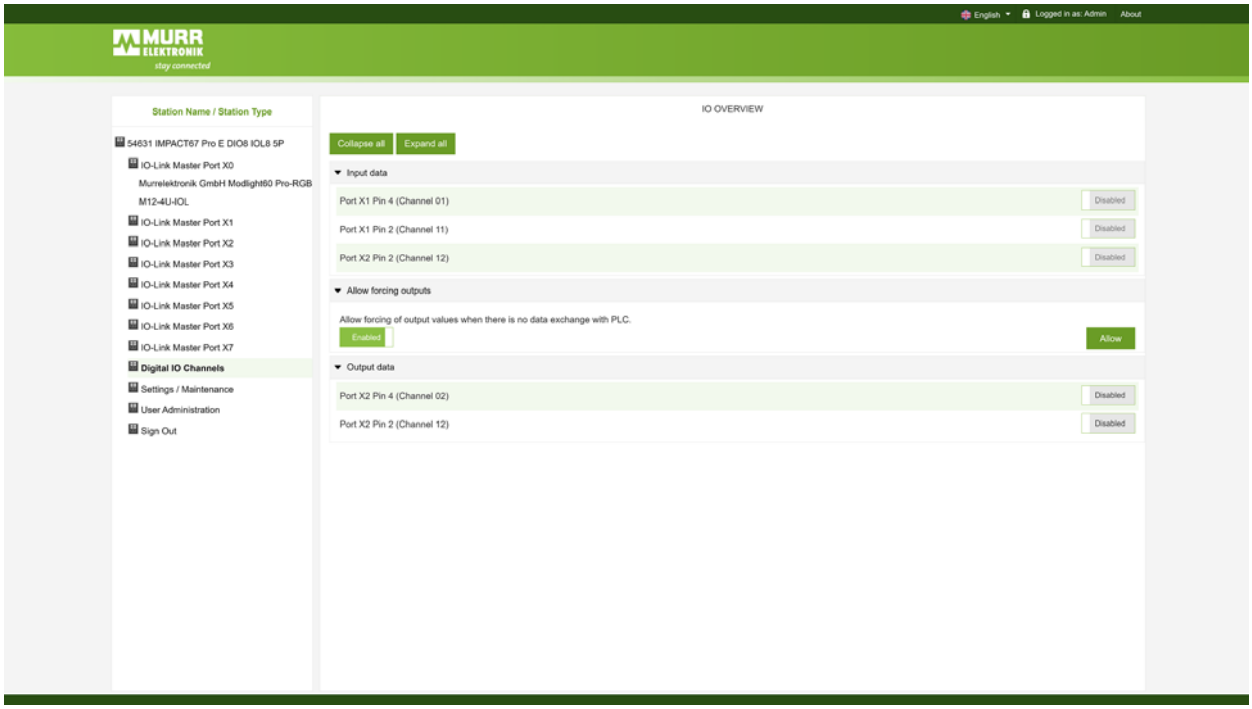


Fig. 10-42: Overview of input data

10.6.2 Output data

Setting outputs allows

Users with admin, operator, and maintenance rights can allow the setting of outputs in this menu.

This right is only granted if the device is not in an active fieldbus connection with the controller. The controller takes precedence.

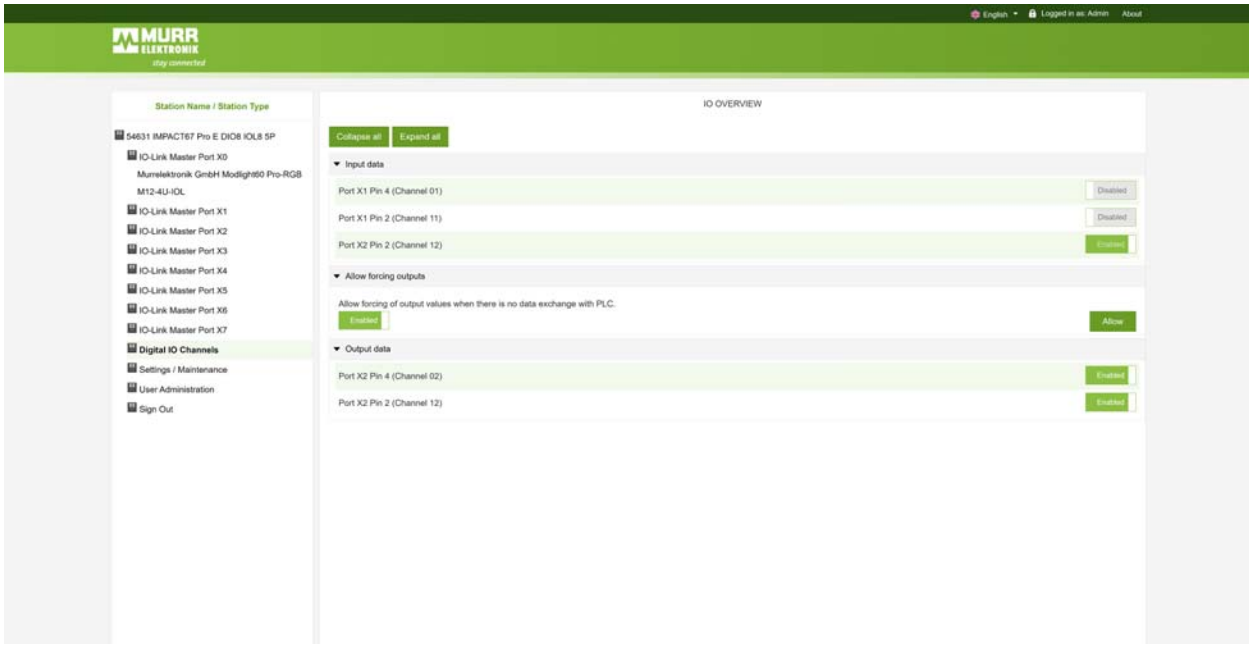


Fig. 10-43: Setting outputs allows

Set output data

Guest users are not allowed to set the outputs.

All other users (admin, operator, maintenance) are allowed to set the outputs.

As soon as the user (admin, operator, maintenance) logs out, the outputs go to "0".

As soon as a fieldbus actively works with the device, the outputs go to "0" and then take over the status they receive from the controller.

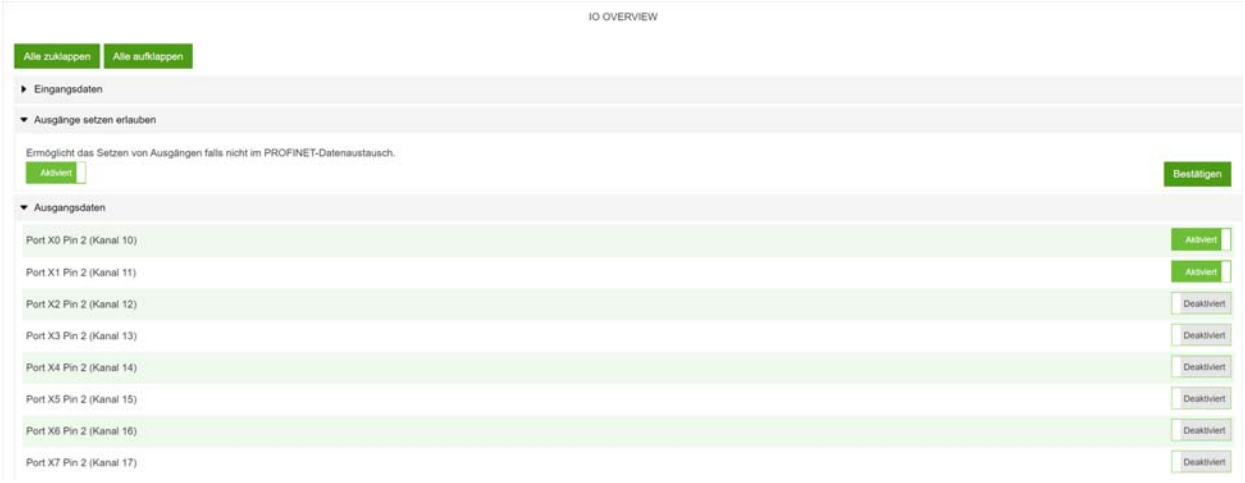


Fig. 10-44: Set output data

10.7 Settings / Maintenance

10.7.1 DEVICE CONFIGURATION menu

Logged-in users can change the IP settings of this device via the web server if no DHCP server is available.

The device's IP address is set to DHCP by default.

In the menu “Settings / Maintenance” - “Device configuration”, the IP address with subnet mask and gateway can be statically entered.

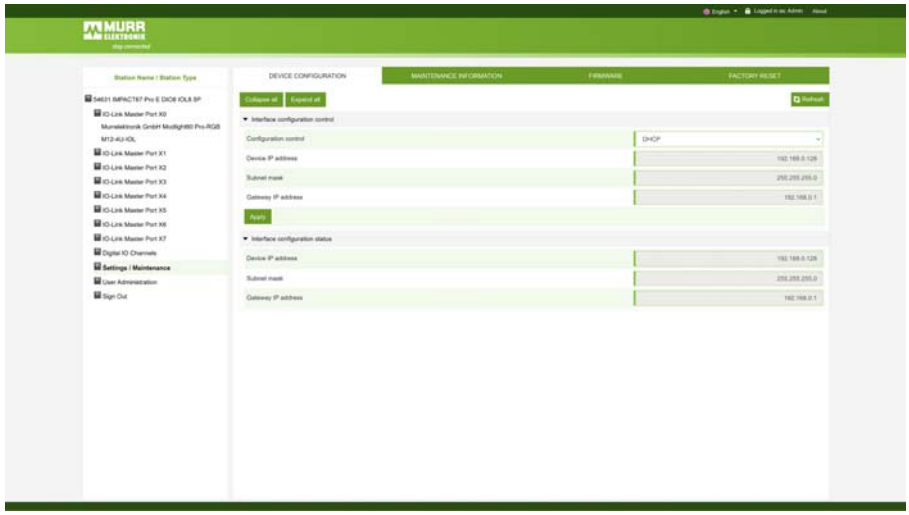


Fig. 10-45: Settings IP address EtherNet/IP

After confirming the application, which will become active after the next reboot, the rotary switches must be set to "000" and the device switched off and on again. Afterward, the device will permanently have the assigned IP address.

If the device has a fixed address, the IP configuration from STATIC can be reset to BOOTP or DHCP in this menu.

10.7.2 MAINTENANCE INFORMATION menu

The device's maintenance information appears in:

- STATUS menu and Maintenance Information submenu.

Fig. 10-46: Maintenance information

Users with admin, operating and maintenance rights can enter device information here.

Fig. 10-47: Maintenance Information Settings

10.7.3 FIRMWARE menu

This menu displays the data for the firmware currently running on the device.Users with administrator, operator, and maintenance rights can install new firmware, provided in ZIP folders, onto the device here. After successful installation, the device checks the firmware container and automatically restarts with the new firmware version.

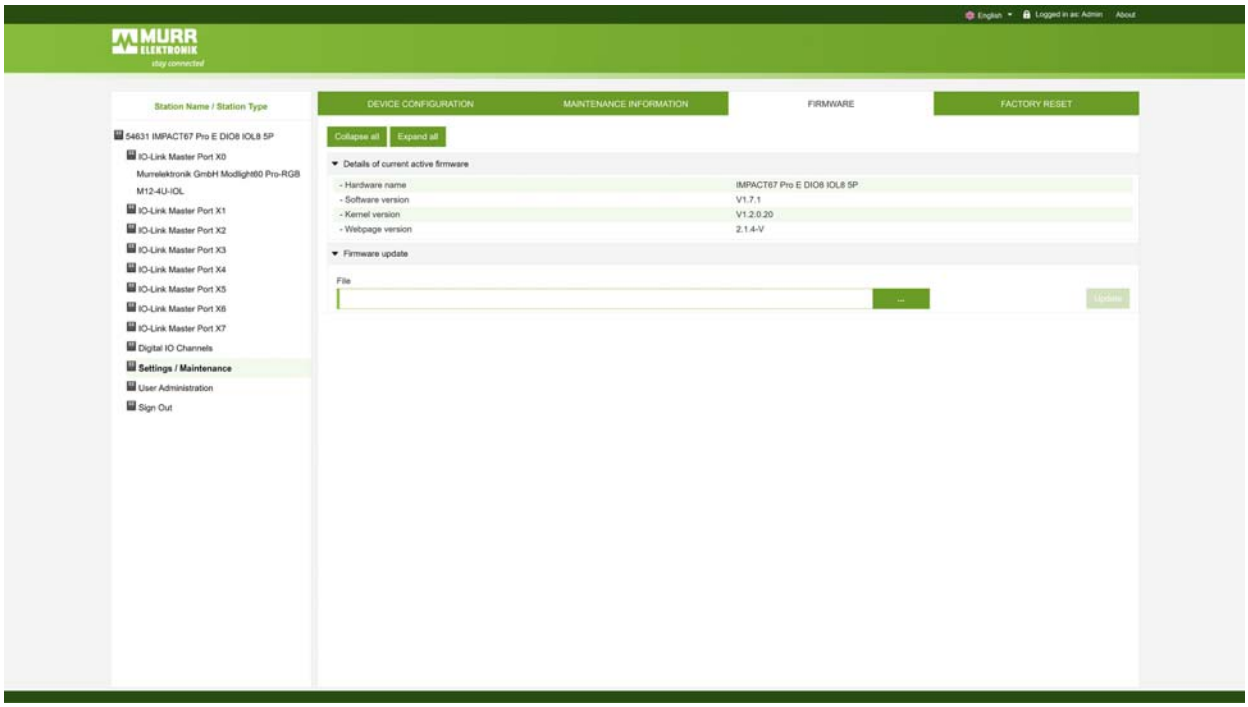


Fig. 10-48: Firmware

Selection of the *.M3Z (from V1.06) and Firmwareupdate.zip (up to V1.06) is possible via the … symbol.

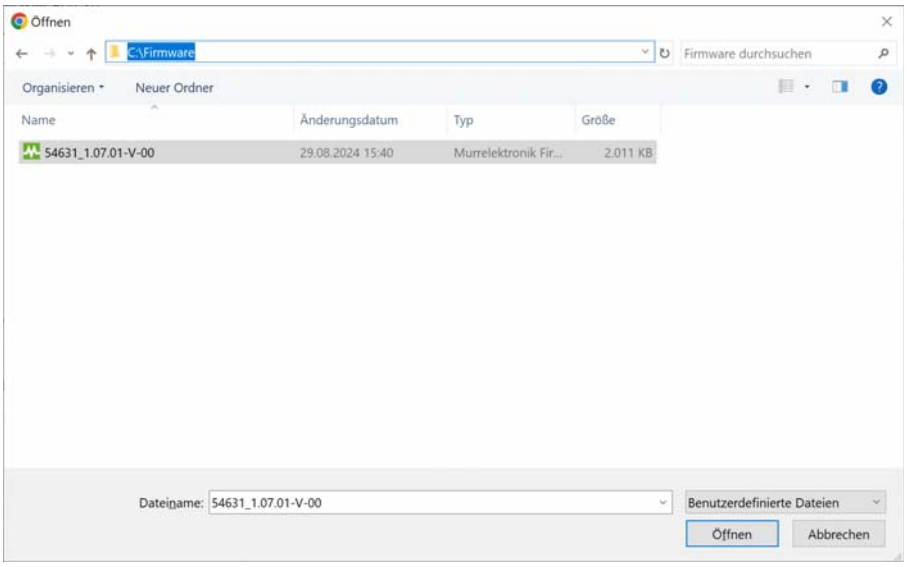


Fig. 10-49: Select the file

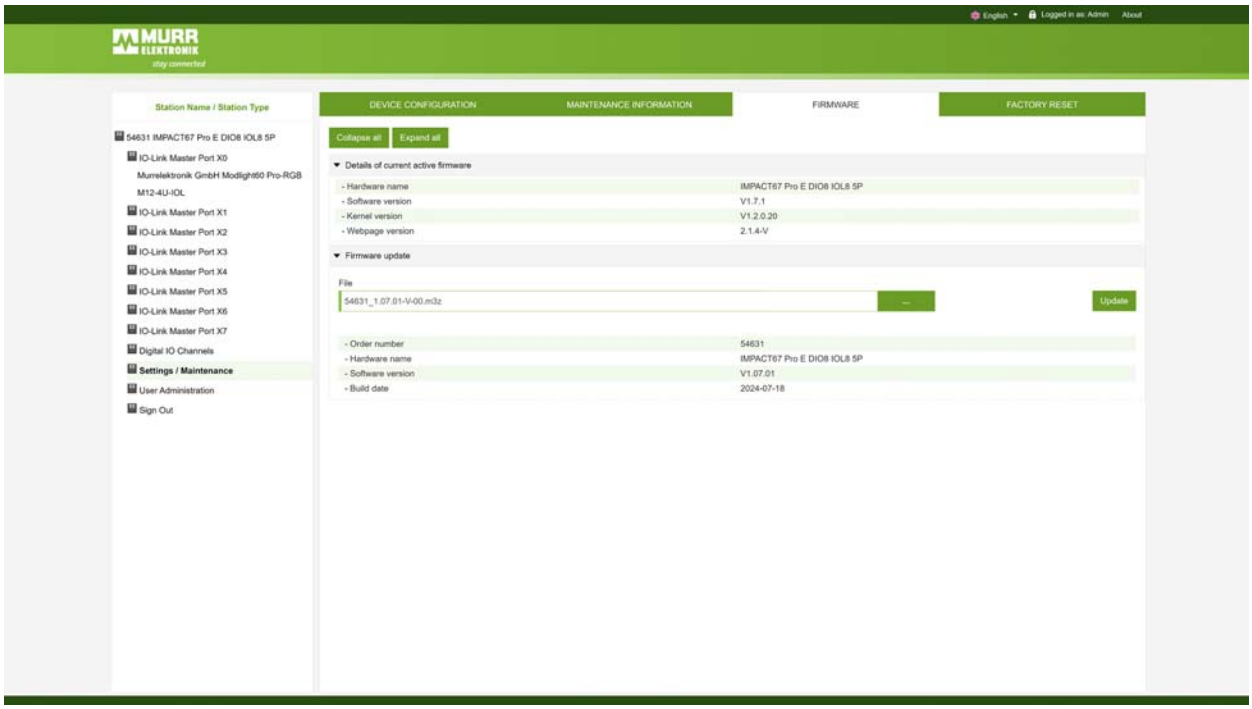


Fig. 10-50: Information about the update file

After pressing "Update", it takes some time for the update to be installed. The module restarts during this process.

10.7.4 FACTORY RESET menu

In this menu item, users with service, maintenance and admin rights can reset the entire device or individual parts (device information, network, application).

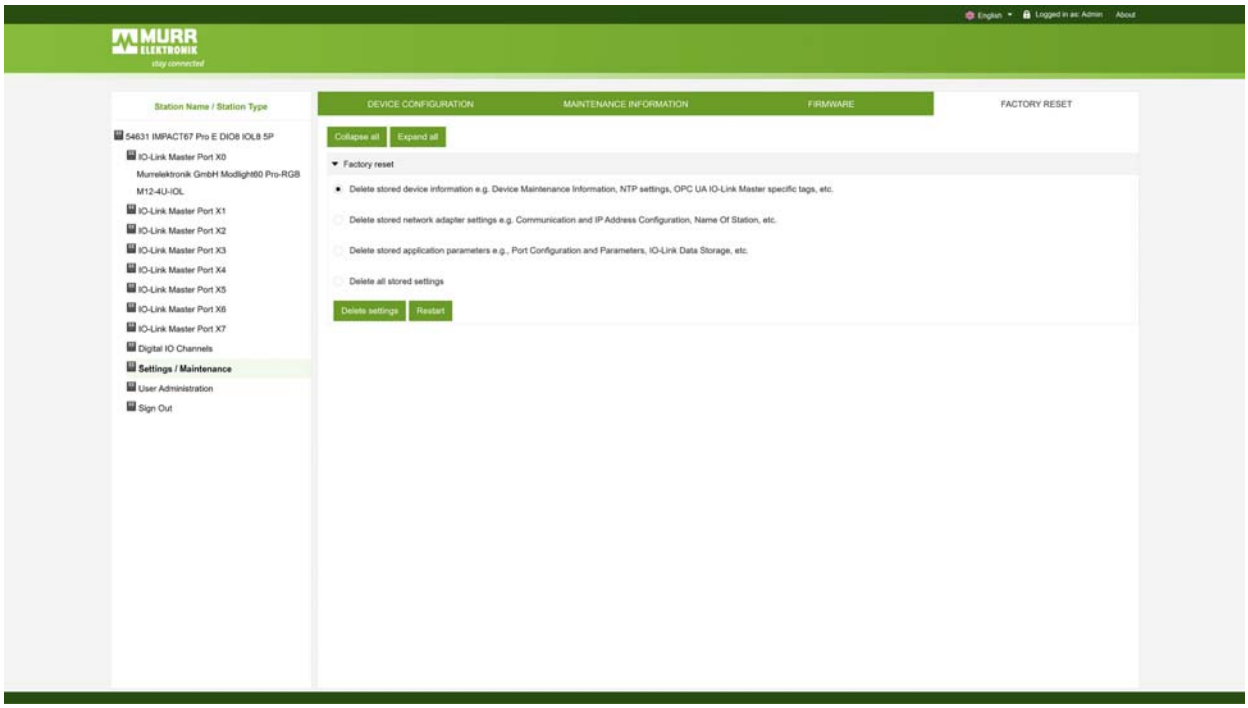


Fig. 10-51: Factory reset

10.8 USER ADMINISTRATION

USER ADMINISTRATION can only be performed with admin rights.

Upon receipt of the product, the administrator account is “admin” and the password is “private”.

The default administrator password can be changed from the controller in the plant with the fieldbus running.

Users log in and out at the bottom left of the system tree.

➔ Click “Sing Out”

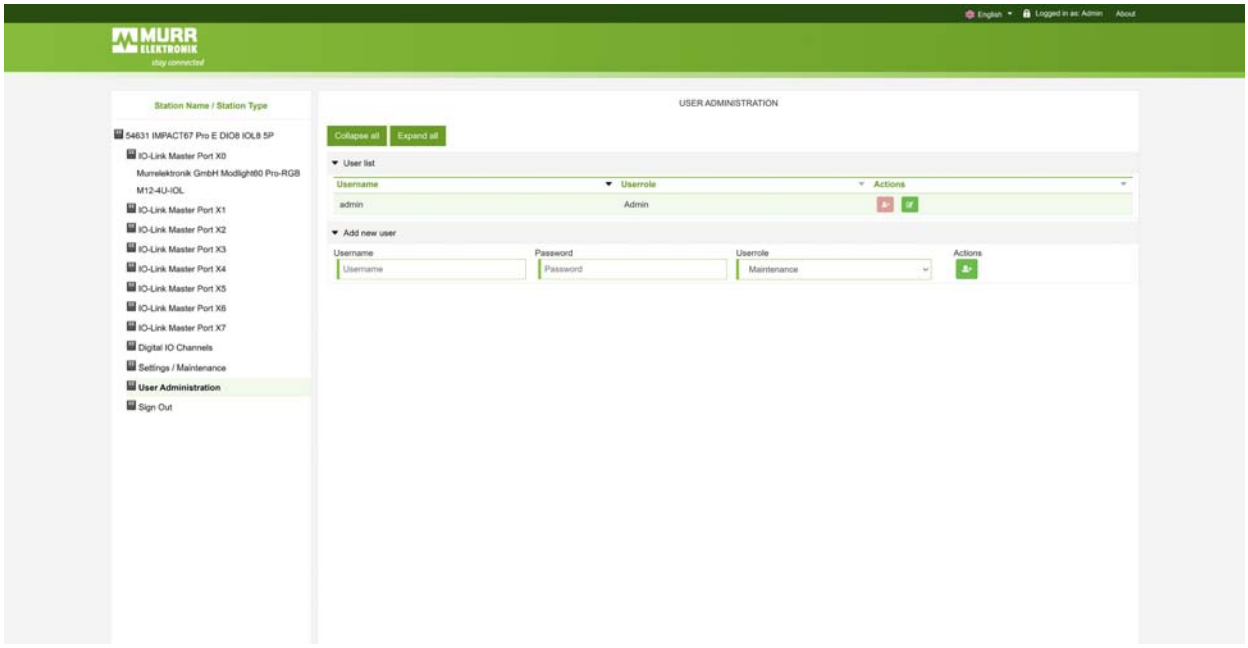


Fig. 10-52: USER MANAGEMENT

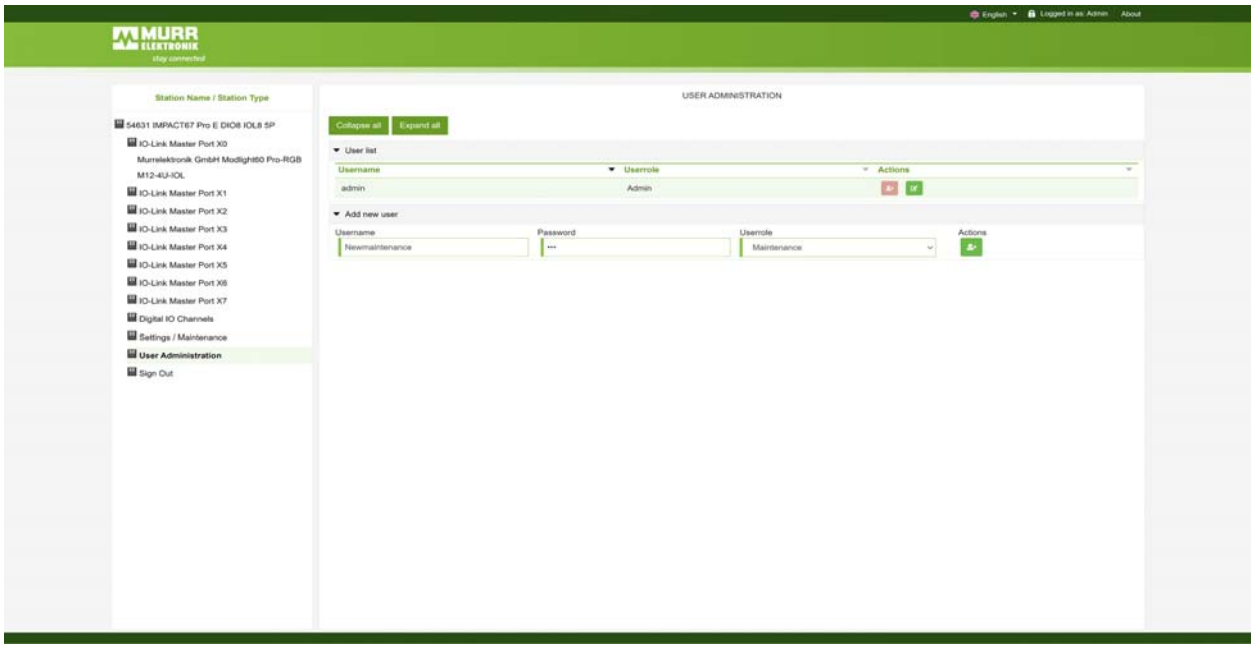


Fig. 10-53: Entering a new user

11 Maintenance and cleaning

NOTICE

Damage caused by defective or damaged devices.

The functioning of the devices is not guaranteed.

➔ 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.

12 Appendix

12.1 Supported EtherNet/IP objects

This chapter is an enumeration of the CIP objects and services supported by and implemented in this product. For more detailed descriptions of the individual objects and attributes, please refer to the EtherNet/IP specification.

12.1.1 Standard objects

12.1.1.1 Identity Object (Class Code: 0x01)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Attribute description	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is two (02). In case of updates that require an increase in this value, the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device.	The largest instance number of a created object at this class hierarchy level. The value currently assigned to this attribute is one (01).
6	Get	Max ID Class Attribute	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	The value of this attribute will be seven (07).
7	Get	Max ID Instance Attributes	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	The value of this attribute will differ by product variant. This attribute will show nine (09).

Tab. 12-1: Identity Object Class Attribute

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Value
1	Get	Vendor ID	UINT	Identification of each vendor by number	640
2	Get	Device Type	UINT	Indication of general type of product	7
3	Get	Product Code	UINT	Identification of a particular product of an individual vendor	
4	Get	Revision	STRUCT *of:*	Revision of the item the Identity Object represents	
		Major Revision	USINT	Major Revision of Firmware	
		Minor Revision	USINT	Minor Revision of Firmware	
5	Get	State	WORD	Summary status of device	
6	Get	Serial Number	UDINT	Serial number of device	
7	Get	Product Name	SHORT_ STRING	Human readable identification	

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Value
8	Get	State	USINT	Present state of the device as represented by the state transition diagram	

Tab. 12-2: Identity Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x01	No	Yes	Get_Attribute_All	Returns a predefined listing of this objects attributes.
0x05	No	Yes	Reset	Invokes the Reset service for the device. Option 0 restarts the device. Option 1 invokes a factory reset of the device.
0x0E	Yes	Yes	Get_Attribute_Single	Returns the contents of the specified attribute.

Tab. 12-3: Common Services of Identity Object

12.1.1.2 Message Router Object (Class Code: 0x02)

This Object has no accessible attributes.

12.1.1.3 Assembly Object (Class Code: 0x04)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Attribute description	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (01). If updates that require an increase in this value are made, then the value of this attribute increases by 1.

Tab. 12-4: Assembly Object Class Attribute

Instance attributes

Attribute ID	Access Rule	Name	Data Type	Attribute description
3	Set,Get	Data	ARRAY of BYTE	
4	Get	Size	UINT	Number of bytes in Attribute 3

Tab. 12-5: Assembly Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x0E	Yes	Yes	Get_Attribute_Single	Returns the contents of the specified attribute.
0x10	No	Yes	Set_Attribute_Single	Modifies an attribute value.

Tab. 12-6: Common Services of Assembly Object

12.1.1.4 Connection Manager Object (Class Code: 0x06)

Ethernet Link Object
Class Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (01). If updates that require an increase in this value are made, then the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device.	The largest instance number of a created object at this class hierarchy level. This attribute will show one (01).

Tab. 12-7: Ethernet Link Object Class Attributes

Instance Attribute: **There are no Instance Attributes implemented for this object.**

Common services: **Common Services of Ethernet Link Object.**

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x0E	Yes	No	Get_Attribute_Single	Returns the contents of the specified attribute.

Tab. 12-8: Common Services of Ethernet Link Object

12.1.1.5 Device Level Ring (DLR) Object (Class Code: 0x47)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is three (03). If updates that require an increase in this value are made, then the value of this attribute increases by 1.

Tab. 12-9: Device Level Ring Object Class Attribute

Instance attributes

Attribute ID	Access Rule	Name	Data Type	Attribute description
1	Get	Network Topology	USINT	Current network topology mode
2	Get	Network State	USINT	Current status of network
10	Get	Active Supervisor Address	STRUCT of:	IP and/or MAC address of the active ring supervisor
			UDINT	Supervisor IP Address
			ARRAY of 6 USINTs	Supervisor MAC Address
12	Get	Capability Flags	USINT	Describes the DLR capabilities of the device

Tab. 12-10: Device Level Ring Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x01	No	Yes	Get_Attribute_All	Returns a predefined listing of this objects attributes.
0x0E	Yes	Yes	Set_Attribute_Single	Returns the contents of the specified attribute.

Tab. 12-11: Common Services of Device Level Ring Object

12.1.1.6 Quality of Service Object (Class Code: 0x48)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (01). If updates that require an increase in this value are made, then the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device.	The largest instance number of a created object at this class hierarchy level. This attribute will show one (01).

Tab. 12-12: Quality of Service Object Class Attribute

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute
1	Set, Get	802.1Q Tag Enable	USINT	Enables or disables sending 802.1Q frames on CIP and IEEE 1588 messages.
4	Set, Get	DSCP Urgent	USINT	DSCP value for CIP transport class 0/1 Urgent priority messages.
5	Set, Get	DSCP Scheduled	USINT	DSCP value for CIP transport class 0/1 Scheduled priority messages.
6	Set, Get	DSCP High	USINT	DSCP value for CIP transport class 0/1 High priority messages.
7	Set, Get	DSCP Low	USINT	DSCP value for CIP transport class 0/1 low priority messages.
8	Set, Get	DSCP Explicit	USINT	DSCP value for CIP explicit messages (transport class 2/3 and UCMM) and all other EtherNet/IP encapsulation messages.

Tab. 12-13: Quality of Service Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x0E	Yes	Yes	Get_Attribute_Single	Returns the contents of the specified attribute.
0x10	No	Yes	Set_Attribute_Single	Modifies the contents of the attributes of the class or object.

Tab. 12-14: Common Services of Quality of Service

12.1.1.7 TCP/IP Interface Object (Class Code: 0xF5)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is four (04). If updates that require an increase in this value are made, then the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device,	The largest instance number of a created object at this class hierarchy level. This attribute will show one (01).

Tab. 12-15: TCP/IP Interface Object Class Attribute

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute
1	Get	Status	USINT	Interface status
2	Get	Configuration Capability	USINT	Interface capability flags.
3	Set, Get	Configuration Capability	USINT	Interface control flags.
4	Get	Physical Link Object	STRUCT of	Path to physical link object.
		Path size	UINT	Size of Path
		Path	Padded EPATH	Logical segments identifying the physical link object.
5	Set, Get	Interface Configuration	STRUCT of	TCP/IP network interface configuration.
		IP Address	UDINT	The device's IP address.
		Network Mask	UDINT	The device's network mask.
		Gateway Address	UDINT	Default gateway address.
		Name Server	UDINT	Primary name server
		Name Server 2	UDINT	Secondary name server.
		Domain Name	STRING	Default domain name.
6	Set, Get	Host Name	STRING	Host name
10	Set, Get	SelectAcd	BOOL	Activates the use of ACD.
11	Set, Get	LastConflictDetected	STRUCT of	Structure containing information related to the last conflict detected.
		AcdActivity	USINT	State of ACD activity when last conflict detected.
		RemoteMAC	Array of 6 USINT	MAC address of remote node from the ARP PDU in which a conflict was detected.
		ArpPdu	ARRAY of 28 USINT	Copy of the raw ARP PDU in which a conflict was detected.
12	n.c.			
13	Get	Encapsulation Inactivity Timeout	UINT	Number of seconds of inactivity before TCP connection or DTLS session is closed.

Tab. 12-16: TCP/IP Interface Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x01	No	Yes	Get_Attribute_All	Returns a predefined listing of this objects attributes.
0x0E	Yes	Yes	Get_Attribute_Single	Returns the contents of the specified attribute.
0x10	NO	Yes	Set_Attribute_Single	Modifies a single attribute.

Tab. 12-17: Common Services of TCP/IP Interface Object

12.1.1.8 EtherNet/IP Link Object (Class Code: 0xF6)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object.	The current value assigned to this attribute is four (04). If updates that require an increase in this value are made, then the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device.	The largest instance number of a created object at this class hierarchy level. This attribute will show two (02).
3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	The number of object instances at this class hierarchy level. This attribute will show two (02).

Tab. 12-18: Ethernet Link Object Class Attribute

Instance Attribute

Attribute ID	Access Rule	Name	Data Type	Description of Attribute
1	Get	Interface Speed	USINT	Interface speed currently in use.
2	Get	Interface Flags	USINT	Interface status flags.
3	Get	Physical Address	USINT	MAC layer address.
4	Get	Interface Counters	STRUCT of	
		In Octets	UDINT	Octets received on the interface.
		In Ucast Packets	UDINT	Unicast packets received on the interface.
		In NUcast Packets	UDINT	Non-unicast packets received on the interface.
		In Discards	UDINT	Inbound packets received on the interface but discarded.
		In Errors	UDINT	Inbound packets that contain errors (does not include In Discards).
		In Unknown Protos	UDINT	Inbound packets with unknown protocol.
		Out Octets	UDINT	Octets sent on the interface.
		Out Ucast Packets	UDINT	Unicast packets sent on the interface.
		Out NUcast Packets	UDINT	Non-unicast packets sent on the interface.
		Out Discards	UDINT	Outbound packets discarded.
		Out Errors	UDINT	Outbound packets that contain errors.

Attribute ID	Access Rule	Name	Data Type	Description of Attribute
5	Get	Media Counters	STRUCT of	Media-specific counters
		Alignment Errors	UDINT	Frames received that are not an integral number of octets in length.
		FCS Errors	UDINT	Frames received that do not pass the FCS check.
		Single Collisions	UDINT	Successfully transmitted frames which experienced exactly one collision.
		Multiple Kollisionen	UDINT	Successfully transmitted frames which experienced more than one collision.
		SQE Test Errors	UDINT	Number of times SQE test error message is generated.
		Deferred Transmissions	UDINT	Frames for which first transmission attempt is delayed because the medium is busy.
		Late Collisions	UDINT	Number of times a collision is detected later than 512 bit-times into the transmission of a packet.
		Excessive Collisions	UDINT	Frames for which transmission fails due to excessive collisions.
		MAC Transmit Errors	UDINT	Frames for which transmission fails due to an internal MAC sublayer transmit error.
		Carrier Sense Errors	UDINT	Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame.
		Frame Too Long	UDINT	Frames received that exceed the maximum permitted frame size.
		MAC Receive Errors	UDINT	Frames for which reception on an interface fails due to an internal MAC sublayer receive error.
6	Set, Get	Interface Control	STRUCT of	Configuration for physical interface.
		Control Bits	WORD	Interface Control Bits
		Forced Interface Speed	UINT	Speed at which the interface shall be forced to operate.
7	Get	Interface Type	USINT	Type of interface: twisted pair, fiber, internal, etc.
8	Get	Interface State	USINT	Current state of the interface: operational, disabled, etc.
9	Set, Get	Admin State	USINT	Administrative state: enable, disable.
10	Set, Get	Interface Label	SHORT_STRING	Human readable identification.
11	Get	Interface Capability	STRUCT of	Indication of capabilities of the interface.
		Capability Bits	DWORD	Interface capabilities, other than speed/duplex.
		Speed/Duplex Options	STRUCT of	Indicates speed/duplex pairs supported in the Interface Control attribute.
			USINT	Speed/Duplex Array Count.
			ARRAY of STRUCT of	Speed/Duplex Array
			UINT	Interface Speed
			UINT	Interface Duplex Mode

Tab. 12-19: Ethernet Link Object Instance Attribute

Common Services

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x01	No	Yes	Get_Attribute_All	Returns a predefined listing of this objects attributes.
0x0E	Yes	Yes	Get_Attribute_Single	Returns the contents of the specified attribute.
0x4C	No	Yes[1]	Set_Attribute_Single	Gets then clears the specified attribute.
[1] The Get_and_Clear sevice is only implemented for the attributes 4 and 5.				

Tab. 12-20: Common Services of Ethernet Link Object

12.1.2 Vendor Specific Objects

12.1.2.1 IO-Link Device Parameter Object (Class Code 0x83)

Class Attribute

Attribute ID	Access Rule	Name	Data Type	Attribute description	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The current value assigned to this attribute is one (01). If updates that require an increase in this value are made, then the value of this attribute increases by 1.
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device.	The largest instance number of a created object at this class hierarchy level. This attribute will show one (01).
6	Get	Max ID Class Attribute	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	The value of this attribute will be seven (07).
7	Get	Max ID Instance Attributes	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	The value of this attribute will differ by product variant. Part number 55143 will show 2 and 55144 will show 4.

Tab. 12-21: IO-Link Device Parameter Object Class Attribute

Instance attributes Instance attributes are not supported.

Object-Specific Services **The following class-specific services are defined for the IO-Link Device Parameter Object.**

Service Code	Implemented for		Service Name	Description of Service
	Class	Instance		
0x4B	No	Yes	Read_ISDU	Read the parameter in the IO-Link Device in raw format. i.e. Big Endian
0x4C	No	Yes	Write_ISDU	Write the parameter in the IO-Link Device in raw format i.e. Big Endian

Tab. 12-22: Common services of Object-Specific Services

Read_ISDU Service

Name	Data Type	Description
Index	UINT	IO-Link device index
Subindex	USINT	IO-Link device subindex

Tab. 12-23: Read_ISDU Service structure

Write_ISDU Service

Name	Data Type	Description
Index	UINT	IO-Link device index
Subindex	USINT	IO-Link device subindex
Data	ARRAY of USINT	IO-Link device ISDU data

Tab. 12-24: Write_ISDU Service structure

12.2 Explanation of the process data

12.2.1 Digital Input

The order of the digital input data depends on the configuration parameter "Pin_Port_based_IO_Layout". This is explained in the following tables:

Port Based

Byte	1								0							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	X7	X7	X6	X6	X5	X5	X4	X4	X3	X3	X2	X2	X1	X1	X0	X0
Pin	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
Chan-nel	17	07	16	06	15	05	14	04	13	03	12	02	11	01	10	00

Tab. 12-25: Port Based

Pin Based

Byte	1								0							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Port	X7	X6	X5	X4	X3	X2	X1	X0	X7	X6	X5	X4	X3	X2	X1	X0
Pin	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4
Chan-nel	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00

Tab. 12-26: Pin Based

NOTE
The tables for Port and Pin Based are also applicable to Digital Input Qualifier, Digital Output Qualifier and Digital Output.

12.2.2 DI Qualifier

The Digital Input Qualifiers inform you quickly about the integrity of the input signal.

Bit value	Description
0	Invalid
1	Valid

NOTE
The bit order depends on the configuration parameter “Pin_Port_based_IO_Layout”. See chap. 12.2 "Explanation of the process data"

12.2.3 DO Qualifier

The Digital Output Qualifiers inform you quickly about the integrity of the output signal.

Bit value	Description
0	Invalid
1	Valid

NOTE
The bit order depends on the configuration parameter “Pin_Port_based_IO_Layout”. See chap. 12.2 "Explanation of the process data"

12.2.4 System Status

The system state bit string provides information about the entire device.

Byte	Description
0 ... 3	Bit 0: Bus/sensor supply undervoltage
	Bit 1: Actuator supply undervoltage
	Bit 2: No actuator supply
	Bit 3: Reserved
	Bit 4: At least one channel has a sensor short circuit
	Bit 5: At least one channel has an actuator short circuit
	Bit 6: Reserved
	Bit 7: Reserved
	Bit 8: Reserved
	Bit 9: At least one IO-Link channel has an error (except wire break)
	Bit 10: Bus/sensor supply overvoltage
	Bit 11: Actuator supply overvoltage
	Bit 12: At least one IO-Link channel has a wire break
	Bit 13 ... 31: Reserved, set to 0

Tab. 12-27: System status bit string

12.2.5 IO-Link Port X Status

Byte	Description	Value
0 ... 1	IO-Link Data Status	Bit 0 - 4: reserved Bit 5: DevCom, is set when a device is detected and is in the PREOPERATE or OPERATE state. It is reset if no device is present. Bit 6: DevErr, is set when an error or warning has occurred that is assigned to either a device or a port. It is reset when there is no error or warning. Bit 7: PQ, is set when valid process data is exchanged between master and device. It is reset if the process data is not valid.
2 ... 3	Vendor ID of connected IO-Link device	
4 ... 7	Device ID of connected IO-Link device	

Tab. 12-28: IO-Link Port X Status

12.2.6 Diagnostic Buffer

The diagnostic buffer consists of an array of diagnostic structures and has a length of 8 structures. A diagnostic structure has the size of 8 bytes. This gives a total length of the diagnostic buffer of 64 bytes.

NOTE
For further information on a diagnostic structure, please refer to chap. 9.2.1 "Diagnostics structure in the control system"

12.2.7 Digital Output

NOTE
The order of the digital output data depends on the configuration parameter “Pin_Port_based_IO_Layout”. See chap. 12.2.1 "Digital Input"

12.3 Accessories

12.3.1 System components

Description	Art.-No.
Screw Plug M12 Metal	996049
Plastic M12 screw plug, VE10	58627
Ground strap 4 mm^2 100 mm for M4	4000-71001-0410004
Grounding strap screw-down set M4	4000-71003-0101604
Designation label 20x8 in a set (20 pcs)	55318

12.3.2 Tools

Designation	Art.-No.
6-part screwdriver set	7000-98001-0000000
M12 torque wrench set, AF 13	7000-99102-0000000

Fig. 12-1: Installation wrench

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12.4 Glossary

Term	Meaning
EtherNet/IP	Ethernet Industrial Protocol Open standard for industrial networks that supports both cyclic and acyclic message transfers and uses standard Ethernet communication chips and physical media.
CIP	Common Industrial Protocol The Common Industrial Protocol is an application protocol used in automation technology. It supports the transition between fieldbuses and industrial Ethernet and IP networks. This industrial protocol uses Ethernet/IP in the application layer as an interface between fieldbus and control, I/O, etc.
DHCP	Dynamic Host Configuration Protocol DHCP allows a server to dynamically distribute IP address and configuration information to clients. Normally, the DHCP server provides at least the following basic information to the client: - IP address - Subnet mask - Standard gateway
EDS	Electronic Data Sheet An EDS file is an external file that contains information for a device. It provides necessary information for access to and change of configurable parameters of a device.
Ethernet frame	In each Ethernet frame (data package), there are addresses of the transmitter (source) and receiver (target). When a frame is received, the receiving unit of a receiving station compares the MAC target address with its own MAC address. When the addresses match, the receiving unit forwards the contents of the frame to a superior layer. If they do not match, the frame is discarded.
IO-Link IOL	Standardized communication system to connect intelligent sensors and actuators to an automation system
IP	Internet Protocol Protocol used for transferring data within a network, e.g. internet or intranet, from one computer to another. Each computer in the network can be clearly identified by means of its IP address. If data is sent from one computer to another, it is subdivided into small information packages containing each the transmitter and receiver address. These packages can be sent over the network using different routes and arrive at their destination in a different order than the sequence of sending. Another protocol, the transmission control protocol [TCP], restores then the original order.
MAC address	Media Access Control Address Hardware address of network components used for clearly identifying devices in a network.
ODVA	ODVA is an international association for open and compatible information and communication technologies in automation systems. e.g. EtherNet/IP, DeviceNet, CompoNet and ControlNet,....
RPI	Requested Packet Interval The interval in which an EtherNet/IP target sends process data to the scanner.

13 Legal notes

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