IO-Link Master XZIOM8AM12PY

Profinet Adapter / 8 Port IO-Link Master V1.0

User manual

Original instructions

www.telemecaniquesensors.com

Legal Information

The information provided in this guide contains description of products sold by TMSS France, its subsidiaries and other affiliated companies ('Offer') with technical specifications and technical characteristics of the performance of the corresponding Offer.

The content of this document is subject to revision at any time without notice due to continued progress in methodology, design and manufacturing.

To the extent permitted by applicable law, no responsibility or liability is assumed by TMSS France, its subsidiaries and other affiliated companies for any type of damage arising out of or in connexion with (a) informational content of this guide not conforming with or exceeding the technical specifications, or (b) any error contained in this guide, or (c) any use, decision, act or omission made or taken on the basis of or in reliance on any information contained or referred to in this guide.

NEITHER TMSS FRANCE, ITS SUBSIDIARIES, NOR ITS OTHER AFFILIATES, AS THE CASE MAYBE, MAKE NO WARRANTY OR REPRESENTATION OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO WHETHER THIS GUIDE OR ANY INFORMATION CONTAINED THEREIN SUCH AS PRODUCTS WILL MEET REQUIREMENTS, EXPECTATIONS OR PURPOSE OF ANY PERSON MAKING USE THEREOF.

Telemecanique™ Sensors is a trademark of Schneider Electric Industries SAS used under license by TMSS France. Any other brands or trademarks referred to in this guide are property of TMSS France or, as the case may be, of its subsidiaries or other affiliated companies. All other brands are trademarks of their respective owners.

Table of Contents

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated and maintained only by qualified personnel. Neither TMSS France nor any of its subsidiaries or other affiliated companies shall be responsible or liable for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

Document Scope

This manual describes the features, installation, wiring, usage, and troubleshooting of the IO-Link master device.

Validity Note

The technical characteristics of the device(s) described in this manual also appear online.

To access this information online:

Step	Action
1	Go to www.telemecaniquesensors.com.
2	In the Search box, type the model number of a product or the name of a product range.Do not include blank spaces in the model number/product range.
3	If more than one model number appears in the Products search results, click on the model number that interests you.
4	To save or print a data sheet as a .pdf file, click Download product datasheet.

The characteristics that are described in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Quick Response Code

A quick response code including the Telemecanique Sensors web address is present on the sensor label. Technical documents are available in various languages in this website.

User Comments

We welcome your comments about this document. You can reach us through the customer support page on your local TeSensors website.

Cybersecurity

Machines, controllers, and related equipment are usually integrated into networks. Unauthorized persons and malware may gain access to the machine as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to software and networks.

⚠ WARNING

UNAUTHORIZED ACCESS TO THE MACHINE VIA SOFTWARE AND NETWORKS

- In your hazard and risk analysis, consider all hazards that result from access to and operation on the network/fieldbus and develop an appropriate cybersecurity concept.
- Verify that the hardware infrastructure and the software infrastructure into which the machine is integrated as well as all organizational measures and rules covering access to this infrastructure consider the results of the hazard and risk analysis and are implemented according to best practices and standards covering IT security and cybersecurity (such as ISO/IEC 27000 series, ISO/ IEC 15408, IEC 62351, ISA/IEC 62443, Common Criteria for Information Technology Security Evaluation, NIST Cybersecurity Framework, Information Security Forum - Standard of Good Practice for Information Security).
- Verify the effectiveness of your IT security and cyber security systems using appropriate, proven methods.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Consult the TMSS Cybersecurity Best Practices (www.telemecaniquesensors.com) for additional information.

Device Description

Function Description

The device is designed to be used within a PROFINET network. The device enables you to use up to 8 IO-Link sensors/actuators and also serves to capture digital inputs and outputs.

Monitoring Functions

The device has several integrated sensors for measuring:

- Temperatures,
- Currents,
- Voltages.

The measurements are carried out for the device as well as for pin 1, pin 2 and pin 4 of each IO-Link port.

The measuring values are compared with limit values in the device. If the values exceed or fall below a limit value (for example: temperature limit value), an alarm is generated.

Web Server

The web server can display the measuring values.

Reaction if the Value Exceeds/Falls Below the Limit

If the value exceeds or falls below the limit, the device can send an event to the controller.

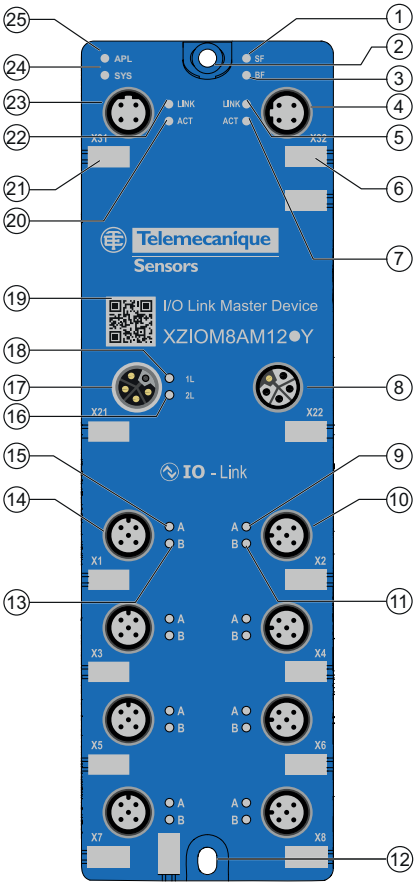
OPC UA Server

An OPC UA client can read and display the measuring values.
If the values exceed or fall below a limit value, the OPC UA server can send an event to the OPC UA client.

Overload Protection

The device has an internal current overload protection for the supply output for IO-Link devices or digital outputs. The output current is subject to permanent measurement and monitoring. If the measured output current exceeds the maximum value, the device reduces the current or switch off the corresponding loads.

Device Drawing XZIOM8AM12PY



Positions of the interfaces and LEDs:

Pos.	Name	Interface/LED	Pos.	Name	Interface/LED
1	SF	PROFINET, system error LED	14	X1	IO-Link, port 1, M12, A-coded
2	-	Fixing hole and ground (FE)	15	A	IO-Link status LED, port 1, channel A
3	BF	PROFINET, bus failure LED	16	2L	Satus +24 V DC power supply, 2L
4	X32	Ethernet interface, M12, D-coded, PROFINET port 2	17	X21	Power In
5	LINK	Link LED X32	18	1L	Status +24 V DC power supply, 1L
6	-	Labeling field	19	-	QR code (part number, hardware revision, serial number, MAC ID, URL)
7	ACT	Activity LED X32	20	ACT	Activity LED X31
8	X22	Power Out	21	-	Labeling field
9	A	IO-Link status LED, port 2, channel A	22	LINK	Link LED X31
10	X2	IO-Link, port 2, M12, A-coded	23	X31	Ethernet interface, M12, D-coded, PROFI-NET port 1
11	B	IO-Link status LED, port 2, channel B	24	APL	Application status LED
12	-	Fixing hole	25	SYS	System status LED
13	B	IO-Link status LED, port 1, channel B			

Identification

To identify the device, there is a dynamic 2D code on the front of the device housing:

The 2D code includes (sample data):

- Part number: 1913.120
- Hardware revision number: R1
- Serial number: 020000
- MAC-ID: 00-02-A2-2F-75-44 (individual for each device)

Revisions and Versions

The hardware revision listed below, as well as the software and firmware versions belong together functionally. If a hardware installation is available, for the firmware update these specifications are relevant.

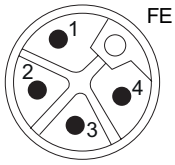
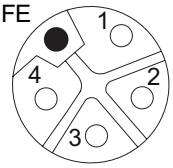
Model	Description	Part number	Hardware revision
XZIOM8AM12PY	IO-Link Master Device IO-Link class A PROFINET IO-Device	1913.100	3

Software	Name	Version
Web server	IO-Link Master Device web server for PROFINET IO-Device	V1.1

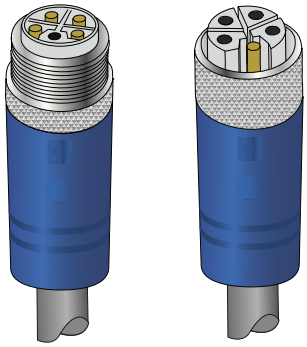
Protocol	File name	Version
PROFINET IO-Device	U197D000.nxi	V1.0

Connectors and Interfaces

Power supply

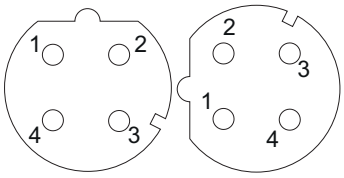
Supply voltage input	Supply voltage output	Pin	Signal	Color	Description
		1	1L+	Brown	24 V DC supply voltage U1L for system and sensor/actuator
		2	2L-	White	Reference potential for 2L
		3	1L-	Blue	Reference potential for 1L
		4	2L+	Black	24 V DC auxiliary/control voltage U2L
		FE	FE	Pink	Functional earth

Available power cables:

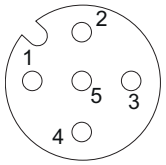


Reference	Description
XZCPK75DL2	IO-Link master single-ended pre-wired, L-Coded power cable, female, straight, 5 pin (4+FE), PUR, 1.5 mm², 2 m
XZCPK75DL5	IO-Link master single-ended pre-wired, L-Coded power cable, female, straight, 5 pin (4+FE), PUR, 1.5 mm², 5 m
XZCPK75CL2	IO-Link master single-ended pre-wired, L-Coded power cable, female, elbowed, 5 pin (4+FE), PUR, 1.5 mm², 2 m
XZCPK75CL5	IO-Link master single-ended pre-wired, L-Coded power cable, female, elbowed, 5 pin (4+FE), PUR, 1.5 mm², 5 m
XZCR25K25DL2	IO-Link master jumper power cable, male straight M12 5 pin, female straight M12 5 pin, PUR, 1.5 mm², 2 m
XZCR25K25DL5	IO-Link master jumper power cable, male straight M12 5 pin, female straight M12 5 pin, PUR, 1.5 mm², 5 m
XZCR26K26CL2	IO-Link master jumper power cable, male elbowed M12 5 pin, female elbowed M12 5 pin, PUR, 1.5 mm², 2 m
XZCR26K26CL5	IO-Link master jumper power cable, male elbowed M12 5 pin, female elbowed M12 5 pin, PUR, 1.5 mm², 5 m

Ethernet

Ethernet	Pin	Signal	Description
	1	TX+	Transmit data positive
	2	RX+	Receive data positive
	3	TX–	Transmit data negative
	4	RX–	Receive data negative

IO-Link ports (Class A)

IO-Link ports (Class A)	Pin	Signal	Description	Wire color
	1	1L+	24 V DC supply voltage U1L for system and sensor/actuator	Brown
	2	2L-	Reference potential for 2L	White
	3	1L-	Reference potential for 1L	Blue
	4	2L+	24 V DC auxiliary/control voltage U2L	Black
	FE	FE	Functional earth	–

Safety

Intended Use

The IO-Link Master device XZIOM8AM12PY serves to receive or send process data via IO-Link:

- The IO-Link Master device XZIOM8AM12PY receives process data from the connected sensor and sends this data to superordinated PLC (PROFINET IO-Controller).
- The IO-Link Master device XZIOM8AM12PY receives process data from the superordinated PLC (PROFINET IO-Controller) and sends this data to the connected actuator.

General Safety Regulations

⚠ CAUTION

ELECTRICAL HAZARD

- Only authorized expert electricians qualified in accordance with EN 50110-1/-2 and IEC 60364-1 are allowed to install and commission the device.
- Replace defective or damaged IO-Link masters (for example: deformed connections), otherwise malfunctions of the affected network stations or nodes may result.
- When installing, connecting, and using the IO-Link master, observe all relevant current regional, national, and international standards, mounting instructions, and accident prevention regulations.
- Observe the accident prevention regulations applicable to your plant during installation, commissioning, maintenance, and troubleshooting. For example: DGUV V3 (previously BGV A 3, «Electrical systems and equipment»). Using the device is allowed only in compliance with these regulations and the complete instructions manual. Any other use may endanger the safe use and result in the loss of the warranty or guarantee. Telemecanique Sensors is not liable for damage resulting from improper use.

Failure to follow these instructions can result in injury, or equipment damage.

⚠ CAUTION

HAZARD OF INJURY OR EQUIPMENT DAMAGE

- This documentation is part of the product. Therefore, keep the documentation at hand the product is used. Pass the documentation on to any subsequent user of the product. In addition, make sure that any supplements received are included in the documentation, if need be added.
- Before installing, operating, or using the product, carefully read the complete information for use.
- The operating manuals of the IO-Link masters used must be kept at hand at the workplace.

Failure to follow these instructions can result in injury, or equipment damage.

Electrical Safety

⚠ CAUTION

ELECTRICAL HAZARD

- Only authorized expert electricians qualified in accordance with EN 50110-1/-2 and IEC 60364-1 are allowed to install and commission the device.
- Replace defective or damaged IO-Link masters (for example: deformed connections), otherwise malfunctions of the affected network stations or nodes may result.
- When installing, connecting, and using the IO-Link master, observe all relevant current regional, national, and international standards, mounting instructions, and accident prevention regulations.
- Observe the accident prevention regulations applicable to your plant during installation, commissioning, maintenance, and troubleshooting. For example: DGUV V3 (previously BGV A 3, «Electrical systems and equipment»). Using the device is allowed only in compliance with these regulations and the complete instructions manual. Any other use may endanger the safe use and result in the loss of the warranty or guarantee. Telemecanique Sensors is not liable for damage resulting from improper use.

Failure to follow these instructions can result in injury, or equipment damage.

⚠ CAUTION

HAZARD OF INJURY OR EQUIPMENT DAMAGE

- Operating inadmissible voltage values or frequency values may destroy the device.
- Make sure that the pin assignment is correct.
- The current at a single IO-Link connector must not exceed the limit of 4 A, not even for a short period. With permanent operation, the admissible maximum per connector is 3 A. Otherwise you risk destruction or damage to the device or other devices connected to it. When the permissible maximum pass-through current is exceeded, you risk damage to the device and/or other connected devices.
- The electronic components integrated into the devices meet the ESD requirements of IEC 61000-6-2. Since, under unfavorable circumstances, higher voltages may occur in the field due to charging, discharge must be guaranteed before carrying out any work on the devices.
- The current limit in a load circuit must not exceed 16 A, never. Otherwise you risk destruction or damage to the device or other devices connected to it.
- SELV: Use the same phase or reference point.
- PELV: Limitation related to overvoltage category II.
- Keep sufficient distance to electromagnetic interference sources with all cables to achieve a high immunity of the IO-Link master against electromagnetic radiation. Where necessary, use shielded cables only. Observe the corresponding standards for installations according to EMC.

Failure to follow these instructions can result in injury, or equipment damage.

Mechanical Safety

⚠ CAUTION

HAZARD OF INJURY OR EQUIPMENT DAMAGE

- Check the device for transport damage before commissioning. If damaged, the product must not be put into operation.
- When laying cables, make sure not to lay them in the shear zones of moving system parts.

Failure to follow these instructions can result in injury, or equipment damage.

Thermal Safety

⚠ CAUTION

BURN AND ELECTRIC SHOCK HAZARD

- During operation, the housing surface and the metallic connection sockets heat up. The surface temperature of the device may rise above 40 °C. Under special conditions (for example in case of a fault or at an increased ambient temperature), touching the device may lead to burns. When the device was in operation, allow it to cool down before touching it, wear protective gloves or apply protective covers or a touch guard
- The cooling of the device must not be impaired. Make sure that the air supply is not obstructed.
- Do not mount the device on, at or near highly flammable materials.

Failure to follow these instructions can result in injury, or equipment damage.

Information and Data Security

NOTICE

INFORMATION SECURITY MEASURES AND DATA SECURITY MEASURES

- Take all standard information measures and data security measures. Telemecanique explicitly points out that a device with access to a public network (Internet) has to be installed behind a firewall or should be accessible only via a secure connection such as an encrypted VPN connection. Otherwise, the integrity of the device, its data, or the application or system section is not guaranteed. Telemecanique disclaims all warranty or liability for damage caused by neglect of safety measures or incorrect installation.
- Change the password immediately after commissioning. The factory default setting is generally known and does not provide sufficient protection.

Failure to follow these instructions can result in equipment damage.

Indirect Security

⚠ WARNING

SAFE OPERATING STATE

- If automation solutions are implemented that may cause personal injury or great property damage in case of a fault, you must take appropriate measures to implement a safe operating state of the plant even in case of a fault.
- Take appropriate, external and independent measures to prevent personal injury or property damage in case of hazardous operations.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

CLEANING

- For handling the device always use clean tools and materials.
- Clean the device only with a dry or soft cloth moistened with water. Do not use any hard objects that might cause scratches or cleaning agents, for example: abrasives, diluents, alcohols, ketones (for example: acetone), and chlorinated hydrocarbons (for example: dichloromethane).

Failure to follow these instructions can result in equipment damage.

⚠ CAUTION

PERSONNEL QUALIFICATION FOR MAINTENANCE AND REPAIR WORK

The product does not contain any parts requiring maintenance by the user. Have maintenance, adaptation, service or repair work carried out only by expert personnel authorized by Telemecanique.

Failure to follow these instructions can result in injury, or equipment damage.

NOTICE

PERSONNEL QUALIFICATION FOR THE USE OF NETWORK ANALYSIS TOOLS

Only trained and qualified specialists are allowed to use network analysis tools (for example: «Wireshark»).

Failure to follow these instructions can result in equipment damage.

NOTICE

INFORMATION PRINTED ON THE PRODUCT

In addition, observe the information printed on the product.

Failure to follow these instructions can result in equipment damage.

Safe Operation of the Flash Memory

There are two way to implement the safe operation of the internal Flash memory of the device.

Interruption of the Power Supply

Write and delete access operations (for example: updating firmware or saving configuration) in the FAT file system of the device may lead to the destruction of the FAT (File Allocation Table) if the access operations cannot be completed due to a voltage drop. If the FAT is corrupted, a firmware is possibly not be found and cannot be started.

Make sure that the power supply to the device is not interrupted during write and delete access operations in the file system (updating firmware, downloading configuration, and so on).

Maximum Number of Write and Delete Accesses

This device uses a serial flash chip to store remanent data such as firmware storage, configuration storage, and so on. This device allows a maximum of 100000 write/delete accesses that are sufficient for standard operation of the device. However, writing/deleting the chip excessively (for example: changing the configuration or changing the name of station) leads to the maximum number of permitted write/delete accesses being exceeded and to device damage. For example: if the configuration is changed once an hour, the maximum number is reached after 11.5 years. If the configuration is changed even more frequently, for example: once a minute, the maximum number is reached after approximately 69 days.

Avoid exceeding the maximum permitted write/delete accesses by writing too often.

Planning

Requirements

Hardware and System Requirements

To install your IO-Link Master, you need the following hardware components:

- Power supply: 24 V DC SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage)
- Power supply cable with L-coded M12 connector
- Ethernet cable with D-coded M12 connector
- PROFINET IO-Controller (PLC)
- At least one IO-Link class A device
- IO-Link cable with A-coded M12 connector

Additional components:

- Ethernet network switch.

For commissioning:

- PC or notebook with at least one additional Ethernet port and Internet access.

Software Requirements

For commissioning and configuration:

- Web browser or Simply Config IO-Link application,
- DHCP server (required at least for the initial commissioning).

Mounting Guidelines and Standards

While mounting, observe the following relevant standards:

- DIN 60204 (Electrical equipment of machines),
- DIN EN 50178 (Electronic equipment for use in power installations),
- EN 61439 (Low-voltage switchgear and controlgear assemblies).

DIN 60204 and DIN EN 50178 also specify the requirements for power supplies according to PELV (Protective Extra Low Voltage) and SELV (Safety Extra Low Voltage) as well as the requirements for the isolation of the supply lines.

Supply Concept

Dimensioning the Supply

Basics

Supply of the Device and the Connected Sensors/Actuators

The 24 V supply voltages are supplied via supply input X21 (PWR IN).

The device has two galvanically isolated supply lines:

- Supply line 1 connects 1L+ (pin 1) with 1L- (pin 3).
- Supply line 2 connects 2L+ (pin 4) with 2L- (pin 2).

In case of IO-Link master class A, pin 4 and pin 2 are directly connected with each other.

The sensors, actuators or hubs connected to the device are supplied via port X1, X2, … . When dimensioning the supply, the required current of the connected sensors and actuators must be taken into account.

Further devices can be supplied via supply output X22 (PWR OUT). The current flowing at X22 is referred to below as the pass-through current and must be taken into account when dimensioning the supply. In contrast to the currents at the ports, the pass-through current cannot be measured by the sensors integrated in the device.

NOTE: For more information on the pass-through current, see Rules 1 and 2 Supply Input X21 and Supply Output X22, page 21.

Protection Functions

The integrated protection functions of the device (see Overload Protection, page 9) prevent damage in overload situations (for example: overcurrent or short circuit), but they do not include the pass-through currents for supplying further devices via supply output (X22). Protective equipment is therefore required to limit the pass-through current via X21 and X22 (for example: safety fuse or automatic circuit breaker, see Technical Data, page 123).

Calculation of the Required Current

The required current of each supply line depends on the connected devices. The following branch currents are components of the total current and thus increase the required current.

Supply line 1:

- Logic supply (approximately 200 mA),
- Supply of all connected sensors/actuators and hubs via 1L,
- Supply of further devices via 1L.

Supply line 2:

- Supply of the further devices via 2L.

The 2L voltage of IO-Link master class A devices is not used for the separate power supply of actuators, it is only passed through.

Rules

The following rules must be observed to take the required current of the connected devices into account and to avoid damage to the device:

- Supply voltage input X21 (PWR IN) and supply voltage output X22 (PWR OUT)
  - Rule 1: Take the current carrying capacity of each pin of a connector into account.
  - Rule 2: Take the pass-through current 1L and 2L into account.
- Ports X1, X2, …
  - Rule 3: The current carrying capacity of pin 3 must not exceed 4 A because the sum of the currents of pins 1, 2, and 4 flows back via pin 3.

Rules 1 and 2 Supply Input X21 and Supply Output X22

The currents for the galvanically isolated supply lines 1 and 2 must be considered individually. The two supply lines are defined as follows:

- Supply line 1 corresponds to the way the current flows from pin 1 (signal 1L+) of power supply connection PWR IN (X21) through the device to pin 3 (signal 1L-) of PWR IN. The way of the current is shown in blue in chapter.
- Supply line 2 corresponds to the way the current flows from pin 4 (signal 2L+) of power supply connection PWR IN (X21) through the device to pin 2 (signal 2L-) of PWR IN. The way of the current is shown in red in chapter.

Rule 1 - Maximum Limit of 16 A for Current in the Entire Supply Line (1 or 2)

The following rule applies to both supply lines.

The upper limit of 16 A applies to the total current in a supply line. If you exceed this limit, you risk damaging or destroying the device. To avoid that, protect each supply line with a fuse or a circuit breaker; see Protection, page 24.

Also pay attention to the dependence of the permissible maximum current on the ambient temperature; see Derating, page 26.

The following branch currents are components of the total current in supply line 1:

1. Current I_{logic} for supplying the internal electronic system of the device (the device is supplied via supply line 1),
2. Currents I_{Xi_1L} for supplying the connected devices, sensors, and actuators (for each port Xi),
3. Current I_{X22_1L} that flows via supply voltage output PWR OUT (X22) to the other connected devices (pass-through current).

The following branch currents are components of the total current in supply line 2:

1. Currents I^{Xi_2L} for supplying the connected devices, sensors, and actuators (for each port Xi)
2. Current I^{X22_2L} that flows via supply voltage output PWR OUT (X22) to the other connected devices

Rule 2 – Limitation of the Pass-through Current

The following rule applies to both supply lines.

The supply voltage for the devices of a supply line connected to output supply connector PWR OUT is passed through the device from the input supply connector. The current carrying capacity of the connector at the power supply input and the PCB is maximum 16 A and specifies the permissible maximum pass-through current for the respective supply line. The total current must not exceed this limit of 16 A.

Observe the following notes:

1. When using digital outputs, the permissible pass-through current must be reduced by the current that flows through these digital outputs.
2. In the worst case, the permissible pass-through current can reach the value 0 A.
3. The pass-through connection between supply voltage input and output has no internal protective device against overcurrent.

NOTE:

For a description of the required safety measures, see Safety, page 14.

As an additional measure, Telemecanique recommends that the values measured by the sensors integrated in the device be monitored by a monitoring application, see Monitoring Functions, page 9.

Rule 3 Ports X1, X2

Rule 3 - Upper Limits for the Current at the Individual Pins of the Connectors

The following rules apply to each pin of the connectors.

The currents at the individual pins of the connectors (IO-Link ports) must not exceed the following upper limits:

Upper limits for the current at the pins of the IO-Link ports:

Pin	Operation under standard	Operation under overload conditions
1	4A	
2	2A	2.4 A
3	4A	
4	2A	2.4 A

The design of the device allows an unlimited operation under overload conditions. Valid for all pins:

Exceeding the maximum load capacity (upper limit of overload operation) of a pin may damage or destroy the printed circuit board or connector of the device.

NOTE: The sum of the currents of pins 1, 2, and 4 flows at pin 3.

Device-dependent Information - IO-Link devices

Pay attention to the currents explained in the following table for supply line 1 of the IO-Link device:

Current	Description
I_{X21_1L}	Current at connector PWR IN (X21): Current 1L+/reverse current 1L-
I_{X22_1L}	Current at PWR OUT (X22): Current 1L+/reverse current 1L-
I_{Logic}	Logic supply
I_{X1_1L}, I_{X2_1L}, … , I_{X8_1L}	Total current for supply line 1 at port Xi (i.e. port X1, X2, …, X8) corresponds to the current $I_{Xi\_Pin3\_1L}$ at pin 3 (ground). This current is the sum of the currents on pins 1, 2, and 4 of port Xi: $I_{Xi\_1L} = I_{Xi\_Pin3\_1L} = I_{Xi\_Pin1\_1L} + I_{Xi\_Pin2\_1L} + I_{Xi\_Pin4\_1L}$
I_{Device_1L}	Device current $I_{Device\_1L} = I_{X1\_Pin3\_1L} + I_{X2\_Pin3\_1L} + \ldots + I_{X8\_Pin3\_1L}$

Pay attention to the currents explained in the following table for supply line 2 of the IO-Link device:

Current	Description
I_{X21_2L}	Current at connector PWR IN (X21): Current 2L+/reverse current 2L
I_{X22_2L}	Current at connector PWR OUT (X22): Current 2L+/reverse current 2L
I_{Device_2L}	Device current $I_{Device\_2L} = 0$

In this device, supply line 2 is used only for connecting PWR IN (X21) and PWR OUT (X22).

When operating the device, always observe the following rules for the currents in supply lines 1 and 2:

Current	Supply line 1	Supply line 2
Total current for supply line (rule 1)	$I_{X21\_1L} \leq 16$ A $I_{X21\_1L} = I_{Logic} + I_{X22\_1L} + I_{Device\_1L}$	$I_{X21\_2L} \leq 16$ A $I_{X21\_2L} = I_{X22\_2L}$
Permissible pass-through current (rule 2)	$I_{X22\_1L} \leq 16$ A - I_{Logic} - I_{Device_1L}	$I_{X22\_2L} \leq 16$ A
Ports	Port X1, … , X8 (below referred to as port Xi with $1 \leq i \leq 8$)	-
Supply current at pin 1 (rule 3)	$I_{Xi\_Pin1\_1L} \leq 4$ A	-
Signal current at pin 2/4 during operation under standard conditions (rule 3)	$I_{Xi\_Pin2\_1L} \leq 2$ A $I_{Xi\_Pin4\_1L} \leq 2$ A	-
Signal current at pin 2/4 during operation under overload conditions (rule 3)	$I_{Xi\_Pin2\_1L} \leq 2{,}4$ A $I_{Xi\_Pin4\_1L} \leq 2{,}4$ A	-
Reverse current at pin 3 (ground) (rule 3)	$I_{Xi\_Pin3\_1L} \leq 4$ A	-

⚠ CAUTION

DEVICE DAMAGE WHEN THE PERMISSIBLE PASS-THROUGH CURRENT IS EXCEEDED

If you exceed the permissible maximum value for the pass-through current, you risk damage to the device and/or other connected devices.

Failure to follow these instructions can result in injury, or equipment damage.

Requirements on the Power Supply

Power Supply

⚠ WARNING

PELV OR SELV POWER SUPPLY REQUIRED

Operate the device only with 24 V DC voltage supply PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage). If you fail to do so, you risk an electric shock.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Protection

Always protect the supply cable from the power supply unit to the first device with a device circuit breaker or a fuse. For that purpose use a fuse or an automatic circuit breaker 24 V DC/maximum 16 A with type B tripping characteristic.

⚠ CAUTION

DEVICE DAMAGE

Do not exceed the maximum supply current, otherwise you risk damage to the printed circuit board and the connector of the device.

Failure to follow these instructions can result in injury, or equipment damage.

Additional Measures

The chip used in the IO-Link masters can measure the current values of all currents on pins 1, 2, and 4 of all connectors. The chip can also calculate the current sum currents of the two supply lines from several measured values. The current at pin 3 (ground pin) of a connector corresponds to the sum of the currents at pins 1, 2, and 4 of that connector. The measured values enable you to implement a monitoring application with an integrated power management. The application can access the measured values via the OPC UA server. Design the monitoring application in such a way that it meets your individual demands and regularly checks compliance with the monitioring functions using the measured current, temperature and voltage values.

Examples of Supply Types

The device can be supplied with its operating voltage individually, or it can be part of a supply group consisting of several devices.

You have two possibilities of forming supply groups of several devices:

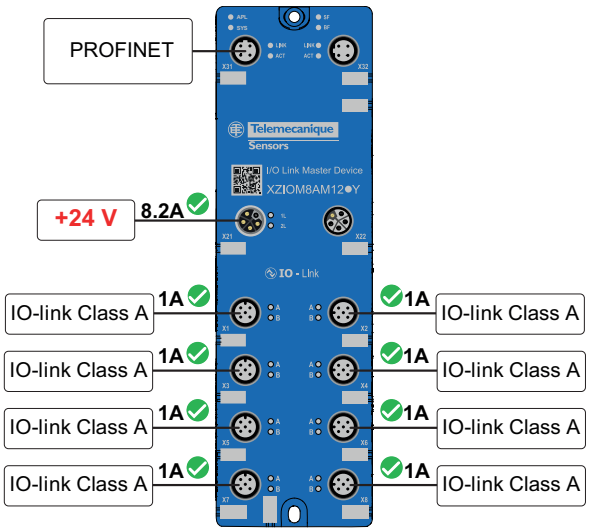
- Via PWR OUT: One or more additional devices can be supplied with power via supply voltage output PWR OUT (X32) and thus form a supply group together with the device.
- Via an IO-Link hub device: A device forms a common supply group with IO-Link hub devices being connected via IO-Link.

One example of single supply and one of group supply is explained below:

- Single supply,
- Supply group via PWR OUT (with a calculation of the permissible pass through current).

Example of a Single Supply

This example shows an individual XZIOM8AM12PY device whose PWR OUT connector (X22) does not supply any other device with power.



One IO-Link class A device each requiring maximum 1 A current is connected to the ports X1 to X8 of XZIOM8AM12PY. XZIOM8AM12PY, requires 0.2 A current.

The total current required in supply line 1 thus is: 8 * 1 A + 0.2 A = 8.2 A.

This value does not exceed the maximum value of 16 A per supply line and is thus permissible.

Example of a Supply Group via PWR OUT

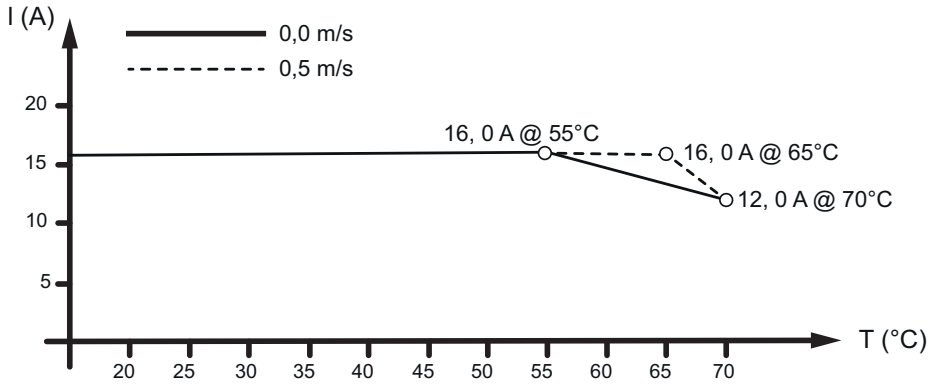
By connecting an additional device to supply voltage output PWR OUT (X22), you form a supply group. The permissible maximum pass-through current of this device is 16 A – 8.2 A = 7.8 A.

Derating

Pay attention to the derating when using the device. Ambient temperature and current influence the heating of the device.

The derating curve was created under the operating conditions "without air flow or with 0.5 m/s air flow" as well as "installation on a wall of poor thermal conductivity". The actual operating conditions may improve the heat dissipation of the device, for example by a higher air flow or a better heat dissipation to the mounting wall. The device provides measured temperature and current values that you can display via the web server or read out via the OPC UA protocol.

The following diagram shows the permissible maximum value of current (I) that may flow into the device depending on the ambient temperature (T):



Mounting

Tools Required for Mounting

For mounting you need the following tools:

- Allen key for the M4 fixing screws with hexagon socket.

Additionally required only for mounting when there is no threaded hole:

- M4 thread tap (ready-made or set of taps),
- Drilling machine (to pre-drill the holes for mounting the device on the system).

Moreover, you need 2 M4 hexagon socket cylinder head screws of suitable length according to DIN 912/ISO 4762.

Before Mounting

Always observe the following notes:

- Only authorized expert electricians qualified in accordance with EN 50110-1/-2 and IEC 60364-1 are allowed to install and commission the device,
- Observe the safety instructions of chapter,
- Before mounting the device, check it for damage, for example transport damage. Damaged devices must not be commissioned.

Mounting Instructions

Observe the following points when selecting the mounting location:

- Mount the device in such a way that it is protected from weathering (no direct sunlight, no salt water or salt spray) and the effects of UV light.
- Only screw the device onto flat contact surfaces to protect it from mechanical tension.
- To protect the device from tensile forces that may occur, do not use it to bridge any gaps.
- To prevent damage to the device, do not mount it in shearing zones of moving system parts. Lay the cables in such a way that they cannot get caught by moving system parts in the shearing zones.
- Leave sufficient space for easy replacement of the device and for connecting the plug connections.
- Make sure that the requirements of the device on vibration and shock resistance are fulfilled at the installation site.
- Mount the device in such a way that its diagnosis LEDs remain visible.

Notes on Protection Against the Heat Generated by the Device

The device can get hot during operation. For that reason, always observe the following notes:

- Do not mount the device in close proximity to objects or equipment that may become hot. In case of a high utilization of the devices, the temperature-dependent working area can be extended by mounting the devices in ventilated areas, on metal surfaces, metal profiles or the like. For optimization you can use the internal temperature measurement of the device.
- Do not mount the device on or near highly flammable materials.
- The cooling of the device must not be impaired.
- Check that the air supply is unobstructed.

Mounting

The devices is mounted with two M4 screws in the cabinet. Note, that the device has to be connected via a screw to FE (Function earth).

Installation

General Information on Installation

Lay the cables in accordance with local conditions and regulations.

Keep the min. distances between the cabling and possible sources of interference (including machines, welding equipment, power lines) to avoid data loss and corruption. Observe the applicable standards and regulations for planning and installing a system.

Mechanical Stress

Observe the following information to protect the cables from mechanical stress:

- Select the correct line type for your application. Make sure that the wires have a sufficient cross-section,
- Consider the min. bending radius,
- Make sure that lines do not enter the shear area of moving machine parts,
- Do not lay the cables crosswise to travel paths and machine movements,
- Use cable channels or cable bridges.

Interference

Follow these instructions to reduce interference:

- Lay network cables (for example Ethernet cables) in separate cable channels.
- Do not lay network cables parallel to supply lines that are used for high power.
- When installing shielded connectors (screws, union nuts), implement the best possible contact between shielding and ground. Check the connection of the grounding or shielding of the cables for low impedance passage before the first commissioning.

Protective Caps

Use protective caps for currently unused connectors to protect the connectors and to make IP67 protection effective. Protective caps are included within the scope of delivery.

Connecting Lines

Telemecanique Sensors recommends the use of factory-made connection lines for the IO-Link master class A devices. The tightening torques specified in section Technical data apply to the connectors of the connecting cables.

Mounting Distances

No specific distances are prescribed between two devices of the "IO-Link master" product family or between a device and a cabinet door or cover. The mounting distances depend only on the connectors, cables, and their bending radii. A factory-made connector can project beyond the edge of the respective housing.

The distance between one IO-Link Master and one IO-Link sensor / actuator is limited to 20 m *(65.61 ft)*.

In case of high ambient temperatures and high current loads at the same time, the devices of the product family "IO-Link master" should not be mounted directly next to each other, so that they do not heat up each other and have a large surface area for heat dissipation to the ambient air.

Grounding

Basically, you have two options for grounding the device:

1. Via cable
2. Via the housing

You can apply both options individually or together.

The IO-Link master class A operates in the low voltage range (SELV/PELV). With these devices, functional earth (FE) is only used to dissipate interference, not as a touch protection for people.

NOTE: Functional grounding is essential for trouble-free operation of the device. Use conductive fixing screws at the mounting holes and make sure that they have good contact.

Connecting Power Supplies

For the devices of the "IO-Link master" product family, two voltages are distinguished:

- 1L to supply logic and sensors/actuators
- 2L to supply actuators (separate actuator supply)

All supply voltages are connected via L-coded M12 connectors.

The 2L voltage of IO-Link master class A devices is not used for the separate power supply of actuators, it is only passed through.

⚠ CAUTION

DAMAGE TO THE ELECTRONIC SYSTEM

Connect each of the supply voltages separately with +24 V and 0 V. Connecting several supply voltages via a common 0 V connection is not permitted because this exceeds the current carrying capacity of the contacts.

Failure to follow these instructions can result in injury, or equipment damage.

Power Supplies 1L and 2L

The voltages 1L and 2L are galvanically separated in the device and fed in at connection X21.

The 1L power supply serves to supply the electronic system of the device and the connected sensors/actuators. Connect these to connector X21. If you want to supply additional devices via this current path, connect the supply voltage output (connection X22) of your IO-Link Master to the supply voltage input of the next device to be supplied. If this device has a pass-through possibility for the supply voltage, you can also set up a cascaded power supply.

⚠ CAUTION

DAMAGE TO THE ELECTRONIC SYSTEM

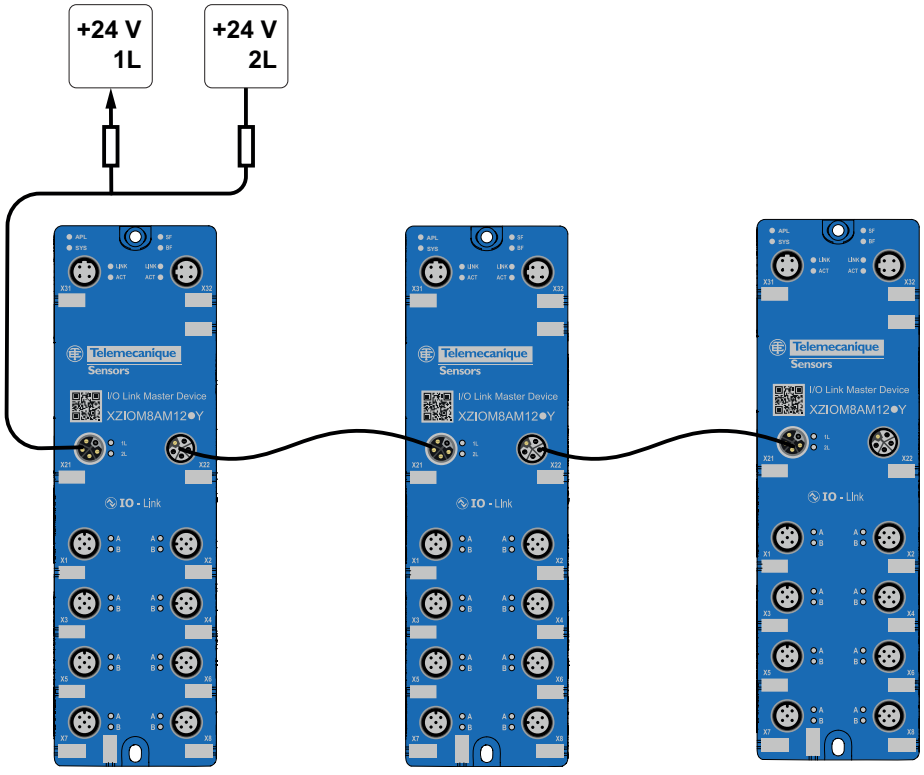
The maximum current carrying capacity of the L-coded M12 connectors of a current path (1L or 2L) is 16 A. Protect both current paths independently of each other so that the sum of all currents in the respective current path never exceeds the limit value of 16 A. To calculate the permissible maximum value of the pass-through current, see Device-dependent Information - IO-Link devices, page 23. Note that connection X22 (supply voltage output) is not monitored for overload. Exceeding the permissible current carrying capacity may damage the connectors.

Failure to follow these instructions can result in injury, or equipment damage.

NOTE: For a description of the supply voltage connections (M12, L-coded), see Connectors and Interfaces, page 12.

Telemecanique Sensors recommends using factory-made connection cables.

The following figure shows an example of supplying and passing through voltages:



Load Capacity of the Supply Line (M12)

Consider the permissible current carrying capacities, see section Device-dependent Information - IO-Link devices, page 23.

⚠ CAUTION

DAMAGE TO THE ELECTRONIC SYSTEM

When passing through the supply voltage, observe the following upper limit:

Maximum total current at 1L: 16 A.

Maximum total current at 2L: 16 A.

The ambient temperature also influences the permissible total current. The above information is valid for room temperature. To consider the influence of higher temperatures, observe the notes on temperature-related derating, see Derating, page 26.

Failure to follow these instructions can result in injury, or equipment damage.

Examples of Calculation

For examples of calculation of the permissible maximum pass-trough, see Device-dependent Information - IO-Link devices, page 23.

Calculation of Cable Loss

You can calculate the cable loss per wire as follows:

$U = 2 \times I \times R_L$

Parameters for calculating the cable loss per wire:

U	Voltage drop
2	Factor for the feed and return cable
I	Current
R_L	Cable resistance

The line resistance R_L (per wire) of a supply line of 4 x 1.5 mm^2 is:

$R_L \leq 13.7\ \Omega/KM$

Example of the voltage drop per wire at a current of 8 A on a supply line of 4 x 1.5 mm2:

$U = 2 \times 8\ A \times 13.7\ \Omega/km = 219.2\ V/km$

This corresponds to a voltage drop of 2.19 V per 10 m cable length.

For the supply line of 4 x 2.5 mm^2 (fine-wire, class 6), the line resistance R_L per wire is:

$R_L \leq 8.22\ \Omega/km$

Example of the voltage drop per wire at a current of 16 A on a supply line of 4 x 2.5 mm_2:

$U = 2 \times 16\ A \times 8.22\ \Omega/km = 263\ V/km$

This corresponds to a voltage drop of 2.63 V per 10 m cable length.

Suggestion:

If you do not know the resistance of the cable used, you can calculate it with the following formula:

$R_L = l/(K \times A)$

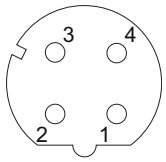
Parameters for calculating the resistance:

R_L	Cable resistance
I	Cable length
K	Specific resistance of the conductor material (mostly copper) according to the manufacturer's specification
A	Wire cross section (refers to the cross section of a single wire)

Connect PROFINET

To establish a connection with a PROFINET IO-Controller, you have to connect the device to a network with a transmission rate of 100 Mbps in full duplex mode.

The following table shows the assignment of the Ethernet connections:

Ethernet	Pin	Signal	Description
	1	TX+	Send data positive
	2	RX+	Receive data positive
	3	TX-	Send data negative
	4	RX-	Receive data negative
	Housing	Shielding	Shield connection, housing is connected to functional earth.

If the Ethernet cable (with RJ45 connector) used is ready-made at one end, a shielded M12 connector with a degree of protection IP 67 must be installed at its other end.

The assignment between the signals, the colors of the individual wires and the contacts on the M12 and RJ45 connectors is as follows:

Contact	Contact	Color	RJ45 connector contact
1	TX+	Yellow	1
2	RX+	White	2
3	TX-	Orange	3
4	RX-	Blue	6

A crossover cable is not required. Since the Auto-MDI(X) function is enabled for the respective Ethernet port and automatically detects the send and receive data direction, it does not matter whether you use a crossed or an uncrossed cable.

Connecting a single device to an Ethernet network

To connect the device to the Ethernet network, proceed as follows:

Step	Action
1	Disconnect that part of the plant from the power supply to which you have mounted the device.
2	Connect the device to the Ethernet network by plugging the Ethernet cable into connector X31.
3	Thereafter, tighten the connector with the knurled screw.

Connecting several devices to an Ethernet network

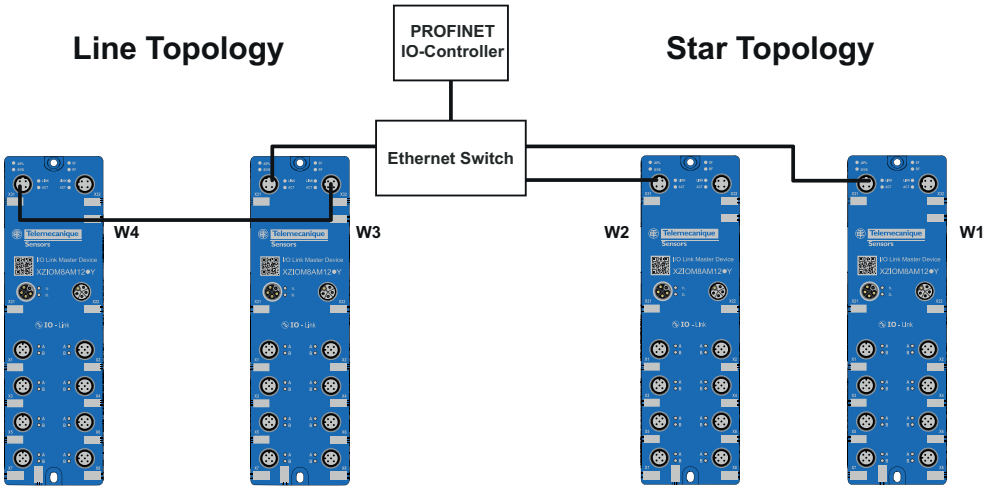
The XZIOM8AM12PY has two ports with an integrated switch so that a line topology can be wired.

The network topology shown in the figure below consists of a mixed star and line topology. To set up a star topology or a mixed topology, you need an Ethernet switch. Only the Ethernet specification IEEE 802.3 limits the number of devices of a star topology.

To connect several devices to the Ethernet network, proceed as follows:

Step	Action
1	Disconnect that part of the plant from the power supply to which you want to mount the device.
2	For a star topology, connect the Ethernet cables (W1, W2) to connector X31 of each device and an Ethernet switch, as shown in the figure below. Then tighten the connectors of the Ethernet cable.
3	For a line topology, connect the Ethernet cables (W3, W4) to connectors X31 and X32 on the device as shown in the figure below. Then tighten the connectors of the Ethernet cable.

The following figure shows how to set up a PROFINET network with a mixed star and line topology:



For connecting a further device, proceed as follows:

Step	Action
1	For a line topology: Connect the next device to the free Ethernet output X32 of the last IO-Link class A device. Connect this output to input X31 of the new device.
2	For a star topology, connect the next device to a free Ethernet output of the switch. Connect this output to input X31 of the new device.

Connecting Sensors and Actuators

The sensor/actuator cables serve to supply connected sensors or actuators and to transmit the sensor and actuator signals.

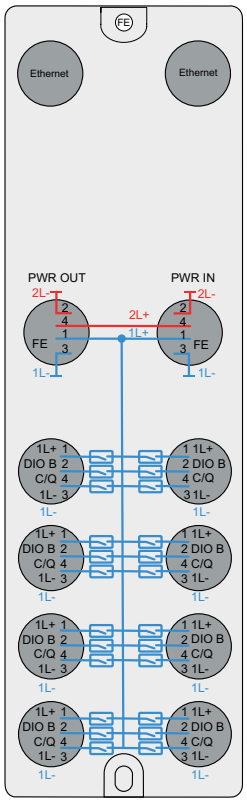
Observe the highest current carrying capacity of the supply contacts, see Rule 3 Ports X1, X2, page 22.

If a port is operated in IO-Link mode, a maximum of 1 A may flow via pin 1 and pin 3 without additional measures. The use of standard cables allows lengths of up to 20 m as long as the current remains below 1 A.

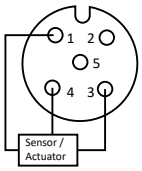
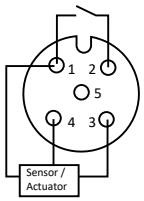
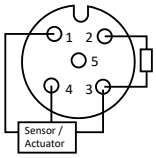
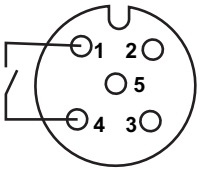
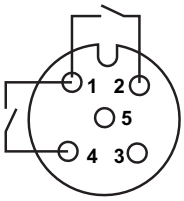
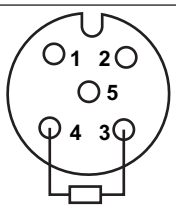
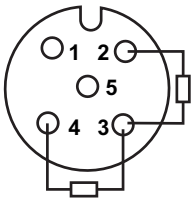
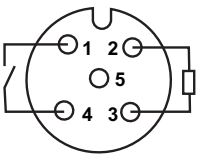
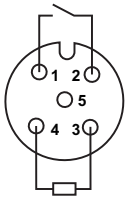
Higher currents are possible, but require a higher conductor cross-section or a shorter cable length to keep the voltage drop below 1.2 V along the return path of the current.

The following figure shows the potential routing of the two load circuits within the device.

Schematic diagram of the supply:



The following table shows the connection options for IO-Link devices (class A), digital inputs and outputs:

Connection	Description
	Connection of an IO-Link device. Required port configuration: IO-Link master and pin 2 deactivated.
	Connection of an IO-Link device and a digital input to channel B. Required port configuration: IO-Link master and pin 2 as a digital input.
	Connection of an IO-Link device and a digital output to channel B. Required port configuration: IO-Link master and pin 2 as a digital output.
	Connection of a digital input to channel A. Required port configuration: Pin 4 as a digital input and pin 2 deactivated.
	Connection of two digital inputs to channel A and B. Required port configuration: Pin 4 and pin 2 as a digital input.
	Connection of a digital output to channel A.Required port configuration: Pin 4 as a digital output and pin 2 deactivated.
	Connection of two digital outputs to channel A and B. Required port configuration: Pin 4 and pin 2 as a digital output.
	Connection of a digital input to channel A and a digital output to channel B. Required port configuration: Pin 4 as a digital input and pin 2 as a digital output.
	Connection of a digital output to channel A and a digital input to channel B. Required port configuration: Pin 4 as a digital output and pin 2 as a digital input.

Commissioning

Setting the IP address

The device needs an IP address so that it can be addressed via Ethernet. The device has no IP address when delivered. here is a way of setting the required IP address.

- The PROFINET IO-Controller sets the IP address while PROFINET is booting.

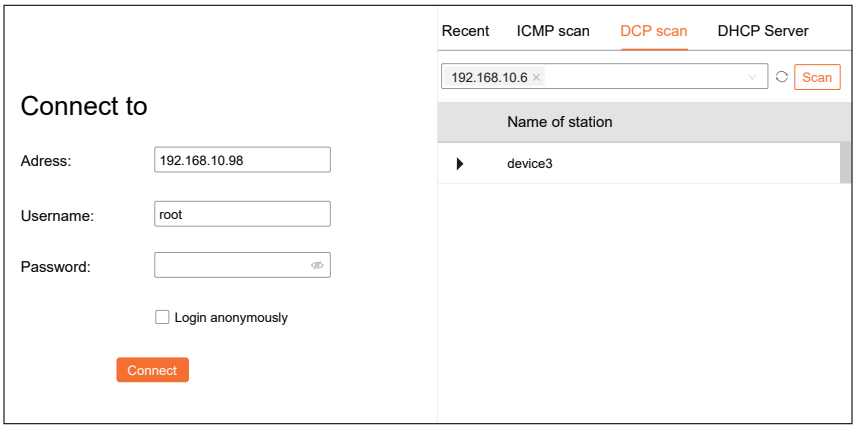
DCP Scan

To find PROFINET devices, you can use the DCP protocol. PROFINET DCP (Discover and Configuration Protocol) is a network protocol used to facilitate the discovery and configuration of PROFINET devices in a network.

To perform a DCP scan to find PROFINET devices:

Step	Action
1	Select the **DCP scan** tab.
2	Select the IP addresses the app can use for the DCP scan. Click the drop-down list of the available Ethernet interfaces to add an IP address. Click the refresh button to update the list. Alternatively, remove an IP address if this interface is not to be used for the DCP scan.
3	Click **Scan** to start the DCP scan. The app sends DCP requests via the network. The app is waiting for incoming responses.

DCP Identify requests are sent to all devices via the selected Ethernet interfaces. If you click an item in the list, the IP address of that device is transferred to the **Address** field.

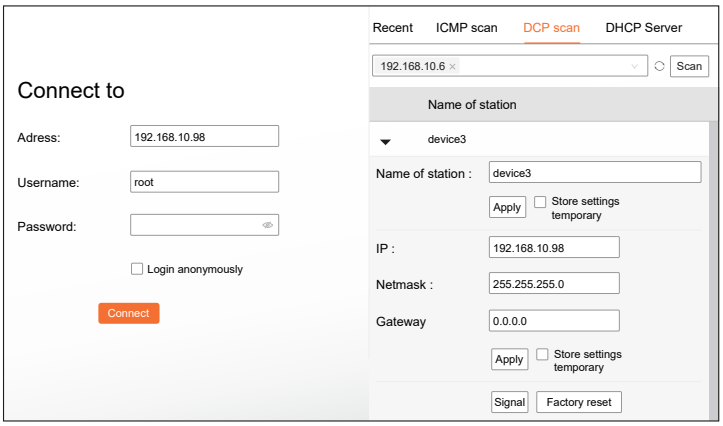


It takes approx. 10 seconds for all PROFINET devices to answer. To commission the PROFINET device you can set or modify the Name of Station. You can set or modify the IP address, network mask, and gateway address of the PROFINET device. Make your settings effective using **Apply**.

If needed, the settings can be stored temporarily in the PROFINET device.

To identify a PROFINET device, you can use the signal function. Click **Signal** and the SF LED of the PROFINET device will blink for 3 seconds.

Factory reset sets the Name of Station, the IP address, the network mask, and the gateway address of the PROFINET device back to factory setting.



Configuration Tools

Overview

There are several ways to set the parameters of the IO-Link Master Device. The following table provides an overview of the tools.

Tool	Description
PLC with PROFINET IO-Controller	The **PROFINET IO-Controller** must be configured to exchange process data with XZIOM8AM12PY. The GSDML file GSDML-V2.42-TELEMECANIQUE-IOLinkMaster-YYYYMMDD.xml describes the PROFINET device. The configuration software of the PROFINET IO-Controller imports this GSDML file and the user can configure and parameterize XZIOM8AM12PY. The user loads the configuration into the PROFINET PLC. The PROFINET PLC configures and parameterizes XZIOM8AM12PY via PROFINET.
IO-Link Master device web server	The **IO-Link Master device web server** is a web server integrated in XZIOM8AM12PY. With a web browser, the user can open the web pages to view and change parameters.
Simply Config IO-Link	**Simply Config IO-Link** is a software for configuring the IO-Link Master and the IO-Link Devices.

Configuration and parameterization are subdivided in the following sections:

3. PROFINET configuration: PROFINET modules and submodules.
4. Port configuration: IO-Link Master, digital input or output.
5. IO-Link Device configuration.

The following table shows which tool can influence which section.

Tool	PROFINET modules and submodules	Port configuration	IO-Link Device configuration
PROFINET IOController	The PROFINET IO-Controller configures the PROFINET modules and submodules of the device.	Based on the parameters in the GSDML file, the IOController sets parameters selected by the user. These parameters configure each individual port and determine whether the port is used as an IO-Link master, as a digital input or as a digital output (or whether it is= deactivated).	-
IO-Link Master device web server	-	Yes	Objects of the IO-Link Device can be read and written. For this purpose, the IO-Link Master device web server uses ISDU (Indexed Service Data Unit) services. This requires expert knowledge and the object description of the IO-Link Device used. The IO-Link Master device web server does not evaluate IODD.
Simply Config IO-Link	-	Yes	Yes Simply Config IO-Link can use IODD to parameterize an IO-Link Device.

NOTE: With each start of the PROFINET communication, the PROFINET IO-Controller transfers the configuration and parameters to XZIOM8AM12PY. Port configuration parameters set by the IO-Link Master device web server, Simply Config IO-Link software, or the OPC UA client for XZIOM8AM12PY will be overwritten. Parameters set via PROFINET have priority.

If you have changed port configuration parameters via the IO-Link Master device web server, the Simply Config IO-Link software, or the OPC UA client for XZIOM8AM12PY, note that the device will initially accept these changes, but the PROFINET IO-Controller will overwrite them as soon as it starts again. If you want to change the port configuration parameters, change them in the configuration software of the PROFINET IO-Controller.

IO-Link Master Web Server

The IO-Link master web server is a web server integrated in the device.

You need a browser to access the IO-Link master web server in order to:

- Display and change device settings,
- Display port-specific information for ports X1, X2, …,
- Log user administration, user setup as well as users on and off,
- Reset the device to factory settings and reload firmware.

Port-specific information includes, for example:

- Display of the current measuring values of the ports (temperature, voltage, current of each pin) and information on the connected IO-Link device,
- Display of status information of the port,
- Port configuration: for example setting the operating mode,
- Read and write access to the connected IO-Link devices,
- Display of process data.

Simply Config IO-Link

The Simply Config IO-Link application enables the configuration of the IO-Link master, the IO-Link ports, and the connected IO-Link devices.

Moreover, Simply Config IO-Link enables access to diagnosis data, events, and the indices/subindices of the connected IO-Link devices.

Simply Config IO-Link can be used with the operating systems Windows, Apple MacOS, and Linux.

Configuring PROFINET

To configure the PROFINET IO-Controller, you require the GSDML file:

```
GSDML-V2.42-TELEMECANIQUE-IOLinkMaster-YYYYMMDD.xml
```

YYYYMMDD is a date (YYYY= year, MM= month, **DD**= day)

Import the GSDML file into the configuration software of the PROFINET IO-Controller used.

Further steps in the configuration software of the IO-Controller:

Step	Action
1	Select device XZIOM8AM12PY from the device catalog.
2	Configuring the ports.
3	Set parameters.

Configuring the Port / Select Modules

For each IO-Link port, set the type of sensor/actuator to be connected.

- If an IO-Link Device is to be used on this port, select an "IO-Link xx I / xx O +PQI". The selection of the data amount depends on the IO-Link Device used.
- If you use a digital input at the port (pin 4), select "Digital Input PIN 4".
- If you use a digital output at the port (pin 4), select "Digital Output PIN 4".

If you use a digital input or output at pin 2 of a port, set the port parameters accordingly as described below.

PROFINET IO-Device

The PROFINET device is a modular device. Slot 0 is the PROFINET access point with 4 submodule. Slot 1 contains the IO-Link Master and 8 IO-Link ports.

Slot	Subslot	Submodule	Description
0	1	DAP	Device access point (fix)
0	32768	PN-IO	PROFINET interface (fix)
0	32769	Port 1	PROFINET port 1 (fix)
0	32770	Port 2	PROFINET port 2 (fix)
1	1	IO-Link Master	IO-Link Master (fix) 2 input and 2 output bytes
1	2	Configuration port X1	Configures the port: Digital input, digital output or IO-Link communication. Selection, see following table.
1	3	Configuration port X2	
1	4	Configuration port X3	
1	5	Configuration port X4	
1	6	Configuration port X5	
1	7	Configuration port X6	
1	8	Configuration port X7	
1	9	Configuration port X8	

Submodule	Description	Input process data (PD_IN)	Output process data (PD_OUT)
Digital input pin 4	Digital input (for pin 4)	1 byte	-
Digital output pin 4	Digital output (for pin 4)	-	1 byte
IO-Link 32 I / 32 O + PQI	IO-Link with 32 bytes input and 32 bytes output data and Port Qualifier Information	32 bytes + 1 byte PQI	32 bytes
IO-Link 16 I / 16 O + PQI	IO-Link with 16 cytes input and 16 bytes output data and Port Qualifier Information	16 bytes + 1 byte PQI	16 bytes
IO-Link 8 I / 8 O + PQI	IO-Link with 8 bytes input and 8 bytes output data and Port Qualifier Information	4 bytes + 1 byte PQI	4 bytes
IO-Link 2 I / 2 O + PQI	IO-Link with 2 bytes input and 2 bytes output data and Port Qualifier Information	2 Bytes + 1 byte PQI	2 bytes
IO-Link 1 I / 1 O + PQI	IO-Link with 1 byte input and 1 byte output data and Port Qualifier Information	1 byte + 1 byte PQI	1 byte

Submodule	Description	Input process data (PD_IN)	Output process data (PD_OUT)
IO-Link 32 I + PQI	IO-Link with 32 bytes input data and Port Qualifier Information	32 bytes + 1 byte PQI	-
IO-Link 16 I + PQI	IO-Link with 16 bytes input data and Port Qualifier Information	16 bytes + 1 byte PQI	-
IO-Link 8 I + PQI	IO-Link with 8 bytes input data and Port Qualifier Information	8 bytes + 1 byte PQI	-
IO-Link 2 I + PQI	IO-Link with 2 bytes input data and Port Qualifier Information	2 Bytes + 1 byte PQI	-
IO-Link 1 I + PQI	IO-Link with 1 byte input data and Port Qualifier Information	1 byte + 1 byte PQI	-
IO-Link 32 O + PQI	IO-Link with 32 bytes output data and Port Qualifier Information	1 byte PQI	32 bytes
IO-Link 16 O + PQI	IO-Link with 16 bytes output data and Port Qualifier Information	1 byte PQI	16 bytes
IO-Link 8 O + PQI	IO-Link with 8 bytes output data and Port Qualifier Information	1 byte PQI	4 bytes
IO-Link 2 O + PQI	IO-Link with 2 bytes output data and Port Qualifier Information	1 byte PQI	2 bytes
IO-Link 1 O + PQI	IO-Link with 1 byte output data and Port Qualifier Information	1 byte PQI	1 byte

Setting Parameters

The IO-Link Master parameters in the following table always have to be configured.

Parameter group	Parameter	Value range	Description
Digital IO layout configuration	PD layout	0: Port based	Sequence of digital input and digital output in the process data: Port 1 (Bit 0 and 1), Port 2 (Bit 2 and 3), …, Port 8 (Bit 14 and 15) (default). For each port, pin 4 is transferred first, then pin 2.
		1: Pin Based	Sequence of digital input an digital output in the process data: Pin 4 (Port 1 to 8), pin 2 (Port 1 to 8).
Digital Output substitute configuration	Digital Output substitute configuration	Sequence of digital input an digital output in the process data: Pin 4 (Port 1 to 8), pin 2 (Port 1 to 8).	In case of an error, all digital outputs will be set to low signal (default).
		1: Set Digital output Pins to definedSubstitute Value	In case of an error, digital outputs will be set to a predefined substitue value. If using this setting, the value of parameter “Digital Output substitute Value“ defines the substitute value.

Parameter group	Parameter	Value range	Description
		2: Hold last value of Digital Output Pins	In case of an error, digital outputs will be hold its last value.
	Digital Output substitute Value	0..65535	Substitute value for digital outputs if setting “Set Digital output Pins to defined Substitute Value“ is used (default: 0). The value to be entered depends on the setting of parameter "PD layout". Use a binary to decimal calculator to calculate this value.

Parameter group	Parameter	Value range	Description
Standard-Input mode (DI PIN 2)	Set Digital Input Logic	0: Digital Input not inverted(NO normally open)	Mode of digital input/ output: Signal at pin 2 will not be inverted (default).
		1: Digital Input not inverted(NC normally open)	Mode of digital input/ output: Signal at pin 2 will be inverted.
	Set Digital Input Filter Time	0: no Filter	No filter to detect a signal change of the digital input pin 2 active (Default).
		30: 3ms Filter Time	Setting the filter time to detect a signal change of the digital input pin 2. The filter time is the duration, a signal has to apply for recongnizing a signal change.
		150: 15ms Filter Time	
		200: 20ms Filter Time	
IO-Link Port parameter	Enable Port diagnosis	0: Disable	The PROFINET port diagnosis is deactivated, e.g. no alarms will be sent.
		1: Enable	The PROFINET port diagnosis is activated (Default).
	Enable Process Alarm (device notification)	0: Disable	PROFINET process alarms are deactivated.
		1: Enable	PROFINET process alarms are activated (Default).
	Configuration Source	0: PDCT (Port and Device Configuration Tool)	Configuration by PDCT.
		1: PNIO	Configuration by PROFINET IO-Controller (Default).
	Configuration by PROFINET IO-Controller (Default).	0: Disable	Input fraction is deactivated (Default).
		1: Enable	Input fraction is activated.
	Enable Pull/Plug	0: Disable	PROFINET pull/plug alarms are deactivated.
		1: Enable	PROFINET pull/plug alarms are avtivated (Default).

Parameter group	Parameter	Value range	Description
	Port mode	0: Deactivated	Port mode: The port is deactivated.
		1: IOL_Manual	The port will be used as an IO-Link port with a manual (user-defined) configuration.
		2: IOL_Autostart	The port will be used as an IO-Link port with an automatic (plug and play) configuration (Default).
	Validation / Backup	0: No Device check	No device validation or Backup for the connected IOLink Device (Default).
		1: Type-compatible device (V1.0)	Device validation and Backup for the connected IO-Link Device.
		2: Type-compatible device (V1.1)	
		3: Type-compatible V1.1 device with Backup + Restore	
		4: Type-compatible V1.1 device with Restore	
	PIN 2 configuration	Not supported	Pin 2 will not be used.
		Digital Input	Pin 2 used as digital input.
		Digital Output	Pin 2 used as digital output.
	Port cycle time	0 … 255	Port cycle time, in tenths of a millisecond. Typical values according to IO-Link specification:0: as fast as possible16: 1.6 ms32: 3.2 ms 48: 48 ms68: 8.0 ms100: 20.8 ms133: 40.0 ms158: 80.0 ms183: 120.0 ms
	Vendor ID	0 … 65535	Vendor ID (see ioddfinder.io-link.com)
	Device ID	0 … 4294967295	Device ID (see ioddfinder.io-link.com)

Parameter group	Parameter	Value range	Description
Stan-dard-Input mode (DI PIN 2)	Set Digital Input Logic	0: Digital Input NO normally open	Mode of digital input/out-put: Signal at pin 2 will not be inverted (default).
		1: Digital Input NC normally closed	Mode of digital input/out-put: Signal at pin 2 will be inverted.
	Set Digital Input Filter Time	0: no Filter	No filter to detect a signal change of the digital input pin 2 active (Default).
		30: 3ms Filter Time	Setting the filter time to detect a signal change of the digital input pin 2. The filter time is the duration, a signal has to apply for recongnizing a signal change.
		150: 15ms Filter Time	
		200: 20ms Filter Time	

Parameter group	Parameter	Value range	Description
Standard-Input mode (DI PIN 4)	Set Digital Input Logic	0: Digital Input NO normally open	0: Digital Input NOnormally open
		1: Digital Input NC normally closed	Mode of digital input/output: Signal at pin 4 will be inverted.
	Set Digital Input Filter Time	0: no Filter	No filter to detect a signal change of the digital input pin 4 active (Default).
		30: 3ms Filter Time	Setting the filter time to detect a signal change of the digital input pin 4. The filter time is the duration, a signal has to apply for recongnizing a signal change.
		150: 15ms Filter Time	
		150: 15ms Filter Time	
IO-Link Port parameter	Enable Port diagnosis	0: Disable	The PROFINET port diagnosis is deactivated, e.g. no alarms will be sent.
		1: Enable	The PROFINET port diagnosis is activated (Default).
	Enable Process Alarm (device notification)	0: Disable	PROFINET process alarms are deactivated.
		1: Enable	PROFINET process alarms are activated (Default).
	PIN 2 configuration	Not supported	Pin 2 will not be used.
		Digital Input	Pin 2 used as digital input.
		Digital Output	Pin 2 used as digital output.

Parameter group	Parameter	Value range	Description
Standard-Input mode (DI PIN 2)	Set Digital Input Logic	0: Digital Input NO normally open	Mode of digital input/output: Signal at pin 2 will not be inverted (default).
		1: Digital Input NC normally closed	Mode of digital input/output: Signal at pin 2 will be inverted.
	Set Digital Input Filter Time	0: no Filter	No filter to detect a signal change of the digital input pin 2 active (Default).
		30: 3ms Filter Time	200: 20ms Filter Time
		150: 15ms Filter Time	
		200: 20ms Filter Time	
IO-Link Port parameter	Enable Port diagnosis	0: Disable	The PROFINET port diagnosis is deactivated, e.g. no alarms will be sent.
		1: Enable	The PROFINET port diagnosis is activated (Default).
	Enable Process Alarm (device notification)	0: Disable	PROFINET process alarms are deactivated.
		1: Enable	PROFINET process alarms are activated (Default).
	PIN 2 configuration	Not supported	Pin 2 will not be used.
		Digital Input	Pin 2 used as digital input.
		Digital Output	Pin 2 used as digital output.

Configuring Device Name and IP-Address

In delivery state and after a factory reset, the IO-Device has no PROFINET device name and IP address 0.0.0.0.

The IO-Device requires a unique PROFINET device name to allow the IOController to communicate with the IO-Device. In the engineering software, assign a PROFINET name to the device.

During start of the PROFINET network, the IO-Controller configures the IP address.

Configuring via IO-Link Master Web Server

With the help of a standard browser, you can obtain detailed information on the current operating status of the device, make settings and thus influence the device behavior.

Functional Overview

The following overview shows the functions of the IO-Link master web server that is integrated into the device and the menu or tabs of the user interface via which you can activate these functions:

Menu	Tab	Description	Section
Dashboard	–	Display of device-specific information	Dashboard, page 48
Port X1, X2 …	(all)	Port-specific information and settings for the selected IO-Link ports (X1, X2 …)	Displaying Port Status Information, page 52
	Information	Display of current port-specific measuring values (temperature, voltage, current and status at pins 1, 2 and 4) and information on the IO-Link device connected to the selected port	Displaying Measuring Values and IO-Link Device Information, page 50
	Status	Display of port-specific status information for the selected port	Displaying Port Status Information, page 52
	Configuration	Performing port-specific settings (for example operating mode or device check for Validation & Backup)	Configuring the Port, page 56
	IOL	Access to an IO-Link device connected to the selected port	Accessing a Connected IO-Link Device, page 60
	Process data	Display of the configured process data (input/output)	Displaying the Process Data, page 55
Settings	(all)	Device settings	-
	Device configuration	Configuring parameters for IP-connection	Configuring IP-Parameters, page 62
	Maintenance information	Storing maintenance information in the device	Entering Maintenance Information, page 63
	Factory reset	Resetting the device to the factory setting	Resetting the Device to the Factory Settings, page 67
	Firmware update	Firmware update	Firmware Update, page 65
User administration	–	Managing users	Signing Users In/Out and Managing Users, page 68
Sign-in, Sign-out	–	Signing users in and out	Signing Users In/Out and Managing Users, page 68

Open the IO-Link Master Web Server

Prerequisite: For opening the user interface of the IO-Link master web server, the IP address of the device must be configured and known.

For this purpose, proceed as follows:

- To address the device, enter the following text in the address line of your web browser:
  http://<Configurable IP-Address>
  http://192.168.10.2
- Upon opening the user interface of the IO-Link master web server, first the page **Dashboard** appears with the following device-specific information.

Dashboard

When you open the user interface of the IO-Link master web server, the register page **Dashboard** is displayed first.

This page displays the following device-specific information:

Area	Displayed information
Vendor information	Contact data of the device manufacturer
Device information	Device data
Device version	Version data of the device: • Hardware version number • Software version number • Version number of the web page
Maintenance information	Maintenance information in text form
IOL device information	IO-Link device information (measuring data concerning the current status of the device)

The maintenance information include indications in text form to be determined by the user, for example concerning device name, installation place, installation date, contact information, description, date of the last and next service of the device. You can edit these texts via tab **Maintenance information** of menu **Device settings** (see Configuring via IO-Link Master Web Server, page 47).

The extended information on devices and ports include the following data measured by the sensors integrated in the device:

- Device temperature,
- Supply voltage (for supply lines 1L and 2L),
- Sum of all currents (for supply lines 1L and 2L).

Displaying Port Information

By means of the tabs Information, Status, Configuration, IOL and Process data, you can display information on every single IO-Link port of the device (port X1, portX2 …).

The tab **Configuration** also enables you to make port-specific settings, see Configuring the Port, page 56.

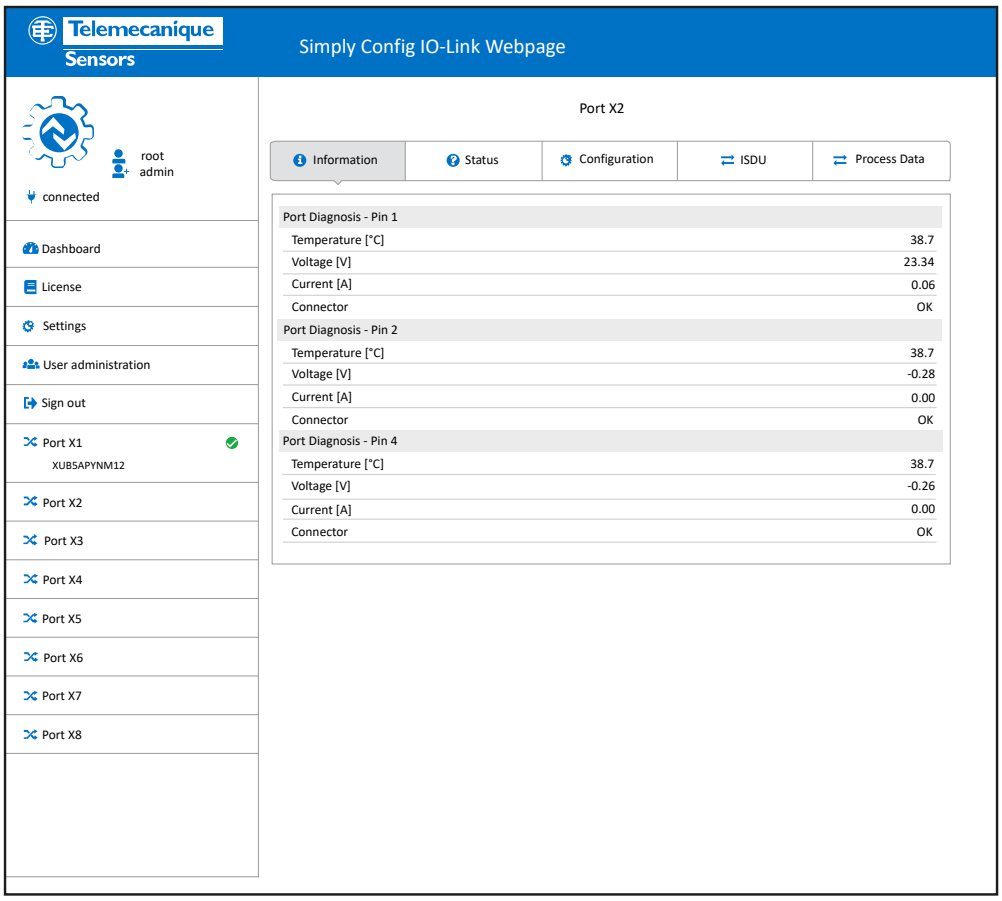
To access the port-specific information, proceed as follows:

Step	Action
1	Click the port in question (X1, X2 …) in the left column to display the information you need.
2	The tab Information is displayed.
3	Click the desired tab.
4	This enables you to access the information on the desired port.

The following five tabs are available for each port:

Tab	Description
Information	Display of the current measuring values: Temperature, voltage, current, and port status (individually for pin 1, 2 and 4). If an IO-Link device is connected to the port via pin 4, its device data is also displayed. This tab is preset.
Status	Display of port-specific status information
Configuration	Display and setting of port parameters, for example operating mode or port cycle time, see .
IOL	Read/write access to the data of an IO-Link device connected to the port.
Process data	Display of the current process data

Displaying Measuring Values and IO-Link Device Information



For the selected port, the tab **Information** shows:

- The measuring values and statuses of the port diagnosis.
- The information on the connected IO-Link device.

Displaying Pin and Port-Specific Measuring Values and Statuses

The tab **Information** shows the following current measuring values individually for pin 1, 2 and 4 of the selected port:

- Temperature of the pin, measured in °C
- Voltage at the pin, measured in Volt
- Current flowing through the pin, measured in Ampere
- Status of the connecting pin

Statuses of the Connecting Pin

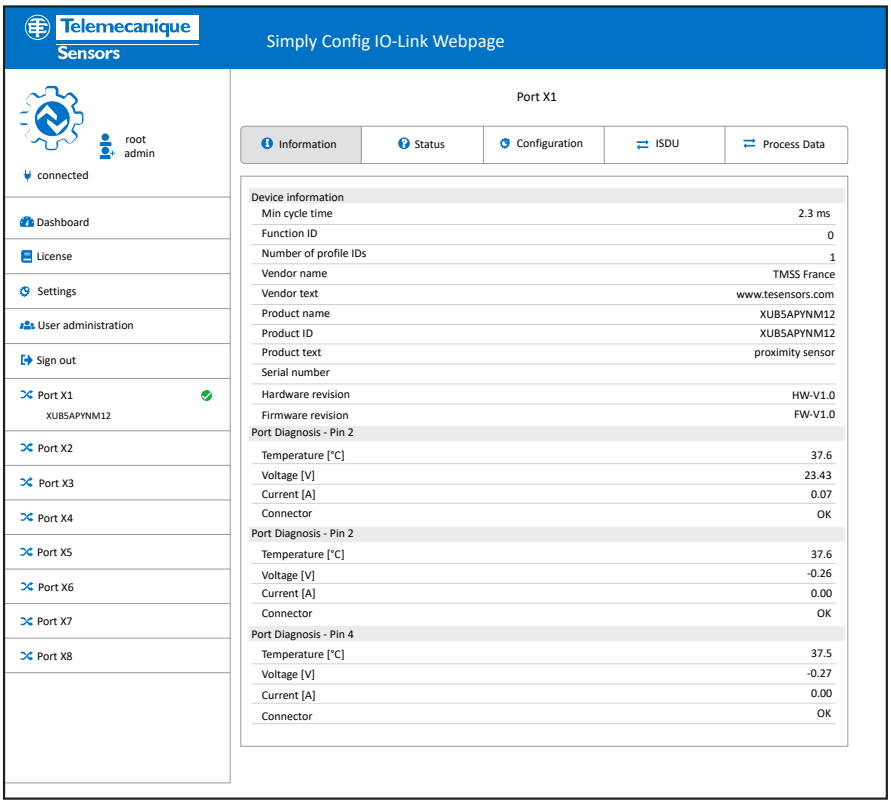
Possible statuses of the connecting pin:

- OK
- Short circuit
- Reaction of the device-internal overload protection
- Reaction of the device-internal overtemperature protection
- Reaction of the device-internal overvoltage protection
- Overcurrent
- Undercurrent
- Overtemperature
- Undertemperature
- Overvoltage
- Undervoltage
- Expiration of the device-internal watchdog timer

Displaying Information on the Connected IO-Link Device

If an IO-Link device is connected to the selected IO-Link port and if the firmware of the IO-Link master has identified this device, the block **Device information** is displayed additionally.

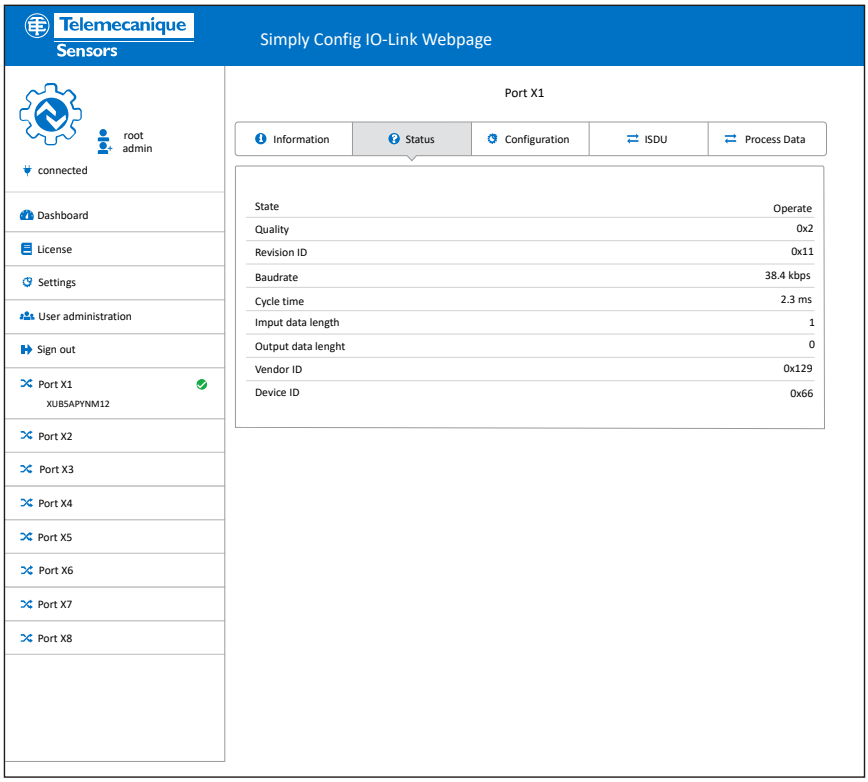
IO-Link master - port X1, X2… - Additional device information in the tab **Information**:.



The block **Device information** displays the following device-specific information on this IO-Link device:

Indication	Indication
Min. cycle time	Min. cycle time supported by the connected device in units of 0.1 milliseconds. Coding, see Master Cycle time
Function ID	Function-ID of the connected device
Number of profile IDs	Number of profile IDs in the profile characteristic (Index 0x000D) of the connected device
Vendor name	Name of the manufacturer/vendor of the connected device in detail (up to 64 characters)
Vendor text	Additional descriptive text about the manufacturer/vendor (up to 64 characters)
Product name	Complete product name of the connected device (up to 64 characters)
Product ID	Vendor-specific information on the product o type of the connected device (up to 64 characters)
Product text	Additional descriptive text about the connected device (up to 64 characters)
Serial number	Individual, vendor-specifically unique serial number of the connected device (up to 16 characters)
Hardware revision	Vendor-specific information on the hardware revision (up to 64 characters)
Firmware revision	Vendor-specific information on the firmware revision (up to 64 characters)

Displaying Port Status Information



The tab **Status** displays status information on the selected port.

The tab answers to the following questions about the selected port:

- Which status has the current port?
- Are the process data valid for input or output?
- Is a device connected to the selected port? If yes, what is the revision ID of that device?
- How high is the data transmission rate between the port and the connected device?
- How long is the cyle time of the communication in the operating mode "Operate"?
- What length does the input/output data of the connected device have in Bytes?
- What is the name of the Vendor-ID or Device-ID of the device connected to the IO-Link port?

To display the status data of a certain port:

Step	Action
1	Select the port in the menu on the left.
2	Open the tab **Status**. The tab **Status** is opened. The current values of the port status data are displayed.

State

The current port status information of the selected IO-Link port is displayed here. The following table contains different values concerning the status of the IO-Link port:

Value	Port status	Description
0	No device	No device connected to the port or no communication with the connected device
1	Deactivated	The port is inactive
2	Incorrect device	Failure of revision check or compatibility check
3	Preoperate	The device is ready for communication
4	Operate	The device is communicating
5	DI CQ	The port is in the digital input mode
6	DO CQ	The port is in the digital output mode
7	Reserved	Reserved
8	Reserved	Reserved
9	Faulty cycle time	The configured cycle time does not match the connected device
254	Port Power Off	The port voltage is disconnected
255	Not available	The port is not available

Quality

The port quality information is displayed here. The information on the validity of the process data is separated for input and output. The contents is binary-coded.

Bits of Port Quality Info	Description
Bit 0	0 = Input process data valid1 = Input process data invalid
Bit 1	0 = Output process data valid1 = Output process data invalid
Bit 2 to 7	Reserved

Revision ID

The revision ID of the connected device is displayed here.

A value of 0 means: No device connected.

All other values have to be interpreted as the revision ID of the connected device.

Baud Rate

If an IO-Link device is connected to the port, its data transmission rate is displayed here. With IO-Link, the transmission rate of the communication between the port and a connected device may have the following values:

- 4.8 kbit/s (COM1)
- 38.4 kbit/s (COM2)
- 230.4 kbit/s (COM3)

If no IO-Link device is connected to the port, the text “Not connected” is displayed here.

Cycle Time

The cycle time of the master is bit-coded as follows:

- Bit 0…5 defines an integral multiplier between 0 and 63.
- Bit 6…7 defines the calculation formula to be used according to the following table:

Bit 6 - 7	Calculation formula
0	Multiplier * 0.1 ms
1	6.4 ms + multiplier * 0.4 ms
2	32.0 ms + multiplier * 1.6 ms
3	Reserved

Input Data Length

The real input data length of the connected device is displayed in Bytes here.

Output Data Length

The real output data length of the connected device is displayed in Bytes here.

Vendor ID

This value is the Vendor-ID of the connected device.

Device ID

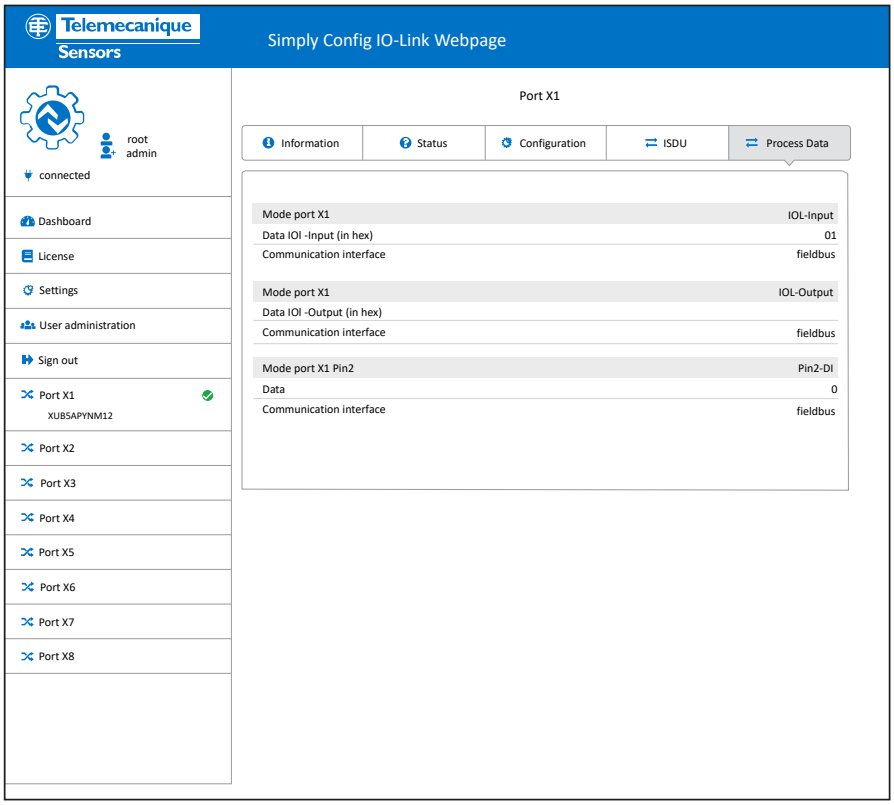
This value is the Device-ID of the connected device.

Displaying the Process Data

With the tab **Process data**, you can display the process data of a certain port.

To display the process data of a certain port:

Step	Action
1	Select the port in the menu on the left.
2	Open the tab **Process data**. The tab **Process data** opens and shows the current values of the process data configured for input or output in hexadecimal format. If no process data has been configured for input or output, the corresponding field remains empty.

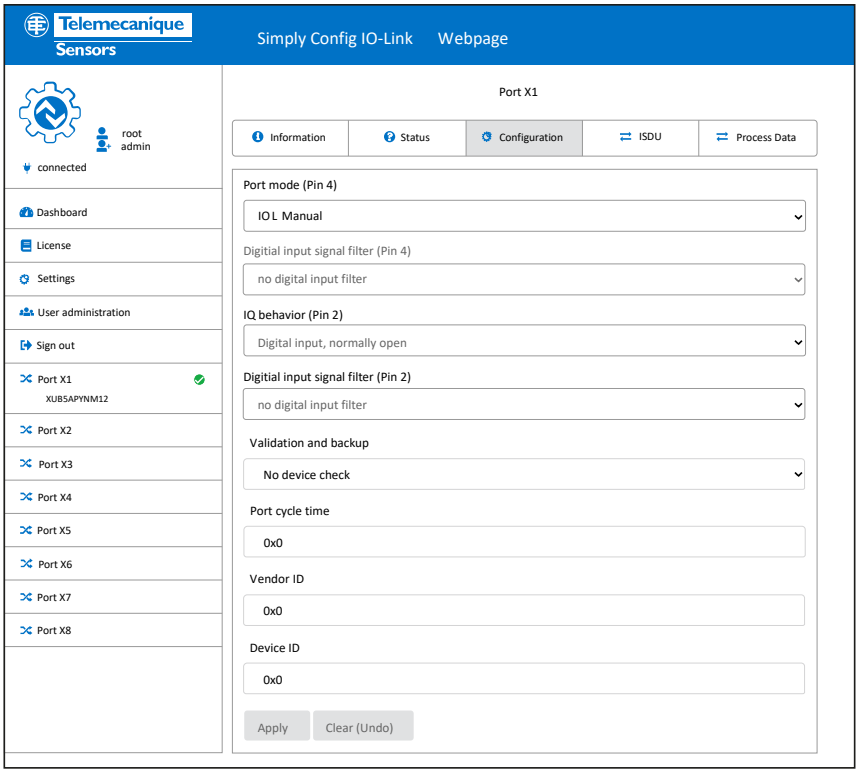


Making Settings at the Device

Via the web server you can make the following settings at the device:

- Configuring the Port, page 56
- Accessing a Connected IO-Link Device, page 60
- Configuring IP-Parameters, page 62
- Entering Maintenance Information, page 63
- Firmware Update, page 65
- Resetting the Device to the Factory Settings, page 67
- Signing Users In/Out and Managing Users, page 68

Configuring the Port



With tab **Configuration** you can display and change the following settings of the selected port individually:

Name	Type	Meaning
Port mode (pin 4)	Selection list	Port operating mode (configuration of pin 4)
Digital input signal filter (pin 4)	Selection list	Filter time for digital input signals at pin 4
IQ behavior (pin 2)	Selection list	Configuration of pin 2 (Digital Input, Digital Output, Off)
Validation and Backup	Selection list	Setting for Validation and backup for a device check when the device is exchanged
PortCycleTime	Input field	Expected port cycle time
Vendor ID	Input field	Expected Vendor ID of the connected device
Device ID	Input field	Expected Vendor ID of the connected device

Modifications to settings require operator or admin rights. If you do not have these rights, the tab is grayed out and the displayed values are not editable.

As long as PLC and device are exchanging process data, the port configuration is not possible and the following message appears:

NOTE:
`Changing configuration not allowed because interface state is "communicating".`

In that case, terminate the exchange of process data.

To modify the configuration of a port:

Step	Action
1	Select the desired port (port X1, port X2 …) in the menu.
2	Open the tab Configuration.
3	Set the port operating mode for pin 4 , see Making Settings at the Device, page 56.
4	If required, configure the filter time for the signals of the digital inputs
5	If required, configure the device check in case of Validation and Backup, see Configuring the Port, page 56.
6	If required, set the I/Q behavior for pin 2, see Configuring pin 2 (I/Q) in Configuring the Port, page 56.
7	If required, set the expected Vendor ID, see Input field “Vendor ID” in Accessing a Connected IO-Link Device, page 60.
8	If required, set the expected Device ID, see Input field “Device ID” in Accessing a Connected IO-Link Device, page 60.
9	If required, set the expected cycle time, see Selection list “PortCycleTime” in Accessing a Connected IO-Link Device, page 60
10	Click **Apply**.Your changes takes effect now.

Configuring the Port Operating Mode for Pin 4

Via the selection list Port mode, you can set the port operating mode for pin 4 of the selected IO-Link port. You can select between the following operating modes:

Option	Meaning
Deactivated	The port is deactivated. L+ is switched off. The process data (input and output) is set to 0. The master no longer performs any activities concerning this port.
IOL Manual	The port is used as an IO-Link port with a manual (user defined) configuration. Vendor ID, Device ID, and Revision ID are validated.
IOL Autostart	The port is used as an IO-Link port with an automatic start. No configuration and no device validation.
Digital Input, normally open	The port is used as a digital input. All elements of the port configuration is ignored except the input and output data length.
Digital Input, normally closed	The port is used as a digital input. The signals at the port are inverted. All elements of the port configuration are ignored except the input and output data length.
Digital Output	The port is used as a digital output. All elements of the port configuration are ignored except the input and output data length.

Setting the Filter Time for Digital Inputs

If the operating mode for pin 4 is set to **Digital Input, normally open** or **Digital Input, normally closed**, the filter time for the signals can be set at the digital inputs via the selection list **Digital Input Signal Filter**.

If filtering is active, a change to the digital input (0 →1 or 1→0) is transferred to the process image only after the set filter time has expired and the changed value is still applied. If the value has changed again during the filter time, the filter time restarts from the beginning.

You can select between the following filter time values:

- No digital input filter
- 3 ms
- 15 ms
- 20 ms

When the option **No digital input filter** is selected, the signals at the digital inputs are not filtered.

With all other operating modes for pin 4, the selection list **Digital Input Signal Filter** is deactivated.

Configuring Pin 2 (I/Q)

Via the selection list **IQ behavior**, you can set the behavior of pin 2. You have the following possibilities of configuration:

Option	Description
Not supported	Pin 2 is not used.
Digital Input, normally open	Pin 2 is a digital input.
Digital Input, normally closed	Pin 2 is a digital input. The signal is inverted.
Digital Output	Pin 2 is a digital output.

NOTE: In the operating mode IOL Autostart (see above), your device check setting has no effect on the behavior of the device.

Via the selection list **Validation and backup**, you can set whether - and at which inspection level - a validation (device check) takes place while a connected device is exchanged and whether the stored operating parameters of the old device are transferred to the new device or not.

The following table explains the possible values of the parameter Inspection Level:

Inspection Level	Meaning
NO_CHECK	A device check does not take place.
TYPE_COMP	The device is checked for type compatibility.For a device check, the real Vendor ID is compared with the configured one, and the real Device ID is compared with the configured one.
IDENTICAL	The device is checked for device identity.For this purpose, the device is checked for type compatibility and the real serial number is compared with the configured one.

The parameter "Backup Level" determines the behavior of the system in case of an exchange of the device connected to the port concerning the continued operation of the system with identical device parameters.

This parameter can take three different values:

Backup Leve	Meaning
Commissioning ("Disable")	No device parameter data is stored on the IO-Link master. In case of a device exchange, the master does not restore the device parameters.
Production ("Restore")	Changed parameter data is not automatically stored on the master. The master restores the parameter data stored in the master on the IO-Link device. For this purpose, the IO-Link device must support the data storage.
Production ("Backup/Restore")	Changed device parameter data is automatically stored on the master. For this purpose, the IO-Link device must support the data storage and report a parameter change. In case of a device exchange, the stored parameters are loaded onto the new device.

The selection list **Validation and Backup** offers the following possibilities of setting the parameters "Inspection Level" and "Backup Level":

Option	Inspection Level	Backup Level	Meaning
no Device check	NO_CHECK	Disable	A device check does not take place.
type-compatible device (V1.0)	TYPE_COMP	Disable	Device check for a type-compatible device according to IO-Link specification 1.0
type-compatible device (V1.1)	TYPE_COMP	Disable	Device check for a type-compatible device according to IO-Link specification 1.1
type-compatible device (V1.1) with Backup + Restore	TYPE_COMP	Backup + Restore	Device check for a type-compatible device according to IO-Link specification 1.1 with Backup & Restore functionality
type-compatible device (V1.1) with Restore	TYPE_COMP	Restore	Device check for a type-compatible device according to IO-Link specification 1.1 with Restore functionality

Selection List "PortCycleTime"

In the selection list **PortCycleTime**, the expected cycle time of the port is displayed or set depending on the selected operating mode. The coding corresponds to that in the port status, see Master Cycle time.

Input Field "VendorID"

This element contains the expected Vendor ID (VendorID, 2 Bytes) of the selected device. Admissible value range: 1 to 0xFFFF.

The indication of the expected Vendor ID is required for checking the device for type compatibility. The selection of “no Device check” requires no input.

Input Field "DeviceID"

This element contains the expected Device ID (DeviceID, 3 Bytes) of the connected device. Admissible value range: 1 to 0xFFFFFF.

The indication of the expected Device ID is required for checking the device for type compatibility. The selection of “no Device check” requires no input.

Accessing a Connected IO-Link Device

The tab **IOL** allows read and write access to the IO-Link device connected to an IO-Link port. The device data is addressed via the ISDU message format (ISDU = Indexed Service Data Unit) by means of Index and Subindex.

NOTE: For a description of the index and subindex values, see the documentation of the connected IO-Link device. For a description of the ISDU-message format, refer to the IO-Link specification.

Required Rights

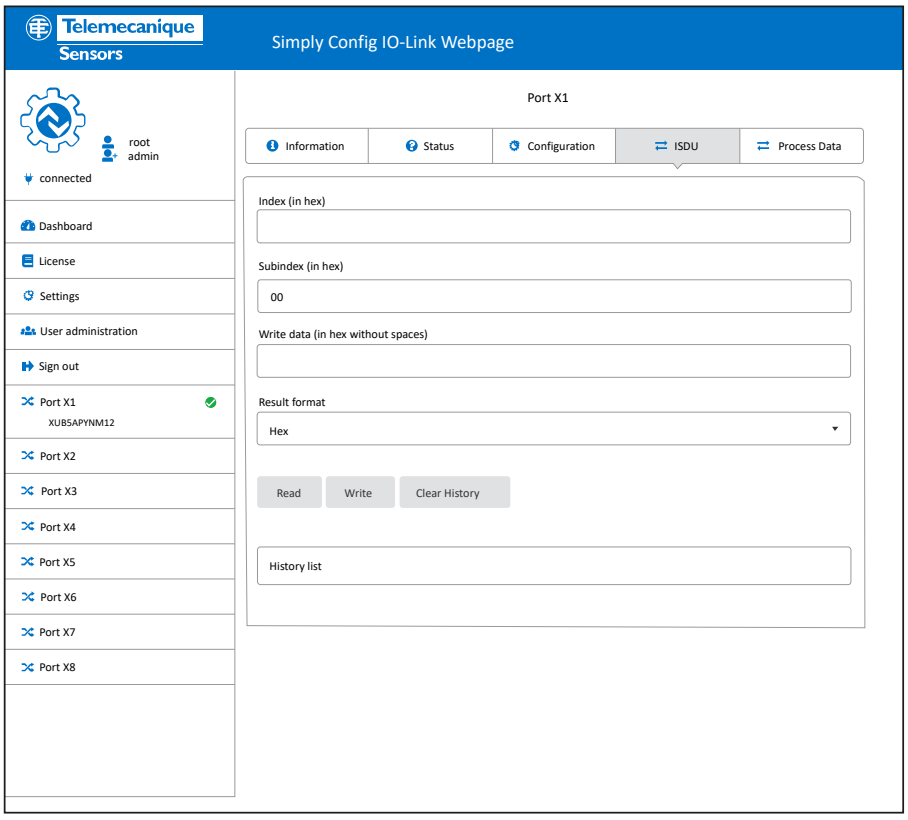
Modifications to settings require operator or admin rights. If you do not have these rights, the tab is grayed out and the displayed values are not editable.

Access to the IO-Link Device

To be able to access the data of an IO-Link device connected to a selected IO-Link port via index und subindex (ISDU message format):

Step	Action
1	In the menu on the left, select the port to which the IO-Link device is connected.
2	Open the tab IOL. The tab IOL is displayed.

Read Access

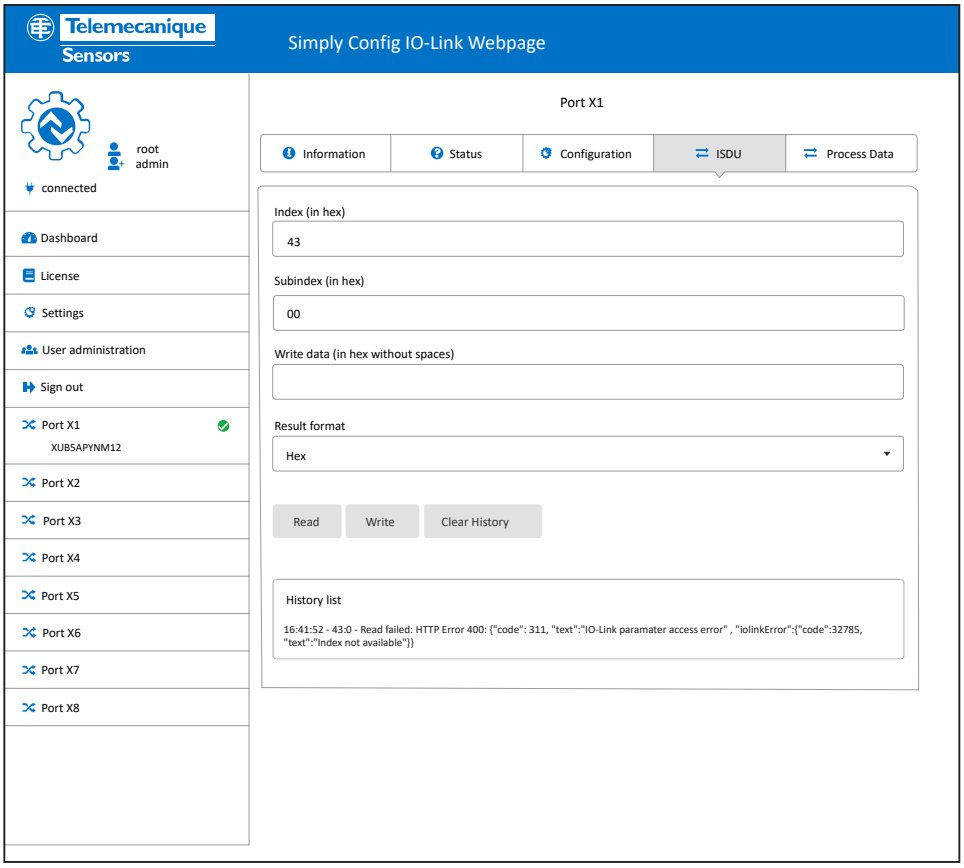


To read data from the connected IO-Link device, proceed as follows:

Step	Action
1	Enter the desired index of the connected IO-Link device as a hexadecimal value in the input field **Index** of tab **IOL**.
2	Enter the desired subindex of the connected IO-Link device as a hexadecimal value in the input field **Subindex** of tab**IOL**. Default is “00”.
3	Click **Read**. The read access is performed and protocolled with the current time in the history (at the bottom of the tab).

If the access is successful, the text Read ok: and the result is displayed in the history. History entries have the following structure:

```
Time – Index:Subindex – Read ok: <Result>
```



If the access is unsuccessful, the history displays an error message with error codes of IO-Link master and IO-Link device.

In this case, the history entries have the following structure:

```
Time – Index:Subindex – Read failed:
IOLMErrorCode(<error code of IO-Link master>):
IOLDErrorCode(<error code of IO-Link device>)
```

> **NOTE**: For information on the meaning of the error codes of the IO-Link master (IOLMErrorCode) and IO-Link device (IOLDErrorCode), refer to the IO-Link specification.

In both cases:

- The time is displayed in the format HH:MM:SSt.
- Index and Subindex are displayed hexadecimally.

Write Access

To write data from the connected IO-Link device, proceed as follows:

Step	Action
1	Enter the desired index of the connected IO-Link device as a hexadecimal value in the input field **Index** of tab **IOL**.
2	Enter the desired subindex of the connected IO-Link device as a hexadecimal value in the input field **Subindex** of tab **IOL**. Default is “00”.
3	Enter the data to be written into the input field Input data of tab IOL.
4	Click **Write**.The write access is performed and protocolled with the current time in the history (at the bottom of the tab).

If the access is successful, the text Write ok: and the result is displayed in the history. History entries have the following structure:

```
Time – Index:Subindex - Write ok: <Result>
```

If the access is unsuccessful, the history displays an error message with error codes of IO-Link master and IO-Link device. History entries have the following structure:

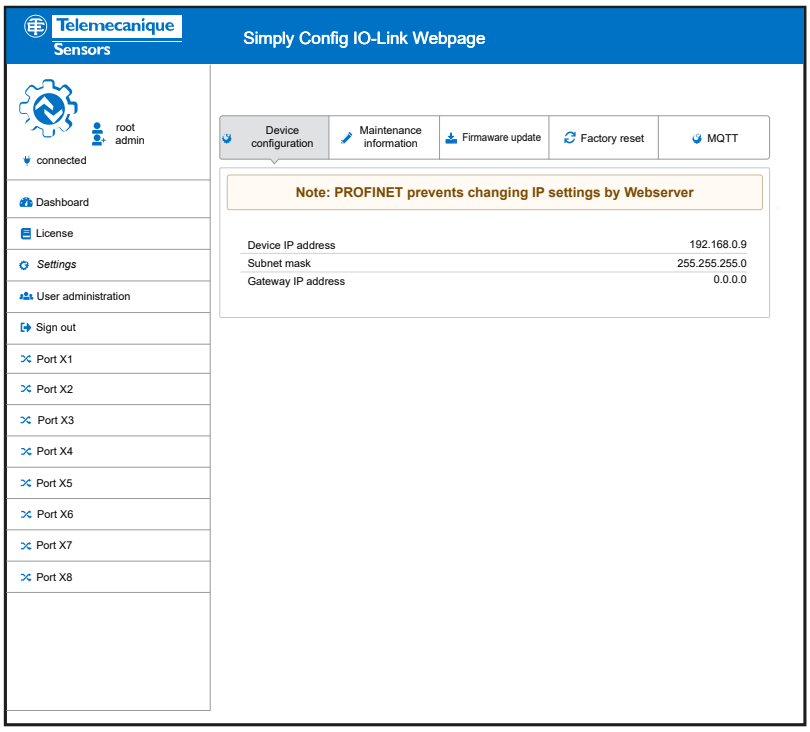
```
Time – Index:Subindex - Write failed:
IOLMErrorCode(<error code of IO-Link master>):
IOLDErrorCode(<error code of IO-Link device>)
```

Deleting the history of the read and write access operations

To delete the history of the read and write access operations:

- Click **Clear History**.
- The history of the read and write access operations is cleared.

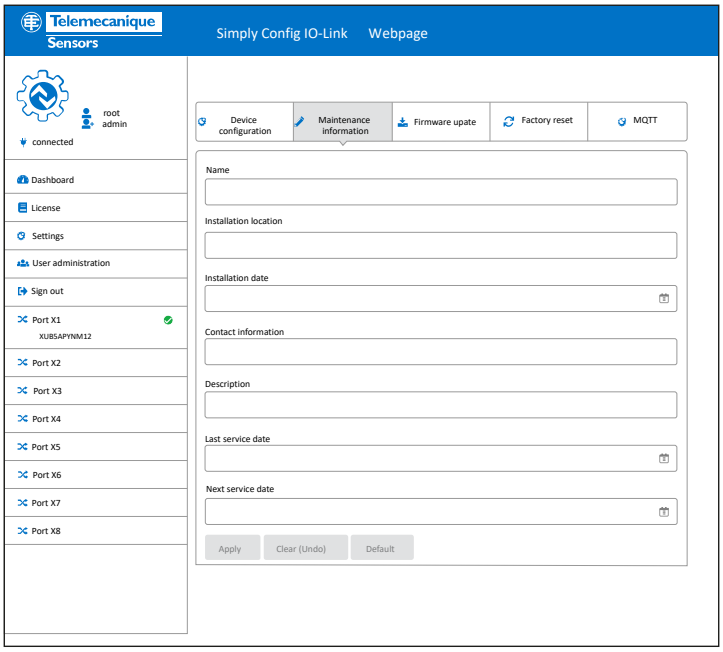
Configuring IP-Parameters



A manual configuration of the IP-address of PROFINET IO devices is not required because the PROFINET IO-Controller configures the IP-address of the device.

Entering Maintenance Information

With the tab **Maintenance information**, you can enter maintenance information into the device, e.g. information on device name, installation location, installation date, contact information, description, date of the last and next service of the device.



Admin rights, the rights of a specialist, or the rights to carry out maintenance are required to modify settings. If you do not have these rights, the tab is grayed out and the displayed values are not editable. In this case, the following error message will be displayed: Note:

```
For user role "Observer", editing maintenance data is not
allowed!
```

The maintenance information include:

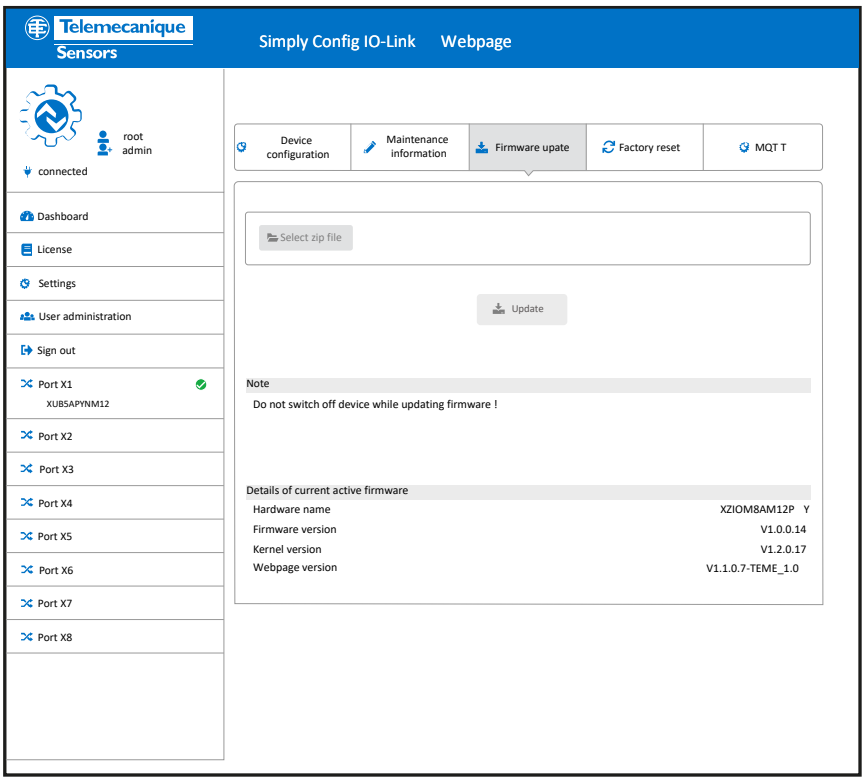
Name	Data format and data length	Description	Corresponding I&Mfield
Name	Printable ASCII-string, max. 64 characters	Uniform label (string) in the plant for the function of this device	I&M1:TAG_FUNCTION
Installation Location	Printable ASCII-string, max. 32 characters	Uniform label (string) in the plant for the position where the device is mounted.	I&M1: TAG_LOCATION
Installation Date	ASCII time indication, max. 32 characters (date format YYYY-MM-DD)	Date of installation or commissioning of this device	I&M2: INSTALLATION_ DATE
Contact Information	Printable ASCII-string, max. 32 characters	Textual identification of a contact person for this managed node of the plant, together with the information on how to contact this person.	
Description	Printable ASCII-string, max. 64 characters	User-readable comment field for storing individual status information and remarks	I&M3: DESCRIPTOR
Signature	Printable ASCII-string, max. 128 characters	Signature	I&M3: DESCRIPTOR
Change count	ASCII decimal digit, max. 32 characters	Counter for changes to the hardware or device parameters. Requires counting up only if the data really have changed.	I&M0: REV_COUNTER
Last Service Date	ASCII time indication, max. 32 characters (date format YYYY-MM-DD)	Date/time of the last service, e.g. firmware update.	
Next Service Date	ASCII time indication, max. 32 characters (date format YYYY-MM-DD)	Date/time of the next service, e.g. firmware update.	

To modify the Maintenance information:

Step	Action
1	Click the menu item **Settings** in the left column. The tab **Device configuration** will be displayed
2	Select the tab **Maintenance information**.
3	Change the fields in question.
4	Click **Apply**. Your changes will thus take effect.

Firmware Update

Via tab **Firmware update** the IO-Link master web server enables you to update the device firmware.



Observe the following notes:

NOTICE

BRINGING THE PLANT INTO A SAFE OPERATING STATE BEFORE THE FIRMWARE UPDATE

Never update the firmware while the plant in which the device is installed is running. Before each firmware update, the plant first must be shut down properly or brought into a safe operating state.

Failure to follow these instructions can result in equipment damage.

NOTE: If you update the firmware of your device, you become unable to re-construct its state before the update or the firmware used so far, unless you have a backup of the firmware and the configuration data.

Admin rights, the rights of a specialist or the rights to carry out maintenance are required to modify settings. If you do not have these rights, the tab is grayed out and the displayed values are not editable.

You can download the firmware container file FWUPDATE.ZIP, that you need for the firmware update, from the device manufacturer's or vendor's website.

Proceed as follows:

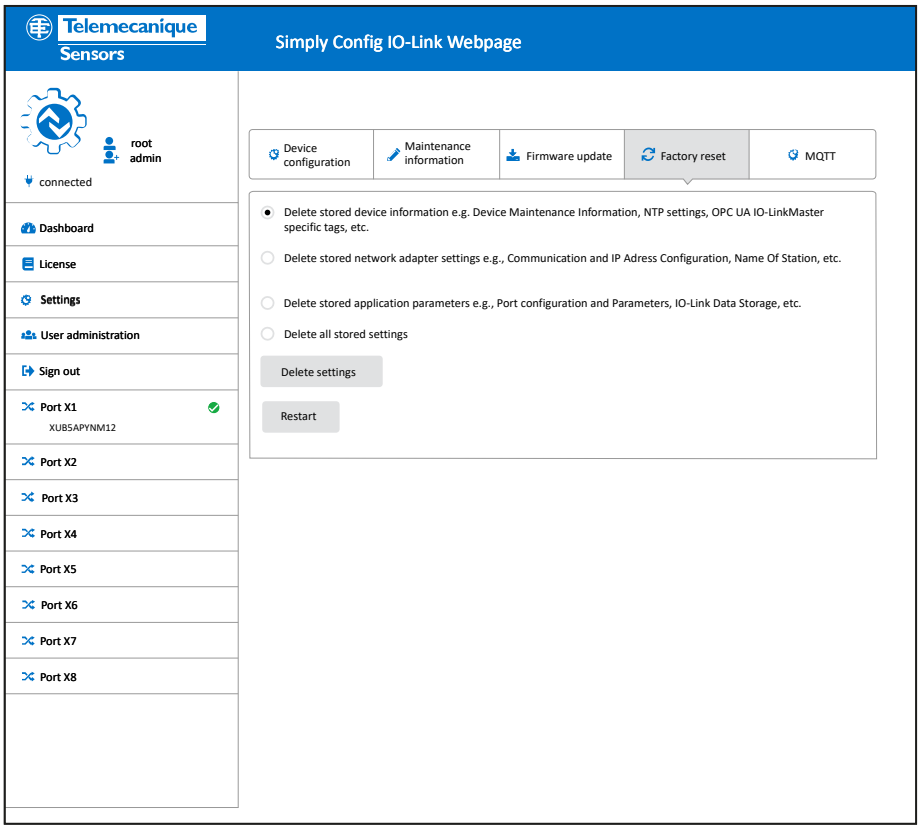
Step	Action
1	Click the menu item **Settings** in the left column.
2	Tab **Device** configuration is displayed.
3	Select the tab **Firmware update**.
4	Click **Select ZIP file**. A file selection dialog is displayed.
5	In this dialog, select the firmware container file “FWUPDATE.ZIP”. The display field **File** shows the name of the selected firmware container file.
6	Click **OK**. The firmware is updated. Thereafter, all ports used must be configured.

The firmware update procedure is as follows:

1. The firmware of the firmware container file “FWUPDATE.ZIP” is stored in the Flash Memory of the device.
2. An internal reset is triggered.
3. The device maintenance firmware, which processes the firmware container file and installs the new firmware including the configuration files of the device, is then started.
4. You are informed as soon as the installation procedure is finished.
5. Thereafter, the device performs again a reset.
6. The new firmware is started.

Resetting the Device to the Factory Settings

If required, you can reset the device or individual groups of settings to the factory settings (see table below) in the menu **Settings** of the tab **Factory reset.**



Admin rights, the rights of a specialist, or the rights to carry out maintenance are required to modify settings. If you do not have these rights, the tab is grayed out and the displayed values are not editable. In this case, the following error message are displayed:Note: For user role "Observer", editing maintenance data is not allowed.

You can reset three different groups of settings to their factory settings:

Options	Reset settings	Examples of concerned settings
Delete stored device information	Device settings	Maintenance information, system time settings, and IO-Link master settings within OPC UA
Delete stored network adapter settings	Settings of the network adapter	Communication settings, configuration of the IP-address, name of station
Delete stored application parameters	Application-specific data	Port configuration and port parameters, remanent parameters
Delete all stored settings	All settings	-

To reset the device to the factory settings, proceed as follows:

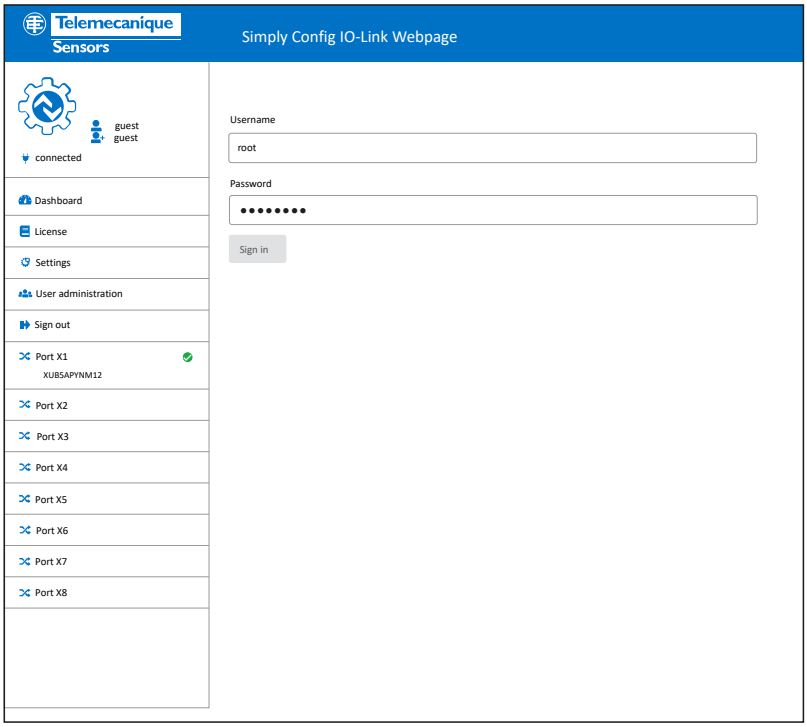
Step	Action
1	Click the menu item **Settings** in the left column. Tab **Device configuration** is displayed.
2	Select the tab **Factory reset**.
3	Use the buttons to select which group(s) of settings are to be reset to the factory settings.
4	Click **Delete Settings**. The selected settings is reset to the factory settings.

If you wish to restart the device after the reset, click **Restart**.

Signing Users In/Out and Managing Users

Signing Users In

To sign in as a user:

Step	Action
1	Select the menu point **Sign in** on the left side of the main menu of the web server. The input mask for user name and password are displayed: 
2	Enter your user name and your password into the corresponding input fields of the screen mask.
3	Click the button **Sign in**. User name and password are checked for matching and correctness. If the IO-Link master web server knows the user name and the password check is successful, you can work with the IO-Link master web server. The rights defined for the user name used apply. The user name used is displayed in the upper left corner of the input mask. The previous menu entry **Sign in** now changes to **Sign out**.

NOTE: For the first commissioning or a guest user access, you can use special combinations of user name and password, which you can find in the corresponding sections of this chapter.

Signing Users Out

To sign out a signed-in user:

- Click the menu item **Sign out** of the main menu of the device web server (left side).
- Thereafter, you no longer have the rights of the user signed in so far to work with the IO-Link master web server. Only the rights of the guest user access are still available. The user name used for signing in is no longer displayed in the upper left corner. Instead of the previous menu entry **Sign out**, the menu entry **Sign in** is now displayed again.

Guest User Access

As standard, the web server knows a user guest without password.

As standard, the IO-Link master web server knows a user guest without password that was created to realize a first-time or guest user access. The guest user access offers only limited display possibilities and no setting possibilities.

Signing-in as an Administrator for the First Time

In the state of delivery or after a reset to the factory settings, the web server can be addressed via the user name root and the password.

This combination also offers administrator rights.

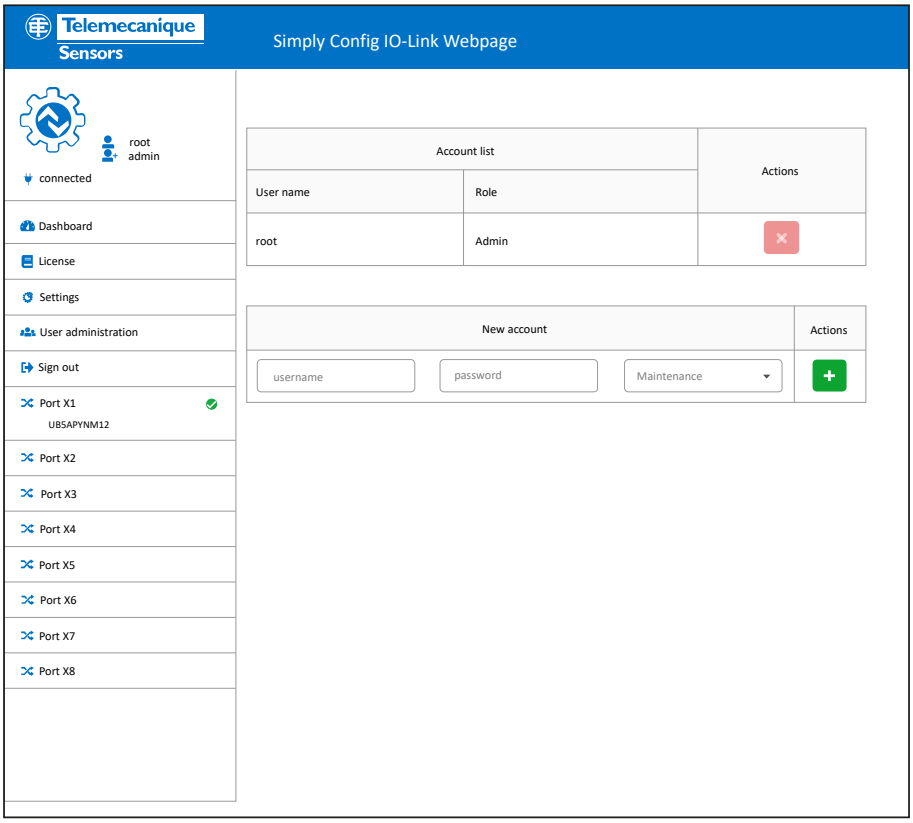
> **NOTE**: Change the administrator password immediately after the commissioning. The factory setting is generally known and does not provide any sufficient protection against misuse.

The tab **Administration** offers a role-based user administration. This tab enables you to create users, delete users, and assign them roles on which user rights depend. Users can be divided into three roles:

- Maintenance
- Operator
- Administrator

Creating a New User

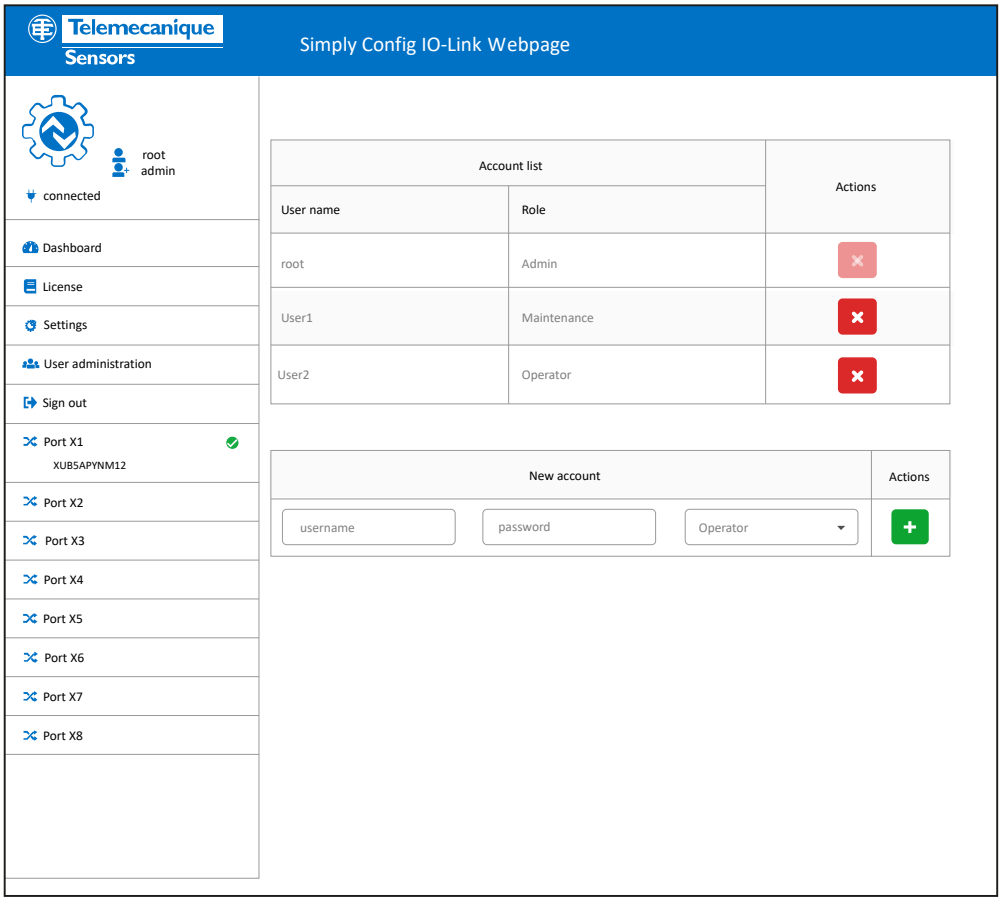
When you open the **User administration**, the following screen mask is displayed:



As standard, the user `root` is defined with the preset password `password`, see first line.

One further user can be defined in the second line. For this purpose, proceed as follows:

Step	Action
1	Enter a new user name in the input field **User name**. User names that are already in use are inadmissible.
2	Enter the password for this user name in the input field **Password**.
3	Via the selection list on the right, select the role for the new user to be created (three roles are available: Maintenance, Operator or Administrator).
4	To confirm the selection, click the green field. The new user is created and assigned to the selected role.



To remove an existing user from the user administration of the device, proceed as follows:

- Click the red button with a white cross to the right of the user you want to remove.
- The user is deleted.

The user `root` cannot be deleted, that is why the red button for deletion is grayed-out.

Communication

Process Data PROFINET IO-Device

This section describes the process data transferred via PROFINET. To transfer the process data, the device uses the following submodules:

- Submodule «IO-Link Master», page 72
- Submodule «IO-Link X I/X O + PQI», page 73
- Submodule «IO-Link X I + PQI», page 74
- Submodule «IO-Link X O + PQI», page 74
- Submodule «Digital Input», page 75
- Submodule «Digital Output», page 75

X stands for the number of bytes and may be 1, 2, 4, 8, 16 or 32.
One submodule is assigned to each port.

Process Data of the Submodule "IO-Link Master"

The submodule "IO-Link Master" transmits the process data of the digital inputs (pin 2 and 4) and outputs (pin 2) of all ports. The prerequisite for that is the configuration of the respective pin as a digital input or output.

Byte offset	Number of bytes	Input process data	Description
0 … 1	2 byte	Input data	Process data of the digital inputs and outputs. The process data of the digital inputs and outputs can be transmitted "port-based" (default) or "pin-based". For the assignment to port and pin, see the tables below.
2	1 byte	IOPS	Provider status of the input data of this submodule. For a description, see tableProvider and Consumer Status, page 77.
3	1 byte	IOCS	Consumer status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0 … 1	2 byte	Output data	Process data of the digital outputs. The process data of the digital outputs can be transmitted "portbased" (default) or "pin-based". For the assignment to port and pin, see the tables below.
2	1 byte	IOPS	Provider status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.
3	1 byte	IOCS	Consumer status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

The process data of the digital inputs and outputs can be transmitted "portbased" (default) or "pin-based". The following tables show the assignment of port and pin.

Byte offset	Bit	Input process data (PD_IN)	Output process data (PD_OUT)
0	0	Port X1, DI A (Pin 4)	0
	1	Port X1, DI B (Pin 2)	Port X1, DO B (Pin 2)
	...	...	...
	6	Port X4, DI A (Pin 4)	0
	7	Port X4, DI B (Pin 2)	Port X4, DO B (Pin 2)
1	0	Port X5, DI A (Pin 4)	0
	1	Port X5, DI B (Pin 2)	Port X5, DO B (Pin 2)
	...	...	...
	6	Port X08, DI A (Pin 4)	0
	7	Port X8, DI B (Pin 2)	Port X8, DO B (Pin 2)

Byte offset	Bit	Input process data (PD_IN)	Output process data (PD_OUT)
0	0	Port X1, DI A (Pin 4)	0
	1	Port X2, DI B (Pin 4)	0
	...	...	...
	6	Port X7, DI A (Pin 4)	0
	7	Port X8, DI A (Pin 4)	0
1	0	Port X1, DI B (Pin 2)	Port X1, DO B (Pin 2)
	1	Port X2, DI B (Pin 2)	Port X2, DO B (Pin 2)
	...	...	...
	6	Port X7, DI B (Pin 2)	Port X07, DO B (Pin 2)
	7	Port X8, DI B (Pin 2)	Port X8, DO B (Pin 2)

Process Data of the Submodule "IO-Link X I/X O + PQI"

The submodule "IO-Link X I/X O + PQI" transfers the IO-Link input/output data and the port qualifier information of a port.

Byte offset	Number of bytes	Input process data	Description
0 … X-1	X bytes	IO-Link input data	The length X is 1, 2, 4, 8, 16 or 32 bytes and depends on the submodule used. For a description of the input process data, see the manual of the manufacturer of the IO-Link Device used.
X	1 byte	PQI	For a description, see Port Qualifier Information (PQI), page 76.
X+1	1 byte	IOPS	Provider status of the input data of this submodule. For a descripotion, see table Provider and Consumer Status, page 77.
X+2	1 byte	IOCS	Consumer status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0 … X-1	X bytes	IO-Link output data	The length X is 1, 2, 4, 8, 16 or 32 bytes and depends on the submodule used. For a description of the output process data, see the manual of the manufacturer of the IO-Link Device used.
X	1 byte	IOPS	Provider status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.
X+1	1 byte	IOCS	Consumer status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Process Data of the Submodule "IO-Link X I + PQI"

The submodule "IO-Link X I + PQI" transfers the IO-Link input data and the port qualifier information of a port.

Byte offset	Number of bytes	Input process data	Description
0 … X-1	X bytes	IO-Link input data	The length X is 1, 2, 4, 8, 16 or 32 bytes and depends on the submodule used. For a description of the input process data, see the manual of the manufacturer of the IO-Link Device used.
X	1 byte	PQI	For a description, see table Port Qualifier Information (PQI), page 76.
X+1	1 byte	IOPS	Provider status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0	1 byte	IOCS	Consumer status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Process Data of the Submodule "IO-Link X O + PQI"

The submodule "IO-Link X O + PQI" transfers the IO-Link output data and the port qualifier information of a port.

Byte offset	Number of bytes	Input process data	Description
0	1 byte	PQI	For a description, see Port Qualifier Information (PQI), page 76.
1	1 byte	IOPS	Provider status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.
2	1 byte	IOCS	Consumer status of the output data of this submodule. For a description, see Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0 … X-1	X bytes	IO-Link output data	The length X is 1, 2, 4, 8, 16 or 32 bytes and depends on the submodule used. For a description of the output process data, see the manual of the manufacturer of the IO-Link Device used.
X	1 byte	IOPS	Provider status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.
X+1	1 byte	IOCS	Consumer status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77..

Process Data of the Submodule "Digital Input"

The submodule "Digital Input" transmits the process data of the digital input (pin 4) of a port.

Byte offset	Number of bytes	Input process data	Description
0	1 byte	Input data 1 byte	Bit 0:Port X1, DI (pin 4) orPort X2, DI (pin 4) or…Port X8, DI A (pin 4)
			Bit 1 … 7: 0
1	1 byte	IOPS	Provider status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0	1 byte	IOCS	Consumer status of the input data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Process Data of the Submodule "Digital Output"

The submodule "Digital Output" transmits the process data of the digital output (pin 4) of a port.

Byte offset	Number of bytes	Input process data	Description
0	1 byte	IOCS	Consumer status of the output data of this submodule. For a description, see table Provider and Consumer Status, page 77.

Byte offset	Number of bytes	Output process data	Description
0	1 byte	Output data 1 byte	Bit 0:Port X1, DO (pin 4) orPort X2, DO (pin 4) or…Port X8, DO (pin 4)
			Bit 1 … 7: 0
1	1 byte	IOPS	Provider status of the output data of this submodule. For a description, see Provider and Consumer Status, page 77.

Port Qualifier Information (PQI)

The PQI (Port Qualifier Information) provides status information on IO-Link port and IO-Link Device.

Bit	Flag	Description
0	-	Reserved, 0
1	-	Reserved, 0
2	NewPar	New parameters 0: No update of the device parameters of the IO-Link Device detected. 1: Update of the device parameters of the IO-Link Device detected: IOLink master performed a "Data Storage upload" and a new IO-Link Device backup object (0xB904) is available.
3	SubstDev	Substitute device detected 0: No substitute device detected (identical serial number) 1: Substitute device detected (different serial number)
4	PortActive	Port activation 0: Port has been deactivated via port function. 1: Port is activated (default)
5	DevCom	IO-Link Device communication 0: No IO-Link Device available. 1: The IO-Link Device detected is in the state PREOPERATE or OPERATE.
6	DevErr	Port/Device error 0: No error/warning occurred. 1: Error/warning occurred at the port or IO-Link Device.
7	PQ	Validity of the process data 0: Invalid I/O-process data from the IO-Link Device. 1: Valid I/O-process data from the IO-Link Device.

Provider and Consumer Status

In addition to the process data, PROFINET transfers the status information IOPS (Input Output Provider Status) and IOCS (Input Output Consumer Status) with each submodule.

Bits	Name	Description
0 … 4	-	Reserved, always 0.
5 … 6	Instance	Instance that has detected the invalid data. If the data status (bit 7) has value 1, you can ignore bits 5 and 6.00: Detected by subslot.01: Detected by slot.10: Detected by IO-Device.11: Detected by IO-Controller.
7	Data status	Status of the input/output data0: Bad, data is invalid.1: Good, data is valid.

Records

PROFINET provides access to device parameters (records) using acyclic services. The PROFINET IO-Controller can read records with ReadRecord from the PROFINET IO-Device and write them to the PROFINET IO-Device with WriteRecord.

IOL_CALL / IO_LINK_DEVICE (Record 0xB400)

This record allows reading and writing the parameters of the IO-Link Device connected to the IO-Link Master port using the IO-Link service ISDU (indexed service data unit). This record maps PROFINET services to IOLink services.

For addressing, the PROFINET IO-Controller uses the "NameOfStation", slot, and subslot. Depending on the PROFINET IO-Controller used, these specifications can be combined into an ID; in the TIA portal this is the hw_id (hardware ID).

The record number is 0xB400 (hexadecimal) or 46080 (decimal). If you use the TIA portal: The name of the block is IO_LINK_DEVICE. The block can be downloaded from the Siemens website as an example. Use the value 16#B400 for the CAP (Client Access Point) input of the block. For the ID input of the block, use the value of the hardware ID displayed in the TIA portal, which you can find in the hardware configuration. For this purpose, open the display of the "System constants". In the "Name" column, find the line with the entry ending in "~IO-Link_Master". The column "HW ID" of this line contains the value you need for the ID input.

The following assignment applies for addressing the IO-Link port with slot and subslot:

- The PROFINET IO-Controller addresses the IO-Link Master with slot 1 and subslot 1. The parameter *Port* adresses the port to which the IOLink Device is connected.
- The PROFINET IO-Controller addresses port 1 directly with slot 1 and subslot 2, port 2 directly with slot 1 and subslot 3, etc.

Slot / subslot	IO-Link port
1 / 1	Port 1 … 8 (parameter port specifies the exact port.)
1 / 2	Port 1
1 / 3	Port 2
1 / 9	Port 8

Using the record, the following parameters (ISDU command) and payload are transferred between PROFINET and IO-Link:

- The parameter *Port* addresses the IO-Link port to which the IO-Link Device is connected.
- The parameters *Index* and *Subindex* address the object of the IO-Link Device. The documentation of the manufacturer of the connected IOLink Device describes the objects and parameters.
- **Read**: During read access, payload is transferred from the IO-Link Device to the PROFINET IO-Controller. The payload is buffered in the payload area of record 0xB400.
- **Write**: During write access, payload is transferred from the PROFINET IO-Controller to the IO-Link Device. The payload is buffered in the payload area of record 0xB400.

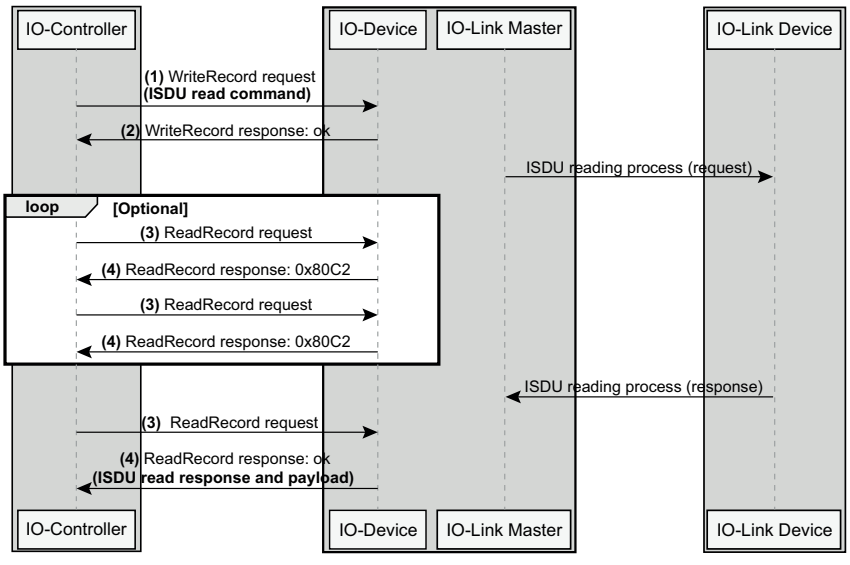
ISDU read service

Read sequence:

The following process is required to read data from an IO-Link Device using a PROFINET record:

- The PROFINET IO-Controller uses WriteRecord and writes the ISDU read command to record 0xB400 indicating index and subindex. These specifications address, among other things, the port and the object to be read in the IO-Link Device.
- The PROFINET IO-Controller then uses ReadRecord to read the result (ISDU read response) from the record 0xB400.

The following figure shows the process of reading from an IO-Link Device via PROFINET record 0xB400:



(1) WriteRecord request: Structure of IOL_CALL for an ISDU read command

For addressing, the PROFINET IO-Controller uses the "NameOfStation", slot, and subslot. Depending on the PROFINET IO-Controller used, these specifications can be combined into an ID; in the TIA portal, this is the hw_id (hardware ID).

To transfer the ISDU read command (number (1) in figure ISDU reading process) the IOL_CALL record (0xB400) must be structured as follows:

IOL_CALL for an ISDU read command (WriteRecord request)

Offset	Parameter name	Description	Type	Value
0	Function	Fixed value Identifies a call header	Unsigned8	0x08
1	Port	Port number	Unsigned8	0x01 … 0x08
2	FI_Index	Fixed value	Unsigned16	0xFE4A
4	Control	Control octet Value 0x03 corresponds to read command	Unsigned8	0x03
5	IOL_Index	Object index (of the IO-Link Device) to be read.	Unsigned16	0x0000 … 0x7FFF
7	IOL_Subin-dex	Object subindex (of the IO-Link Device) to be read.	Unsigned8	0x00 … 0xFF

(2) WriteRecord response

The PROFINET IOontroller receives the WriteRecord response.

If the status is 0, the ISDU read command has been accepted and the PROFINET IO-Controller can continue with ReadRecord, as described below.

If the status is not equal to 0, there is an error. The PROFINET IOController has to restart the process with number (1). Status 0xDF80B100 reports a length error.

(3) ReadRecord request

The PROFINET IO-Controller uses ReadRecord (number (3) in the figure ISDU reading process) with the same parameters for "NameOfStation", slot, and subslot for addressing or the same ID as with the WriteRecord already performed.

With ReadRecord, the PROFINET IO-Controller must read the response of the ISDU read service from record 0xB400.

(4) ReadRecord response: Response of the ISDU read service

The PROFINET IO-Controller receives the ReadRecord response (number (4) in figure *ISDU reading process*).

If the status is 0, the response of the ISDU read service has been read and the status octet must be evaluated.

If the status is not equal to 0, the status must be evaluated.

The resource busy (0x80C2) status indicates that ReadRecord has to be repeated because the response of the ISDU read service is not yet available. ReadRecord must be repeated (polling) until another value is returned.

- If the status is 0, the response of the ISDU read service has been read. The response can be evaluated as described below.
- Otherwise, there is an error and the operation was unsuccessful.

ReadRecord response: Structure of IOL_CALL (in case of success: Status octet is 0x00)

If the status octet has the value 0, the ISDU read command has been executed and the IOL_Data parameter contains the payload. The response has the following structure:

Offset	Parameter name	Description	Type	Value
0	Function	Fixed value Identifies a call header	Unsigned8	0x08
1	Port	Port number	Unsigned8	0x01 … 0x08
2	FI_Index	Fixed value	Unsigned16	0xFE4A
4	Status	Status octet	Unsigned8	0x00: Finished / Transfer complete
5	IOL_Index	Object index (of the IO-Link Device) that was read.	Unsigned1	0x0000 … 0x7FFF
7	IOL_Subindex	Object subindex (of the IO-Link Device) that was read.	Unsigned8	0x00 … 0xFF
8	IOL_Data	In case of success, the status octet is 0x00. The parameter IOL_Data contains the payload read. Max. 232 bytes can be read. Depending on the quantity of payload read, n has the value range 8 to 239. The documentation of the manufacturer of the connected IO-Link Device describes the content of the payload.	Record	Value of the read object of the IO-Link Device

ReadRecord response: Structure of IOL_CALL (in case of error: Status octet is 0x80)

If the status octet has the value 0x80, the ISDU read command could not be executed and the parameter IOL_Data contains IOL_Error_PDU with error numbers.

The response has the following structure:

Offset	Parameter name	Description	Type	Value
0	Function	Fixed valueIdentifies a call header	Unsigned8	0x08
1	Port	Port numberValue 0x00 is reserved.	Unsigned8	0x01 … 0xFF
2	FI_Index	Fixed value	Unsigned16	0xFE4A
4	Status	Status octet	Unsigned8	0x80: IOL_Error_PDU
5	IOL_Index	Object index (of the IO-Link Device) that could not be read.	Unsigned16	0x0000 … 0x7FFF
7	IOL_Subin-dex	Object subindex (of the IO-Link Device) that could not be read.	Unsigned8	0x00 … 0xFF

Offset	Parameter name	Description	Type	Value
8 … 11	IOL_Data	In case of an error, the status octet is equal to 0x80. Parameter IOL_ Data contains IOL_Error_ PDU with several error codes for evaluation.	Unsigned32	See table Coding of the IOL_Error_PDU, page 83

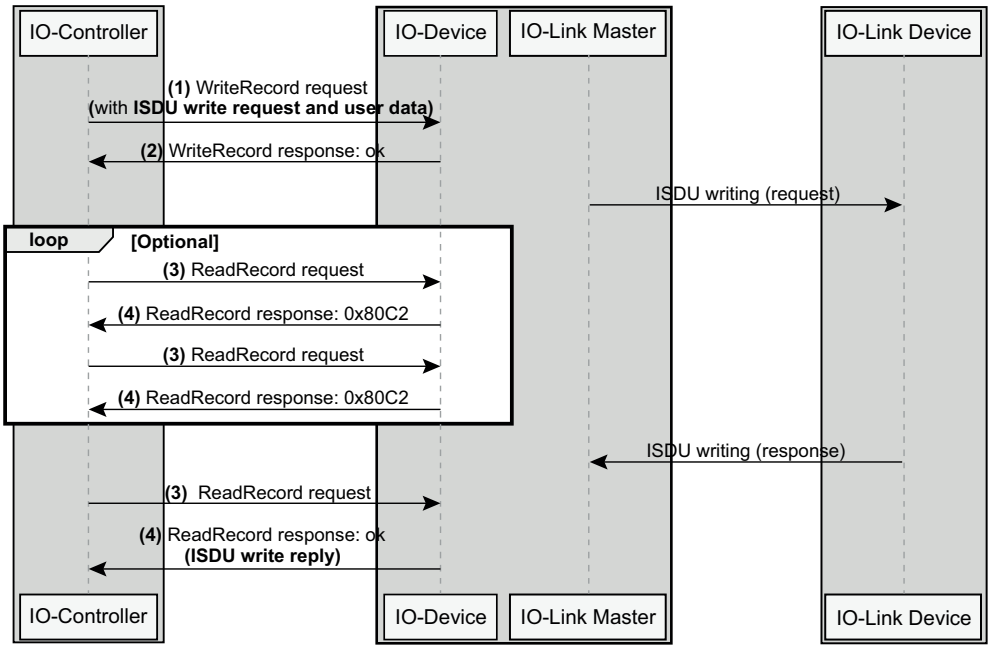
ISDU Write Service

Write sequence

The following process is required to write data to an IO-Link Device using PROFINET record:

- The PROFINET IO-Controller uses WriteRecord and writes the ISDU write command to record 0xB400 indicating index and subindex. These specifications address, among other things, the port and the object to be written in the IO-Link Device.
- The PROFINET IO-Controller then uses ReadRecord to read the result (ISDU write response) from record 0xB400.

The following figure shows the process of writing to an IO-Link Device via PROFINET record 0xB400:



(1) WriteRecord request: Structure of IOL_CALL for an ISDU write command

For addressing, the PROFINET IO-Controller uses the "NameOfStation", slot, and subslot. Depending on the PROFINET IO-Controller used, these specifications can be combined into an ID; in the TIA portal, this is the hw_id (hardware ID).

To transfer the ISDU write command (number (1) in figure ISDU writing process), record IOL_CALL must have the following structure:

Offset	Parameter name	Description	Type	Value
0	Function	Fixed valueIdentifies a call header	Unsigned8	0x08
1	Port	Port number	Unsigned8	0x01 … 0x08

Offset	Parameter name	Description	Type	Value
2	FI_Index	Fixed value	Unsigned16	0xFE4A
4	Status	Control octet Value 0x02 corresponds to write command.	Unsigned8	0x02
5	IOL_Index	Object index (of the IO-Link Device) to be written.	Unsigned16	0x0000 … 0x7FFF
7	IOL_Subin-dex	Object subindex (of the IO-Link Device) to be written.	Unsigned8	0x00 … 0xFF
8 … n	IOL_Data	Payload for write command Payload to be written to the IO-Link- Device. Max. 232 bytes can be written. Depending on the quantity of payload to be written, n has the value range 8 to 239. The documentation of the manufacturer of the connected IO-Link Device describes the content of the payload.	Record	-

(2) WriteRecord response

The PROFINET IOontroller receives the WriteRecord response.

If the status is 0, the ISDU write command has been accepted and the PROFINET IO-Controller can continue with ReadRecord, as described below.

If the status is not equal to 0, there is an error. The PROFINET IOController has to restart the process with number (1). Status 0xDF80B100 reports a length error.

(3) ReadRecord request

The PROFINET IO-Controller uses ReadRecord (number (3) in the figure *ISDU writing process*) with the same parameters for "NameOfStation", slot, and subslot for addressing or the same ID as with the WriteRecord already performed.

With ReadRecord, the PROFINET IO-Controller must read the response of the ISDU read service from record 0xB400.

(4) ReadRecord response: Response from ISDU write service

The PROFINET IO-Controller receives the ReadRecord response (number (4) in the figure *ISDU writing process*)

If the status is 0, the ISDU write service has been executed and the status octet must be evaluated.

If the status is not equal to 0, the status must be evaluated.

The resource busy (0x80C2) status indicates that ReadRecord needs to be repeated because the ISDU write service response is not yet available. ReadRecord must be repeated (polling) until another value is returned.

If the status is 0, the ISDU write service response has been read. The response can be evaluated as described below.

Otherwise, there is an error and the operation was unsuccessful.

ReadRecord response: Structure of IOL_CALL (in case of success: Status octet is 0x00)

If the status octet has the value 0, the ISDU write command has been executed.

The response has the following structure:

Offset	Parameter name	Description	Type	Value
0	Function	Fixed value Identifies a call header	Unsigned8	0x08
1	Port	Port number	Unsigned8	0x01 … 0x08
2	FI_Index	Fixed value, for reasons of compatibility	Unsigned16	0xFE4A
4	Status	Status octet	Unsigned8	0x00: Finished / Transfer complete
5	IOL_Index	Object index (of the IO-Link Device) that was written.	Unsigned16	0x0000 … 0x7FFF
7	IOL_Subin-dex	Object subindex (of the IO-Link Device) that was written.	Unsigned8	0x00 … 0xFF

ReadRecord response: Structure of IOL_CALL (case of error: Status octet is 0x80)

If the status octet has the value 0x80, the ISDU write command could not be executed and paramaneter IOL_Data contains IOL_Error_PDU with error numbers.

The response has the following structure:

Offset	Parameter name	Description	Type	Value
0	Function	Fixed value Identifies a call header	Unsigned8	0x08
1	Port	Port number	Unsigned8	0x01 … 0x08
2	FI_Index	Fixed value	Unsigned16	0xFE4A
4	Status	Status octet	Unsigned8	0x80: IOL_Error_PDU
5	IOL_Index	Object index (of the IO-Link Device) that has not been written.	Unsigned16	0x0000 … 0x7F-FF
7	IOL_Subin-dex	Object subindex (of the IO-Link Device) that has not been written.	Unsigned8	0x00 … 0xFF
8 … 11	IOL_Data	In case of an error, the status octet is 0x80. Parameter IOL_Data contains IOL_Error_PDU with several error codes for evaluation.	Unsigned32	See table Coding of the IOL_Er-ror_PDU, page 83

Error Handling

In the event of an error, the 32-bit value IOL_Error_PDU contains information on the error and cause, see the following tables:

Offset	Parameter	Content	Data type
0	Port Error	Port-specific error information; see Port error coding. These errorcodes are detected by the linking module or the IO-Link client.	Unsigned16
2	Error code	IO-Link error codes	Unsigned8
3	Additional code	Additional IO-Link error codes	Unsigned8

Port error

Error code	Port error	Description
0x0000	No error	No error detected
0x0001 … 0x6FFF	Reserved	Reserved
0x7000	IOL_CALL conflict	Inconsistent header information
0x7001	Incorrect IOL_CALL	Inconsistent header information (send/receive)
0x7002	Port blocked	Port temporarily unavailable
0x7003 … 0x7FFF	Reserved	Reserved
0x8000	Timeout	No correct termination of IOL_CALL (busy resource detected)
0x8001	Invalid port number	Invalid port number or port not supported
0x8002	Invalid IOL_Index	Invalid index
0x8003	Invalid IOL_Subindex	Invalid subindex
0x8004	No device	No device detected
0x8005 … 0x8050	Reserved	Reserved
0x8051	Decode error	Error detected during decoding of IOL_CALL request
0x8052	RDREC fault	Error when calling the read record
0x8053	WRREC fault	Error when calling the read record
0x8054	Unexpected error	Sequence error
0x8055	Function error	Port function failed (nonspecific)
0x8056	Function not available	Port function not available
0x8057	Function not supported	Port function (for this port) not supported
0x8058 … 0xFFFF	-	Vendor-specific

Error code and additional code: Application-specific errors

The following table explains the possible combinations of error code and additional code for the application-specific errors:

Error code	Additional code	Event	Name of the errorDescription
0x80	0x00	Error in the device application - no details	APP_DEV This type of error is used if the device application has refused to excute the requested service and detailed information on the event is not available.
0x80	0x11	Index not available	IDX_NOTAVAIL This type of error will be used if a read or write access is executed to a non-existent index.
0x80	0x12	Subindex not available	SUBIDX_NOTAVAIL This type of error will be used if a read or write access is executed to a non-existent subindex.
0x80	0x20	Service temporarily unavailable	SERV_NOTAVAIL This type of error will be used if a parameter for a read or write service cannot be accessed due to the current state of the device application.

Error code	Additional code	Event	Name of the errorDescription
0x80	0x21	Service temporarily unavailable – local control	SERV_NOTAVAIL_LOCCTRL This type of error will be used if a parameter for a read or write service cannot be accessed due to a progressing local operation on the device. (e.g. operation or parameterization via on-board device control panel).
0x80	0x22	Service temporarily unavailable – device control	SERV_NOTAVAIL_DEVCTRL This type of error will be used if a read or write service cannot be accessed due to an externally caused state of the device application. (E.g. parameterization during an externally caused teach-in operation or calibration).
0x80	0x23	Access denied	IDX_not_writeable This type of error will be used if a service writes to a read-only parameter.
0x80	0x30	Parameter outside the value range	PAR_VALOUTOFRNG This type of error will be used if a service receives a parameter that does not belong to the permitted value range of the service.
0x80	0x31	Parameter value exceeds limit value	PAR_VALGTLIM This type of error will be used if a write service receives a parameter that exceeds the upper limit of the specified value range of the service.
0x80	0x32	Parameter value is below limit value	PAR_VALLTLIM This type of error will be used if a write service receives a parameter that is below the lower limit of the specified value range of the service.
0x80	0x33	Parameter too long	VAL_LENOVRRUN This type of error will be used if the content of a write service of a parameter is longer than specified. This type of error will also be used if a data object is too large to be processed by the device application (e.g. because the ISDU buffer size is limited).
0x80	0x34	Parameter too short	VAL_LENUNDRUN This type of error will be used if the content of a write service of a parameter is shorter than specified (e.g. write access of an Unsigned16 value to a Unsigned32 parameter).
0x80	0x35	Function not available	FUNC_NOTAVAIL This type of error will be used if the command code of a write service is not supported by the device application (e.g., a system command with an unimplemented value).
0x80	0x36	Function temporarily unavailable	FUNC_UNAVAILEMP This type of error will be used if the command code of a write service calls a device function that is not available due to the current state of the device application (e.g. a system command).
0x80	0x40	Invalid parameter record	PAR_SETINVALID This error type will be used if values sent by a single parameter transfer are incompatible with other current parameter settings.
0x80	0x41	Inconsistent parameter record	PAR_SETINCONSIST This type of error will be used if the plausibility check shows inconsistencies upon completion of a block parameter transfer with ParamDownloadEnd or ParamDownloadStore.

Error code	Additional code	Event	Name of the errorDescription
0x80	0x82	Application not ready	APP_DEVNOTRDY This type of error will be used if a read or write service is denied due to an application that is temporarily unavailable (e.g. a peripheral controller during startup).
0x81	0x00	Vendor-specific	UNSPECIFIC This type of error will be forwarded directly by the IO-Link Master as an error (no warning) for higher-level processing.
0x81	0x01 … 0xFF	Vendor-specific	VENDOR_SPECIFIC This type of error will be forwarded directly by the IO-Link Master as an error (no warning) for higher-level processing.

Error code and additional code: "Derived" errors

The following table lists the possible combinations of error code and additional code for the "derived" errors:

Error code	Additional code	Event	Name of the errorDescription
0x10	0x00	IO-Link Master communication error	COM_ERR The IO-Link Master will generate a negative response for the service for this type of error if a communication error (e.g. an interruption of the SDCI connection) occurs during the read or write service.
0x11	0x00	IO-Link Master – ISDU timeout	I-SERVICE_TIMEOUT The IO-Link Master will generate a negative response for the service with this type of error if a read or write service waits longer than the specified I-Service timeout in the master.
0x11	0x00	Device event – ISDU error (DL)	I-SERVICE_TIMEOUT If the IO-Link Master receives an event with Event Qualifier DL, Error, Event single shot and Event Code 0x5600, a negative response indicating a timeout of the service will be generated and sent back.
0x11	0x00	Device event – ISDU illegal service primitives (AL)	I-SERVICE_TIMEOUT If the IO-Link Master receives an event with Event Qualifier AL, Error, Event single shot and Event Code 0x5800, a negative response indicating a service timeout will be generated and sent back.
0x56	0x00	IO-Link Master – ISDU checksum error	M_ISDU_CHECKSUM The IO-Link Master will generate a negative response for the service with this type of error if the data link layer (DLL) of the master detects an ISDU checksum error.
0x57	0x00	IO-Link Master – ISDU illegal service primitives	M_ISDU_ILLEGAL The IO-Link Master will generate a negative response for the servicewith this type of error if the data link layer (DLL) of the master detects an illegal ISDU service primitive.
0x80	0x33	Device event – ISDU buffer overrun (DL)	VAL_LENOVRRUN If the IO-Link Master receives an event with Event Qualifier DL, Error, Event single shot, and Event Code 0x5200, a negative response indicating that the service has exceeded the allowed parameter length will be generated and sent back.

MQTT Topics

General Parts of a Topic

The description of a topic contains parts that are substituted:

Bit	Description
{prefix}	Prefix of each topic. The prefix is a text used to identify a device. Configurable in the IO-Link master Web Server.
[MASTER_NUMBER]	Number for each master in the gateway. Typically, the gateway has one master and MASTER_NUMBER is 1.
[PORT_NUMBER]	Number for each port of a master. If the master has 8 ports for example, PORT_NUMBER is 1 … 8.
[DEVICE_ALIAS]	String to identify a device connected to a port of a master:masterXportY. Example: master1port3.

Gateway Topics

Overview

Topic	Description
{prefix}/IO-Link/v1/gateway/identification	Identification of the gateway: MAC address, serial number, product ID, vendor name, product name, hardware revision, firmware revision. For an example, see Gateway Identification, page 87.
{prefix}/IO-Link/v1/gateway/capabilities	Capabilities of the gateway: IODD supported, MQTT supported. For an example, see Gateway Capabilities, page 88.
{prefix}/IO-Link/v1/gateway/configuration	Network configuration of the gateway: IP configuration, IP address, subnet mask, standard gateway. For an example, see Gateway Configuration, page 88.

You can find examples of and details about the transferred JSON objects below.

Gateway Identification

Example of the gateway identification JSON object:

```
{
"macAddress": "01:02:03:04:05:06",
"serialNumber": "12345678",
"productID": "TMP34Z",
"vendorName": "SensorCompany",
"productName": "FlowSensor34",
"hardwareRevision": "V2.34",
"firmwareRevision": "V1.23"
}
```

Gateway Capabilities

JSON key	Description
ioddSupported	"ioddSupported": true: IODD is available "ioddSupported": false: IODD is not available
mqttSupported	"mqttSupported": true: MQTT is available "mqttSupported": false: MQTT is not available

Example of the gateway capabilities JSON object:

```
{
"ioddSupported": true,
"mqttSupported": false
}
```

Gateway Configuration

JSON key	Description
"ipConfiguration"	Possible values for "ipConfiguration": • “MANUAL”: Assignment of the IP address by other device-specific means. • “DHCP”: RFC 2131 defines the “Dynamic Host Configuration Protocol” that allows automatic assignment of IP addresses. • “DCP”: PROFINET defines the “Discovery and Configuration Protocol”, a link-layer protocol that allows the manual assignment of IP addresses.

Example of the gateway configuration JSON object:

```
{
"ethIpv4":
[
{
"ipConfiguration": "MANUAL",
"ipAddress": "192.168.1.13",
"subnetMask: "255.255.255.0",
"standardGateway": "192.168.1.1
}
]
}
```

Master Topics

Overview

Topic	Description
{prefix}/IO-Link/v1/masters	Available master number keys and identification information: Master number, serial number, location tag For an example, see Master List, page 90.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/identification	Identification of the master: Vendor name, vendor ID, master ID, master type, serial number, application-specific tag, location tag, function tag Example: {prefix}/IO-Link/v1/masters/1/identification For an example, see Master Identification, page 90.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/capabilities	Capabilities of the master: Number of ports, maximum power supply (of the device)Example: {prefix}/IO-Link/v1/masters/1/capabilities For an example, see Master Capabilities, page 91.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports	Available port number keys: Port number, status info, device alias Example: {prefix}/IO-Link/v1/masters/1/ports For an example, see Port List, page 91.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/capabilities	Capability information of the port: Max power supply (of the port), port type Example: {prefix}/IO-Link/v1/masters/1/ports/4/capabilities For an example, see Port Capabilities, page 91.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/status	Current status of the port: Status Info, IO-Link revision, transmission rate, master cycle time Example: {prefix}/IO-Link/v1/masters/1/ports/4/status For an example, see Port Status, page 92.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/configuration	Configuration of the port: Mode, validation and backup, iq configuration, cycle time, device alias Example: {prefix}/IO-Link/v1/masters/1/ports/4/configuration For an example, see Port Configuration, page 92.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/diagnostics/configuration	Diagnostics/configuration of the port: overcurrent pin 1, undercurrent pin 1, overcurrent pin 2, undercurrent pin 2, overcurrent pin 4, undercurrent pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/diagnostics/configuration For an example, see Port Diagnostics Configuration, page 93.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/diagnostics/current	Diagnostics/current of the port: current pin 1, current pin 2, current pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/diagnostics/current For an example, see Port Diagnostics Current, page 93.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/diagnostics/voltage	Diagnostics/voltage of the port: voltage pin 1, voltage pin 2, voltage pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/diagnostics/voltage For an example, see Port Diagnostics Voltage, page 93.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/diagnostics/temperature	Diagnostics/temperature of the port: temperature pin 1, temperature pin 2, temperature pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/diagnostics/temperature For an example, see Port Diagnostics Temperature, page 94.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/statistics/current	Statistics/current of the port: minimum current pin 1, maximum current pin 1, minimum current pin 2, maximum current pin 2, minimum current pin 4, maximum current pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/statistics/current For an example, see Port Diagnostics Current, page 93.

Topic	Description
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/statistics/voltage	Statistics/voltage of the port: minimum voltage pin 1, maximum voltage pin 1, minimum voltage pin 2, maximum voltage pin 2, minimum voltage pin 4, maximum voltage pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/statistics/voltage For an example, see Port Statistics Voltage, page 95.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/statistics/temperature	Statistics/temperature of the port: minimum temperature pin 1, maximum temperature pin 1, minimum temperature pin 2, maximum temperature pin 2, minimum temperature pin 4, maximum temperature pin 4 Example: {prefix}/IO-Link/v1/masters/1/ports/4/statistics/temperature For an example, see Port Statistics Temperature, page 95.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/diagnostics/configuration	Diagnostics/configuration: over temperature, temperature hysteresis, overvoltage low, undervoltage low, overvoltage low2, undervoltage low2, voltage hysteresis, current hysteresis Example: {prefix}/IO-Link/v1/masters/1/diagnostics/configuration For an example, see Diagnostics Configuration, page 96.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/diagnostics/value	Diagnostics/value: mean temperature, mean voltage low, mean voltage low2, sum current low, sum current low2 Example: {prefix}/IO-Link/v1/masters/1/diagnostics/value For an example, see Diagnostics Value, page 96.
{prefix}/IO-Link/v1/masters/[MASTER_NUMBER]/ports/[PORT_NUMBER]/datastorage	Data storage content of the port: Vendor ID, device ID, IO-Link revision Example: {prefix}/IO-Link/v1/masters/1/ports/4/datastorag eFor an example, see Port Data Storage, page 97.

You can find examples of and details about the transferred JSON objects below.

Master List

Example of the master list JSON object:

```
{
{
"masterNumber": 1,
"serialNumber": "A0A1A2A3A4",
"locationTag": "slot 2"
},
{
"masterNumber": 2,
"serialNumber": "B0B1B2B3B4",
"locationTag": "slot 3"
}
```

Master Identification

Example of the master identification JSON object:

```
{
"vendorName": "Vendor GmbH",
"vendorId": 26,
"masterId": 42,
"masterType": "Master acc. V1.0",
"serialNumber": "IOLM123456",
"applicationSpecificTag": "Fallback reader",
"locationTag": "Down under",
"functionTag": "Code reading"
}
```

Master Capabilities

Example of the master capabilities JSON object:

```
{
"numberOfPorts": 8,
"maxPowerSupply": {
"value": 0.3,
"unit": "A"
}
}
```

Port List

JSON key	Description
statusInfo	Activated: "statusInfo": "DEVICE_ONLINE" Deactivated: "statusInfo": “DEACTIVATED”
deviceAlias	Possible values for "deviceAlias": • "Distance_sensor" • "Pressure_sensor" • "Switching_sensor” • "Empty_port"

Example of the port list JSON object:

```
[
{
"portNumber": 1,
"statusInfo": "DEVICE_ONLINE",
"deviceAlias": "Distance_sensor"
},
{
"portNumber": 2,
"statusInfo": "DEVICE_ONLINE",
"deviceAlias": "Pressure_sensor"
},
{
"portNumber": 3,
"statusInfo": "DEVICE_ONLINE",
"deviceAlias": "Switching_sensor"
},
{
"portNumber": 4,
"statusInfo": "DEACTIVATED",
"deviceAlias": "Empty_port
}
]
```

Port Capabilities

JSON key	Description
portType	Value for “portType” for IO-Link master: “CLASS_A”

Example of the port capabilities JSON object:

```
{
"maxPowerSupply": {
"value": 0.3,
"unit": "A"
,
"portType": "CLASS_A"
}
```

Port Status

JSON key	Description
statusInfo	Activated: "statusInfo": "DEVICE_ONLINE"Deactivated: "statusInfo": “Deactivated”

Example of the IO-Link port status JSON object:

```
{
"statusInfo": "DEVICE_ONLINE",
"IO-LinkRevision": "1.1",
"transmissionRate": "COM2",
"masterCycleTime":
{"value": "5.0",
"unit": "ms"
}
}
```

Port Configuration

JSON key	Values
mode	• "DEACTIVATED" • "IO-Link_CYCLIC" • "IO-Link_ROAMING"
validationAndBackup	• "NO_DEVICE_CHECK" • "TYPE_COMPATIBLE" • "TYPE_COMPATIBLE_RESTORE_ONLY" • "TYPE_COMPATIBLE_BACKUP_AND_RESTORE"

Example of the IO-Link configuration JSON object:

```
{
"mode": "IO-Link_MANUAL",
"validationAndBackup": "TYPE_COMPATIBLE",
"iqConfiguration":"DIGITAL_INPUT"
"cycleTime": {
"value": "5.0",
"unit": "ms"
},
"deviceAlias": "Distance_sensor_1"
}
```

Example of the cycle time object JSON object:

```
{
"value": "5.0",
"unit": "ms"
}
```

Port Diagnostics Configuration

Example of the port diagnostics configuration JSON object:


```
{
"overCurrentPin1": {
"value": "0.0",
"unit": "A"
},
"underCurrentPin1": {
"value": "0.0",
"unit": "A"
},
"overCurrentPin2": {
"value": "0.0",
"unit": "A"
},
"underCurrentPin2": {
"value": "0.0",
"unit": "A"
},
"overCurrentPin4": {
"value": "0.0",
"unit": "A"
},
"underCurrentPin4": {
"value": "0.0",
"unit": "A"
}
}
```


Port Diagnostics Current

Example of the port diagnostics current JSON object:


```
{
"currentPin1": {
"value": "60.0",
"unit": "mA"
},
"currentPin2": {
"value": "0.0",
"unit": "mA"
},
"currentPin4": {
"value": "0.0",
"unit": "mA"
}
}
```


Port Diagnostics Voltage

Example of the port diagnostics voltage JSON object:


```
{
"voltagetPin1": {
"value": "23.2",
"unit": "V"
},
"voltagePin2": {
"value": "0.2",
"unit": "V"
},
"voltagePin4": {
"value": "18.3",
"unit": "V"
}
}
```

Port Diagnostics Temperature

Example of the port diagnostics temperature JSON object:


```
{
"temperaturePin1": {
"value": "39.3",
"unit": "C"
},
"temperaturePin2": {
"value": "39.3",
"unit": "C"
},
"temperaturePin4": {
"value": "39.3",
"unit": "C"
}
}
```


Port Statistics Current

Example of the port statistics current JSON object:


```
{
"minCurrentPin1": {
"value": "55.0",
"unit": "mA"
},
"maxCurrentPin1": {
"value": "72.0",
"unit": "mA"
},
"minCurrentPin2": {
"value": "0.0",
"unit": "mA"
},
"maxCurrentPin2": {
"value": "0.0",
"unit": "mA"
},
"minCurrentPin4": {
"value": "0.0",
"unit": "mA"
},
"maxCurrentPin4": {
"value": "0.0",
"unit": "mA"
}
}
```

Port Statistics Voltage

Example of the port statistics voltage JSON object:


```
{
"minVoltagePin1": {
"value": "23.3",
"unit": "V"
},
"maxVoltagePin1": {
"value": "23.3",
"unit": "V"
},
"minVoltagePin2": {
"value": "-0.2",
"unit": "V"
},
"maxVoltagePin2": {
"value": "-0.2",
"unit": "V"
},
"minVoltagePin4": {
"value": "-0.2",
"unit": "V"
},
"maxVoltagePin4": {
"value": "22.4",
"unit": "V"
}
}
```


Port Statistics Temperature

Example of the port statistics temperature JSON object:


```
{
"minTemperaturePin1": {
"value": "38.9",
"unit": "C"
},
"maxTemperaturePin1": {
"value": "39.5",
"unit": "C"
},
"minTemperaturePin2": {
"value": "38.9",
"unit": "C"
},
"maxTemperaturePin2": {
"value": "39.5",
"unit": "C"
},
"minTemperaturePin4": {
"value": "38.9",
"unit": "C"
},
"maxTemperaturePin4": {
"value": "39.5",
"unit": "C"
}
}
```

Diagnostics Configuration

Example of the diagnostics configuration JSON object:


```
{
"overTemperature": {
"value":70.0,
"unit":"C"
},
"temperatureHysteresis": {
"value":2.0,
"unit":"C"
},
"overVoltageL": {
"value":30.0,
"unit":"V"
},
"underVoltageL": {
"value":18.0,
"unit":"V"
},
"overVoltageL2": {
"value":30.0,
"unit":"V"
},
"underVoltageL2": {
"value":18.0,
"unit":"V"
},
"voltageHysteresis": {
"value":0.3,
"unit":"V"
},
"currentHysteresis": {
"value":0.0,
"unit":"A"
}
}
```


Diagnostics Value

Example of the diagnostics value JSON object:


```
{
"meanTemperature":{
"value":37.6,
"unit":"C"
},
"meanVoltageL":{
"value":23.2,
"unit":"V"
},
"meanVoltageL2":{
"value":0.0,
"unit":"V"
},
"sumCurrentL":{
"value":0.5,
"unit":"A"
},
"sumCurrentL2":{
"value":0.0,
"unit":"A"
}
}
```

Port Data Storage

Example of the port data storage JSON object:


```
"header": {
"vendorId": 15,
"deviceId": 65253,
"IO-LinkRevision": "1.1"
},
"content": "YmFzZTY0IGVuY3J5cHRlZCBjb250ZW50"
}
}
```

Device Topics

Overview

Topic	Description
{prefix}/IO-Link/v1/devices	Address all devices of all masters: Device alias, master number, port number. For an example, see Device List, page 98.
{prefix}/IO-Link/v1/devices/[DEVICE_ALIAS]/processdata/value	Process data value of the device: Get data (IO-Link, IQ value), set data (IO-Link) Example: {prefix}/IO-Link/v1/devices/master1port4/processdata/value For an example, see Device Process Data, page 99.
{prefix}/IO-Link/v1/devices/[DEVICE_ALIAS]/processdata/getdata/value	Process data input value of the device: Get Data (IO-Link, IQ value) Example: {prefix}/IO-Link/v1/devices/master1port4]/processdata/getdata/value For an example, see Device Process Data Input, page 99.
{prefix}/IO-Link/v1/devices/[DEVICE_ALIAS]/processdata/setdata/value	Process data output value of the device: Set Data (IO-Link) Example: {prefix}/IO-Link/v1/devices/master1port4]/processdata/setdata/value For an example, see Device Process Data Output, page 100.
IO-Link/v1/devices/[DEVICE_ALIAS]/events	Event log of the device: Time, severity, origin, message Example: {prefix}/IO-Link/v1/devices/master1port4/events For an example, see Device Events, page 100.

Device List (JSON Object)

Example of the device list JSON object:

JSON key	Description
deviceAlias	Device alias
masterNumber	Master number
portNumber	Port number

Example of the device list JSON object:

```
[
{
"deviceAlias": "DT35",
"masterNumber": 1,
"portNumber": 1,
},
{
"deviceAlias": "DT36",
"masterNumber": 1,
"portNumber": 2,
},
{
"deviceAlias": "DT37",
"masterNumber": 1,
"portNumber": 3,
},
{
"deviceAlias": "DT38",
"masterNumber": 1,
"portNumber": 4,
},
]
```


Device Process Data (JSON Object)

Example of the device process data JSON object:

JSON key	Description
getData	Get Data
IO-Link	IO-Link
iqValue	IQ value
setData	Set Data
IO-Link	IO-Link

Example of the device process data JSON object for an IO-Link device:


```
{
"getData": {
"IO-Link": {
"valid": true,
"value": [12,22,216]
},
"iqValue": false
},
"setData": {
"IO-Link": {
"valid": true,
"value": [128,221,134]
}
}
```


Device Process Data Input (JSON Object)

Example of the device process data input JSON object:

JSON key	Description
getData	Get Data
IO-Link	IO-Link
iqValue	IQ value

Example of the device process data input JSON object for an IO-Link device:

```
{
"getData": {
"IO-Link": {
"valid": true,
"value": [12,22,216]
},
"iqValue": false
}
}
```


Device Process Data Output (JSON Object)

Example of the device process data output JSON object:

JSON key	Description
setData	Set Data
IO-Link	IO-Link

Example of the device process data output JSON object for an IO-Link device:


```
{
"getData": {},
"setData": {
"IO-Link": {
"valid": true,
"value": [128,221,134]
}
}
}
```


Device Events (JSON Object)

Example of the device events JSON object:

JSON key	Description
time	Time
severity	Severity
origin	Origin
message	Message

Example of the device events JSON object:


```
[
{
"time": "2018-05-18T07:31:54.123z",
"severity": "WARNING",
"origin": {
"master": 1,
"port": 1,
"device": "Temp sensor 1",
},
"message": {
"code": 16912,
"mode": "APPEARS",
"text": "Device temperature over-run - Clear source of heat"
}
}
]
```

MQTT Topics

Overview

Topic	Description
{prefix}/IO-Link/v1/mqtt/configuration	Configuration of MQTT client: Client mode, server address, user name, password, last will, keep alive timeFor an example, see MQTT Configuration, page 101.
{prefix}/IO-Link/v1/mqtt/connectionstatus	Configuration of MQTT client: Connection status, server address, up timeFor an example, see MQTT Connection Status, page 101.

You can find examples of and details about the transferred JSON objects below.

MQTT Configuration

JSON key	Description
clientMode	Activated: "clientMode": "ACTIVE"Deactivated: "clientMode": "INACTIVE"

Example of the MQTT configuration JSON object:

```
{
"clientMode": "ACTIVE",
"serverAddress": "192.168.2.1./mqttserver",
"username": "IO-Link_json",
"password": "123456",
"lastWill": {
"topic": "my temperature sensor",
"message": "Process data transfer stopped",
"qoS": "0_ONLY_ONCE",
"retain": true
},
"keepAliveTime": 0
}
```

MQTT Connection Status

JSON key	Description
connectionStatus	Possible values for "connectionStatus":-CONNECTINGCONNECTION_ACCEPTEDCLIENT_INACTIVE

Example of the MQTT connection status JSON object:

```
{
"connectionStatus": "CONNECTION_ACCEPTED",
"serverAddress": "192.168.2.1./mqttserver",
"upTime": 123
}
```

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:

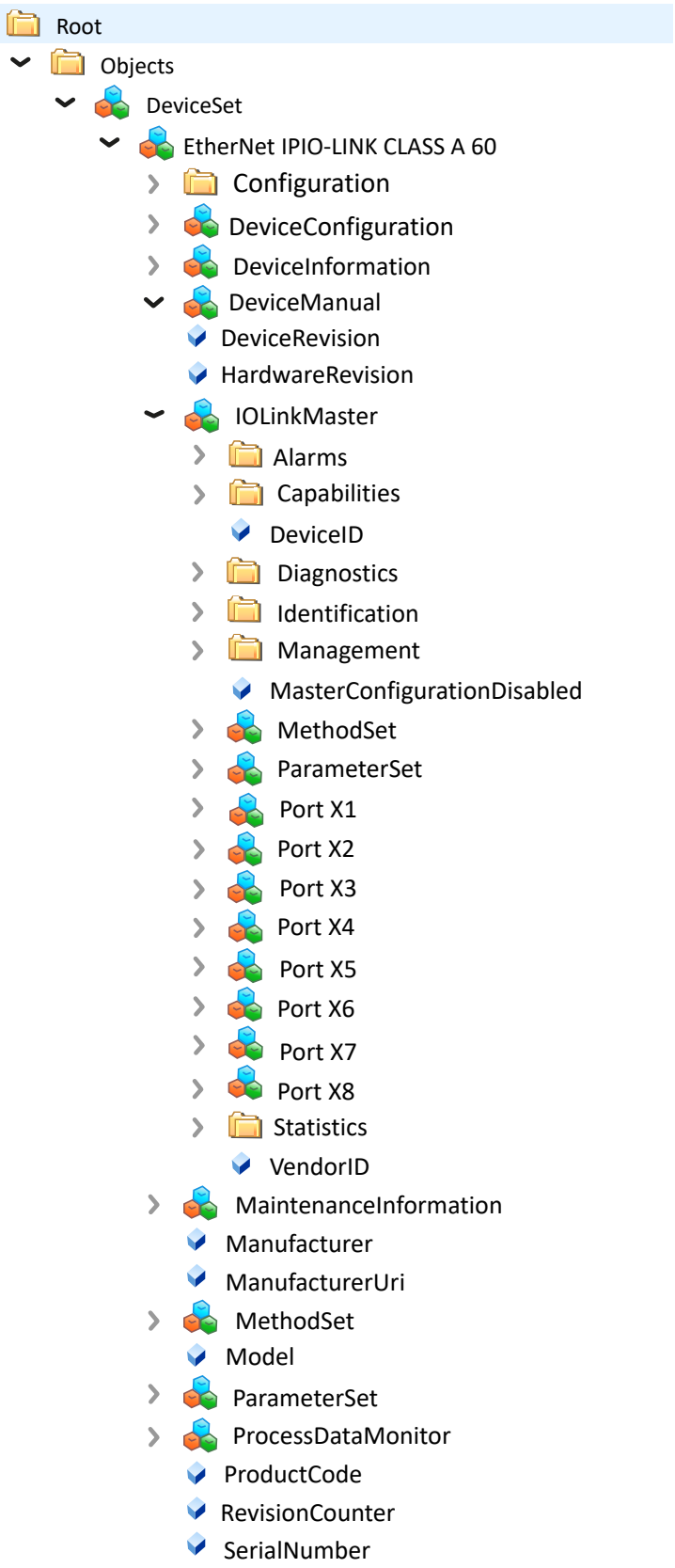
- Device identification,
- Configuration parameters,
- Process data,
- Measuring values,
- Information on diagnosis,
- Information on statistics, and so on.

The OPC UA client establishes a connection via the following URL:
`opc.tcp://IP address:4840`

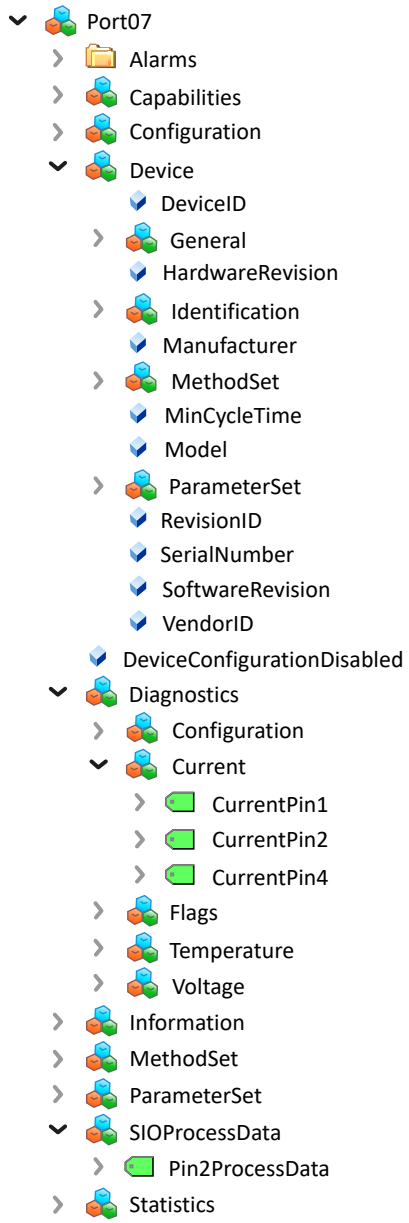
For IP address use the IP address of the device.

The client can access the device parameters anonymously (reading only) or via user name/password (reading and writing). Use the web server to set user name and password.

The following figure shows a part of the information model of the device:



The following figure shows a part of the information model of the IO-Link port:



Device Identifiation

The device provides nodes for the device identification. In the node SoftwareRevision, for example, the OPC UA client can read the version of the device firmware used.

The path to these nodes is:

Root > Object > DeviceSet > [device name]

Device identification:

Node name	Node class	Access	Description
Manufacturer	Variable	read	Device manufacturer
ManufacturerUri	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 firmware

Configuration Parameter

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

The path to these nodes is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > Configuration

Device-related configuration parameter:

Node name	Node class	Access	Default	Description
CurrentHysteresis	Variable	read	10 mA	Current hysteresis, unit: mAI n case the current exceeds the limit, then the current has to lower by the hysteresis value below the limit in order to remove the diagnosis.
OverTemperature	Variable	read	70 °C	Higher limit value for the temperature of a port, unit: 0,1°C
OverVoltageL1	Variable	read	30 V	Upper voltage limit of power line 1, monitoring possible for pins with function L+, DI, DO, DIO, IO-Link, unit: mV
OverVoltageL2	Variable	read	30 V	Higher limit of the voltage of power line 2, unit: mV
TemperatureHysteresis	Variable	read	2 °C	Temperature hysteresis, unit: 0.1 °C In case the the temperature exceeds the limit, then the temperature has to lower by the hysteresis value below the limit in order to remove the diagnosis.
UnderTemperature	Variable	read	-25 °C	Lower temperature limit of a port, unit: 0.1 °C
UnderVoltageL1	Variable	read	18 V	Lower limit of the voltage of power line 1, monitoring possible for pins with function L+, DI, DO, DIO, IO-Link, unit: mV
UnderVoltageL2	Variable	read	18 V	Lower limit of the voltage of power line 2, unit: mV
VoltageHysteresis	Variable	read	300 mV	Voltage hysteresis, unit: mV In case the the voltage exceeds the limit, then the voltage has to lower by the hysteresis value below the limit in order to remove the diagnosis.

The OPC UA server provides nodes with configuration parameters for each port.

The path to these nodes is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > PortXX > Configuration

The following table lists port-related configuration parameters:

Node name	Node class	Access	Default	Description
OverCurrent-Pin1	Variable	read	0	Warning level for upper current limit at pin 1, unit: 1 mA 0: Monitoring not activated
OverCurrent-Pin2	Variable	read	0	Warning level for upper current limit at pin 2, unit: 1 mA 0: Monitoring not activated
OverCurrent-Pin4	Variable	read	0	Warning level for upper current limit at pin 4, unit: 1 mA 0: Monitoring not activated
UnderCurrent-Pin1	Variable	read	0	Warning level for lower current limit at pin 1, unit: 1 mA 0: Monitoring not activated
UnderCurrent-Pin2	Variable	read	0	Warning level for lower current limit at pin 2, unit: 1 mA 0: Monitoring not activated
UnderCurrent-Pin4	Variable	read	0	Warning level for lower current limit at pin 4, unit: 1 mA 0: Monitoring not activated

Process Data

The OPC UA server provides nodes with configuration parameters for each port. For example, the OPC UA client can read the value at pin 4 of a port in the Pin4ProcessData node.

The OPC UA server provides nodes with configuration parameters for each port. The path to these nodes is:

Root > Objects > DeviceSet > [Device name] > IO-LinkMaster > Port XX > Device > ParameterSet

The following table lists port-related IO-Link process data:

Node name	Node class	Access	Description
ProcessDataInput	Variable	read	Process data (inputs)
PDDescriptor	Variable	read	Coding according to "IO-Link Companion Specification"
ProcessDataLength	Variable	read	Length of input process data
ProcessDataOutput	Variable	read	Process data (outputs)
PDDescriptor	Variable	read	Coding according to "IO-Link Companion Specification"
ProcessDataLength	Variable	read	Length of input process data

Read Device-related Measured Values

The OPC UA server provides nodes with calculated measured values. For example, the OPC UA client can read the calculated sum current of supply line 1 in the SumCurrentL node.

The path to these nodes is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > Current

The following table lists device-related (calculated) current measured values:

Node name	Node class	Access	Description
SumCurrentL1	Variable	read	Total current calculated from individual measurements in supply line 1, unit: mA
SumCurrentL2	Variable	read	Total current calculated from individual measurements in supply line 2, unit: mA

The path to the node of the temperature measured value is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > Temperature

The following table lists device-related (calculated) temperature measured values:

Node name	Node class	Access	Description
MeanTemperature	Variable	read	Mean value for the temperature of the module, calculated from the temperature values measured individually on the three chips, unit:°C

The path to the nodes of the voltage measured values is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > Voltage

The following table lists device-related (calculated) voltage measured values:

Node name	Node class	Access	Description
MeanVoltageL1	Variable	read	Mean voltage of power line 1, unit: mV
MeanVoltageL2	Variable	read	Mean voltage of power line 2, unit: mV

Read Port Measured Values and Diagnostics

The OPC UA server provides nodes with measured values for each port and each pin.

The path to the nodes with port-related current measured values is:

Root > Object > DeviceSet > [device name] > IO-LinkMasterDiagnostics > PortXX > Current

The following table lists port-related current measured values:

Node name	Node class	Access	Description
CurrentPin1	Variable	read	Current measured at pin 1, unit: mA
CurrentPin2	Variable	read	Current measured at pin 2, unit: mA
CurrentPin4	Variable	read	Current measured at pin 4, unit: mA

The path to the nodes with port-related temperature measured values is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > PortXX > Temperature

The following table lists port-related temperature measured values:

Node name	Node class	Access	Description
TemperaturePin1	Variable	read	Temperature measured at pin 1, unit: °C
TemperaturePin2 C	Variable	read	Temperature measured at pin 2, unit: °
TemperaturePin4	Variable	read	Temperature measured at pin 4, unit: °C

The path to the nodes with port-related voltage measured values is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > Diagnostics > PortXX > Voltage

The following table lists port-related voltage measured values:

Node name	Node class	Access	Description
VoltagePin1	Variable	read	Voltage measured at pin 1, unit: mV
VoltagePin1	Variable	read	Voltage measured at pin 1, unit: mV
VoltagePin4	Variablev	read	Voltage measured at pin 4, unit: mV

Diagnosis OPC UA

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

Node name	Node class	Access	Description
DiagnosticsPin1,- DiagnosticsPin2,- DiagnosticsPin4	Variable	read	Diagnosis on pin 1, pin 2 or pin 4. The numeric value contains bitcoded information: • Bit 0: Short circuit • Bit 1: Overload protection • Bit 2: Overtemperature protection • Bit 3: Overvoltage protection • Bit 4: Overcurrent • Bit 5: Undercurrent • Bit 6: Overtemperature • Bit 7: Undertemperature • Bit 8: Overvoltage • Bit 9: Undervoltage • Bit 10: Watchdog 0: Diagnosis not active 1: Diagnosis active

Statistics

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

The path to these nodes is:

Root > Object > DeviceSet > [device name] > IO-LinkMaster > PortXX > Statistics > Current/Temperatur/Voltage

The following table lists port-related statistic information:

Measurement	Node name	Node class	Access	Description
Current	MaxCurrentPin1	Variable	read	Maximum current at pin 1 since last reset, unit: mA
	MaxCurrentPin2	Variable	read	Maximum current at pin 2 since last reset, unit: mA
	MaxCurrentPin4	Variable	read	Maximum current at pin 4 since last reset, unit: mA
	MinCurrentPin1	Variable	read	Maximum current at pin 1 since last reset, unit: mA
	MinCurrentPin2	Variable	read	Maximum current at pin 2 since last reset, unit: mA
	MinCurrentPin4	Variable	read	Maximum current at pin 4 since last reset, unit: mA
Temperature	MaxTemperaturePin1	Variable	read	Maximum temperature at pin 1 since last reset, unit: °C
	MaxTemperaturePin2	Variable	read	Maximum temperature at pin 2 since last reset, unit: °C
	MaxTemperaturePin4	Variable	read	Maximum temperature at pin 4 since last reset, unit: °C
	MinTemperaturePin1	Variable	read	Maximum temperature at pin 1 since last reset, unit: °C
	MinTemperaturePin2	Variable	read	Maximum temperature at pin 2 since last reset, unit: °C
	MinTemperaturePin4	Variable	read	Maximum temperature at pin 4 since last reset, unit: °C
Voltage	MaxVoltagePin1	Variable	read	Maximum voltage at pin 1 since last reset, unit: mV
	MaxVoltagePin2	Variable	read	Maximum voltage at pin 2 since last reset, unit: mV
	MaxVoltagePin4	Variable	read	Maximum voltage at pin 4 since last reset, unit: mV
	MinVoltagePin1	Variable	read	Maximum voltage at pin 1 since last reset, unit: mV
	MinVoltagePin2	Variable	read	Maximum voltage at pin 2 since last reset, unit: mV
	MinVoltagePin4	Variable	read	Maximum voltage at pin 4 since last reset, unit: mV

NTP Client Configuration

The OPC UA server provides nodes for configuring the NTP client.

The path to these nodes is:

Root > Object > DeviceSet > [Device Name] > Configuration > NtpClient > Configuration > CurrentConfiguration

Node name	Node class	Access	Default	Description
NtpClientServerIpAddress	Variable	read/write	0	IP address of the NTP server. The NTP client uses the set IP address to getthe date and time from an NTP server. The IP address must be converted into a decimal number. The calculation is explained below the table. The value 0 disables the function.
NtpClientServerIpAddressFallback	Variable	read/write	0	IP address of the NTP server (fallback) Optional additional IP address if the NTP server cannot be reached via the IP address in theNtpClientServerIpAddress node. The IP address must be converted into adecimal number. The calculation is explained below the table. The value 0 disables the function.
NtpClientUpdateConfiguration	Method	write	-	Method for writing the nodes NtpClientServerIpAddress and NtpClientServerIpAddressFallback.

To convert the IP address to a decimal number, use the following formula. Starting from an IP address in the format A.B.C.D:

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

Example of IP address 192.53.103.108

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

Using OPC UA client

The IO-Link master has an integrated OPC UA server. You can communicate with the IO-Link master using an OPC UA client.

For test purposes, you can use for example the UaExpert from Unified Automation GmbH:

http://www.unifiedautomation.com

An OPC UA client has read access to the IO-Link master with the authentication "anonymous".

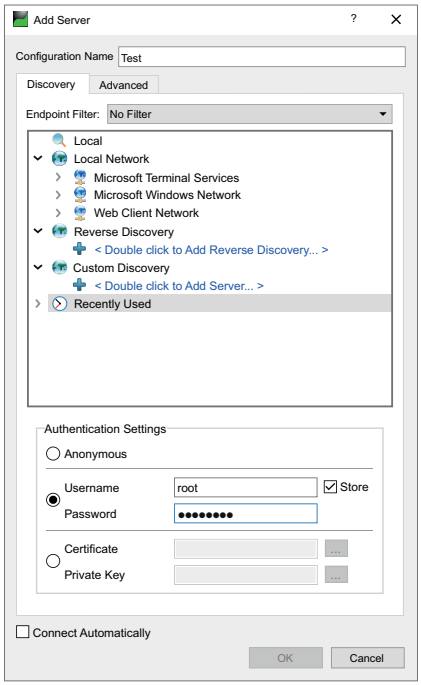
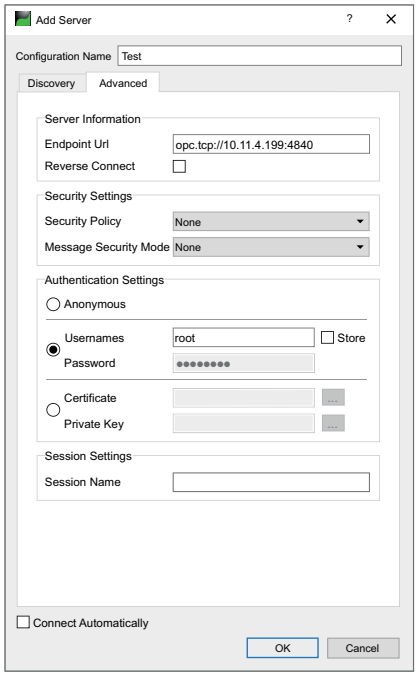
An OPC UA client has read and write access to the IO-Link master with the authentication "User name and password" if the user used has write permissions.

Connecting to IO-Link Master Device

Requirements:

- You have an OPC UA client.
- If you want write access to the IO-Link master:You know the user name and password and have write permissions.
- You know the IP address of the IO-Link master.

Without user name and password, you can access the IO-Link master "anonymously" and read data:

Step	Action
1	Start UaExpert.
2	Use **File > New** to create a new project.
3	Use **Server > Add** to add a new server. The dialog **Add server** is displayed with the tab **Discovery**. Tab Discovery (default) Tab Advanced  
4	Enter a name for your configuration, in the field **Configuration name**. For example: “Test”.
5	Select the tab **Advanced**.
6	In the area **Server Information** of the tab **Advanced**, enter the following text in the data field **Endpoint Url**: `opc.tcp://<IP address>:4840` For <IP address> enter the IP address of your device.
7	In the area **Authentication Settings**, select the option **Username/Password** if you want to execute a write access to the device or select **Anonymous** if a read access is sufficient.
8	If you have selected the option **Username/Password**, enter your user name and, if necessary, your password.
9	Click **OK**. In the project window, under **Project > Servers**, the UaExpert enters the server. for example Test.
10	Open the context menu of the server (“Test”) and select **Connect**. The connection is established.

Setting Date and Time of the Device via OPC UA

Requirements

- You have an OPC UA client.
- You know the username and password, and you have the permission to write.
- You know the IP address of an NTP server.
- You have converted the IP address of the NTP server into a decimal number, as described below.
- You have already established a connection to the IO-Link master.

Example of an NTP Server

NTP server ptbtime1.ptb.de of the German Federal Institute of the Physikalisch-Technische Bundesanstalt in Braunschweig with the IP address 192.53.103.108

Substitude NTP server (optional) of the NTP server ptbtime2.ptb.de of the Physikalisch-Technische Bundesanstalt in Braunschweig with the IP address 192.53.103.104

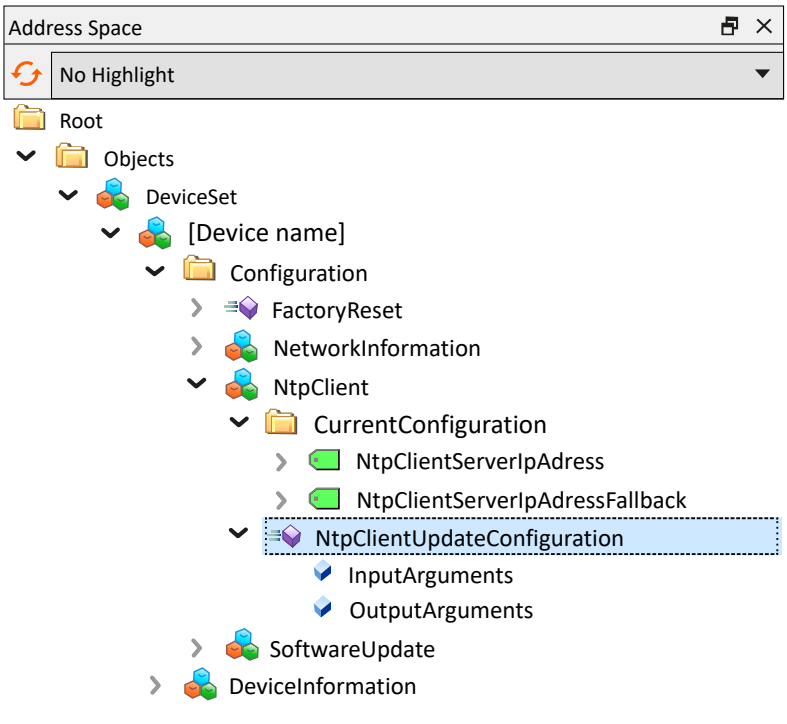
Converting an IP Address into a Decimal Number

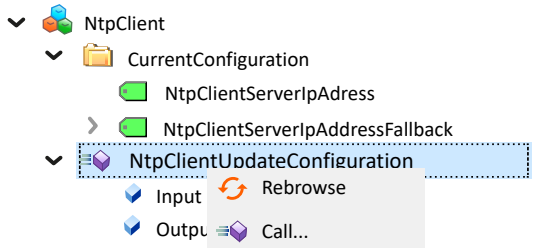
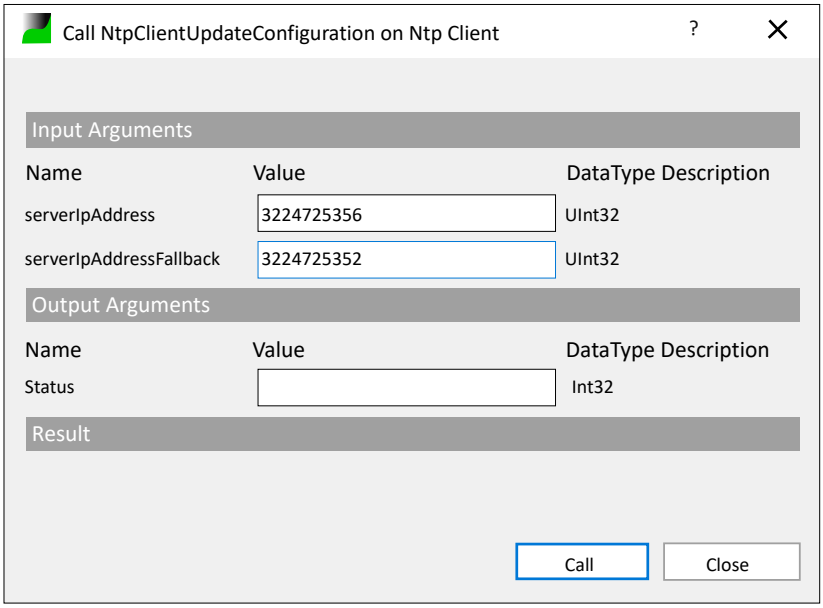
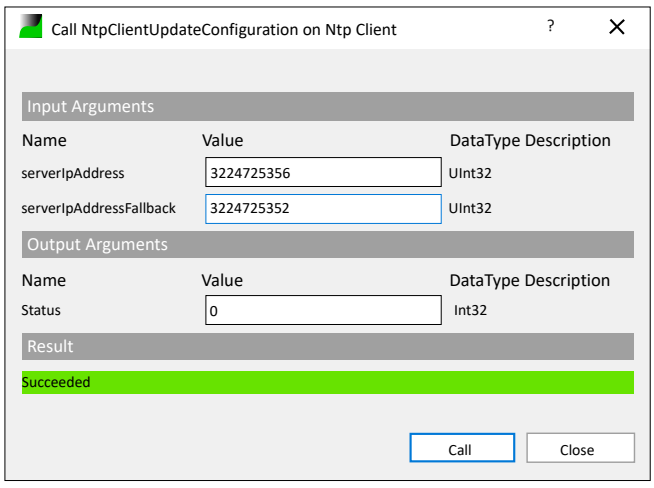
To convert the IP address to a decimal number, use the following formula.Starting from an IP address in the format A.B.C.D:

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

Example of IP address 192.53.103.108

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

Step	Action
1	In the window **Address Space**, open the context menu: **Root > Objects > DeviceSet > [Device name] > Configuration > NtpClient > NtpClientUpdateConfiguration** 

Step	Action
2	In the context menu select **Call**.  The dialog **Call NtpClientUpdateConfiguration on NtpClient** is displayed: 
3	In the area **Input Arguments**, in the input field **ServerIpAddress**, enter the value “3224725356” for the IP address of the NTP server.
4	In the area **Input Arguments**, in the input field **ServerIpAddressFallback**, enter “3224725352” for the IP address of the replacement NTP server.
5	Click **Call**. If the function call was successful, the output field to the right of Status in the area **Output Arguments** displays “0”. A green bar with the text "succeeded" appears in the area **Result**. The two variables ServerIpAddress and ServerIpAddressFallback are now set. The device obtains the current time of the time server via NTP and synchronizes its internal time. 

Diagnosis

Diagnosis via LEDs

Supply Voltage Status

Supply voltage 1L correspond to (18) and 2L to (16) in Positions of the interfaces and LEDs (see).

The following table describes the LED status of the supply voltages 1L and 2L:

LED	Color	State	Meaning
1L	**Duo-LED red/green**		
	 (green)	On	1L supply voltage OK (18…30V)
	 (red)	On	1L undervoltage (11…18V)
	 (red)	Flashing (4 Hz)	1L overvoltage (> 30V)
	 (off)	Off	No 1L supply voltage (< 11V)
2L	**Duo-LED red/green**		
	 (green)	On	2L supply voltage OK (18…30V)
	 (red)	On	2L undervoltage (11…18V)
	 (red)	Flashing (4 Hz)	2L overvoltage (> 30V)
	 (off)	Off	No 2L supply voltage (< 11V)

System Status

SYS corresponds to (24) in Positions of the interfaces and LEDs (see).

The following table describes the LED status of the system LED SYS:

LED	Color	State	Meaning
SYS	**Duo-LED yellow/green**		
	(green)	On	Firmware is running. System status: OK
	(yellow)	On	Error
	(yellow) / (green)	Flashing (4 Hz)	Firmware update active
	(off)	Off	No power supply

Application Status

APL corresponds to (23) in Positions of the interfaces and LEDs (see).

The following table describes the LED status of the application LED APL:

LED	Color	State	Meaning
APL	**Duo-LED red/green/yellow (yellow = red and green simultaneously)**		
	(green)	On	Firmware is running, normal operating state
	(green)	Flashing (4 Hz)	Used for device identification (via web server or OPC UA connection)
	(yellow)	On	Initialization error (for example hardware error, missing valid configuration, no COM firmware found)
	(red)	On	Critical operating state: Overtemperature or self-protection is active
	(off)	Off	Firmware is not running

PROFINET IO-Device Status

BF corresponds to (1) , SF to (3) , LINK channel 0 to (21) , ACT channel 0 to (19) , LINK channel 1 to (5) , ACT Kanal 1 to (7) in Positions of the interfaces and LEDs .

LED	Color	State	Description
SF (System Failure)	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (1 Hz, 3 s)	DCP signal service is initiated via the bus.
	(red)	On	Watchdog timeout; channel, generic or extended diagnosis present; system error
BF (Bus Failure)	**Duo LED red/green**		
	(off)	Off	No error
	(red)	Flashing (2 Hz)	No data exchange
	(red)	On	No configuration; or low speed physical link; or no physical link
LNK	**LED green**		
	(green)	On	The device is linked to the Ethernet.
	(off)	Off	The device has no link to the Ethernet.
ACT	**LED yellow**		
	(yellow)	Flickering (load dependent)	The device sends/receives Ethernet frames.
	(off)	Off	The device does not send/ receive Ethernet frames.

LED state	Definition
Flashing (1 Hz, 3 s)	The indicator turns on and off for 3 seconds with a frequency of 1 Hz: “on” for 500 ms, followed by “off” for 500 ms.
Flashing (2 Hz)	The indicator turns on and off with a frequency of 2 Hz: “on” for 250 ms, followed by “off” for 250 ms.
Flickering (load dependent)	The indicator turns on and off with a frequency of approximately 10 Hz to indicate high Ethernet activity: “on” for approximately 50 ms, followed by “off” for 50 ms. The indicator turns on and off in irregular intervals to indicate low Ethernet activity.

IO-Link Port Status

IO-Link, channel A correspond to (15) for port 1 and (9) for port 2 in Positions of the interfaces and LEDs (see), channel B correspond to (13) for port 1 and (11) for port 2.

The following table describes the LED status of the IO-Link channels A and B:

LED	Color	State	Description
IO-Link, channel A Status pin 4 IO-Link	**Duo-LED yellow/red/green (yellow by red and green simultaneously)**		
	(yellow)	On	Status of digital input pin 4: On
	(off)	Off	Status of digital input pin 4: Off
	(green)	On	IO-Link communication active
	(green)	Blinking 1 Hz	No IO-Link device connected to the port or no IO-Link communication to the connected IO-Link device
	(green)	Blinking 4 Hz	IO-Link device ready for communication but IO-Link communication not yet active or check of revision or compatibility of the IO-Link device failed
	(red)	On	Overload, short circuit (pin 4 and pin 3)
	(red)	Blinking 1 Hz	Overload, short circuit sensor supply 1L+, 1L- (pin 1 and pin 3)
IO-Link, channel B Status pin 2 DIO	**Duo-LED yellow/red (yellow by red and green simultaneously)**		
	(yellow)	On	Status of digital input pin 2: On
	(off)	Off	Status of digital input pin 2: Off
	(red)	On	Overload, short circuit (pin 2 and pin 3)
	(red)	Blinking 1 Hz	Overload, short circuit sensor supply 1L+, 1L- (pin 1 and pin 3)

Diagnosis via PROFINET

General Alarms

Number (hex)	Alarm	Description	Remedy
0x0100	Undervoltage	Undervoltage in supply line 1LThe supply voltage has fallen below the limit value for minimum voltage.	Check the supply voltage.
0x0101	Overvoltage	Overvoltage in supply line 1LThe supply voltage has exceeded the limit value for maximum voltage.	Check the supply voltage.
0x0102	Overtemperature	OvertemperatureThe device temperature has exceeded the upper limit value.	Eliminate external heat source or overload.
0x0103	Overload	Overload in supply line 1LThe total current in supply line 1L has exceeded the upper limit value.	Eliminate the overload.
0x0104	Overload 2L	Overload in supply line 2LThe total current in supply line 1L has exceeded the upper limit value.	Eliminate the overload.
0x0105	Undertemperature	UndertemperatureThe device temperature has fallen below the lower limit value.	Thermally isolate the device.
0x0106	Undervoltage 2L	Undervoltage in supply line 2LThe power supply for supply line 2L has fallen below the limit value for minimum voltage.	Check the supply voltage.
0x0107	Overvoltage 2L	Overvoltage in supply line 2LThe power supply for supply line 2L has exceeded the limit value for maximum voltage.	Check the supply voltage.
0x0108	Forcing mode active	Forcing mode active (activated by Web client or OPC UA client)	The Web client or OPC UA client must exit the forcing mode as soon as forcing is no longer required.
0x0109	Short circuit at pin 4	Short circuit detected at pin 4	Eliminate the short circuit.
0x010A	Short circuit at pin 2	Short circuit detected at pin 2	Eliminate the short circuit.
0x010B	Short circuit at pin 1	Short circuit detected at pin 1	Eliminate the short circuit.

Diagnosis Alarms

The IO-Link master triggers diagnosis alarms. They indicate events on the IO-Link master or its ports. The following values are set in the "Event Qualifier":

```
TYPE = 2 (Warning) or 3 (Error)
MODE = 2 (Event disappears) or 3 (Event appears)
SOURCE = 1 (Master/local)
```

The IO-Link master sends this event to the IO-Controller as a diagnosis alarm. The "channel error (PROFINET)" has the value 0x9502.

The following table lists the numbers of the IO-Link master diagnosis alarms:

Channel error	Extended channel error type	Description	Remedy
0x9502	0x17FF	Process data error	Check the submodule configuration
0x9502	0x1800	No access to device / loss of communication	Check the IO-Link port
0x9502	0x1801	Start parameter error	Check the parameters
0x9502	0x1802	Faulty device identification	Check the port configuration parameters
0x9502	0x1803	Faulty device identification	Check the port configuration parameters
0x9502	0x1804	Short circuit at C/Q	Check the wiring
0x9502	0x1805	PHY overtemperature	Check temperature and load
0x9502	0x1806	Short circuit at L+	Check the wiring
0x9502	0x1807	Overcurrent at L+	Check the power supply (e.g. 1L+)
0x9502	0x1808	Overflow of the device event	Contact the device manufacturer
0x9502	0x1809	Backup inconsistency	Access outside memory area (2048 octets)
0x9502	0x180A	Backup inconsistency	Correct the identity error
0x9502	0x180B	Backup inconsistency	Unspecific error during data storage
0x9502	0x180C	Backup inconsistency	Correct the upload error
0x9502	0x180D	Parameter inconsistency	Correct the download error
0x9502	0x180E	P24 (class B) undervoltage or missing	Check the power supply
0x9502	0x180F	Short circuit at P24 (class B)	Check the wiring (e.g. 2L+)
0x9502	0x1810	Short circuit at I/Q	Check the wiring
0x9502	0x1811	Short circuit at C/Q	Check the wiring
0x9502	0x1812	Overcurrent at I/Q	Check the load
0x9502	0x6000	Invalid cycle time	Check the port configurationparameters
0x9502	0x6001	Revision error (incompatible protocol version)	Check the port configuration parameters
0x9502	0x6002	Failure of ISDU batch	Eliminate parameter inconsistency

Process Alarms

The IO-Link device triggers process alarms. An IO-Link device sends the "event code" and the "event qualifier" of the event to the IO-Link master. The following values are set in the event qualifier:

```
TYPE = 1 (Notification)
MODE = 1 (Single shot)
SOURCE = 0 (Device/remote)
```

The IO-Link master sends this event as a process alarm to the IOController. In case of "standard events", the "channel error" value is 0x9500, in case of manufacturer-specific events, the value is 0x9501. The IODD of the IO-Link device contains manufacturer-specific events with message text.

The following table describes possible standard events of the IO-Link device:

Channel error (PROFINET)	Extended channel error type (PROFINET)	Description of the problem at the connected IO-Link device	Remedy at the connected IO-Link device
0x9500	0x1000	General problem	IO-Link device reports an unknown error
0x9500	0x4000	Temperature error	Eliminate the overload
0x9500	0x4210	Overheating of the device	Eliminate the heat source
0x9500	0x4220	Undercooling of the device	Isolate the IO-Link device
0x9500	0x5000	Hardware error in the device	Replace the IO-Link device
0x9500	0x5010	Malfunction of a component	Repair or replacement
0x9500	0x5011	Data loss of non-volatile memory	Check the batteries
0x9500	0x5012	Batteries too low	Replace the batteries
0x9500	0x5100	General fault in the power supply	Check the availability
0x9500	0x5101	Fuse blown/open	Replace the fuse
0x9500	0x5110	Overvoltage in the primary power supply	Check the tolerance
0x9500	0x5111	Undervoltage in the primary power supply	Check the tolerance
0x9500	0x5112	Fault in the additional powersupply	Check the tolerance
0x9500	0x6000	Error in the device software	Check the firmware revision
0x9500	0x6320	Parameter error	Check data sheet and values
0x9500	0x6321	Missing parameter(s)	Check the data sheet

Channel error (PROFINET)	Extended channel error type (PROFINET)	Description of the problem at the connected IO-Link device	Remedy at the connected IO-Link device
0x9500	0x6350	Parameter change	Check the configuration
0x9500	0x7700	Wire break in line to subordinate device	Check the installation
0x9500	0x7701 – 0x770F	Wire break in line to subordinate device 1…15	Check the installation
0x9500	0x7710	Short circuit	Check the installation (device)
0x9500	0x7711	Grounding fault	Check the installation
0x9501	0x0C00	Technology-specific application error	Reset device
0x9501	0x0C01	Simulation active	Check the operating mode
0x9501	0x0C10	Exceeding the value range of a process variable	Process data uncertain
0x9501	0x0C20	Measuring range exceeded	Check the application
0x9501	0x0C30	Value of process variable below value range	Process data uncertain
0x9501	0x0C40	Maintenance required	Cleaning
0x9501	0x0C41	Maintenance required	Refilling
0x9501	0x0C42	Maintenance required	Replacement of wear parts

Decommissioning

Decommissioning the Device

⚠ CAUTION

RISK OF UNSAFE PLANT OPERATION

To prevent possible personal injury or property damage, do not remove this device from a production plant without ensuring a safe operation of the plant during or after the removal of the device.

Failure to follow these instructions can result in injury, or equipment damage.

To decommission the IO-Link master you have to switch off its power supply, but if you do that, you must be aware that in doing so you also switch off the connected IO-Link devices, which depend on the power supply by the IO-Link master.

So, before switching off the power supply, consider the consequences of a switching-off of the connected devices for your plant and, if necessary, consider appropriate precautions and countermeasures.

Do not switch off the power supply of the IO-Link master before you have taken all necessary precautions, observing the above note.

Dismounting

Tools Required for Dismounting

For dismounting, you need an Allen key to loosen the M4 cylinder head screws with hexagon socket according to DIN 912 or ISO 4762.

Before Dismounting

⚠ CAUTION

HAZARD OF BURN

During operation, high surface temperatures can occur on the metal housing and on the metal connection sockets. If the device has been in use, let it cool down before you touch it or use gloves.

Failure to follow these instructions can result in injury, or equipment damage.

Prepare the dismounting:

Step	Action
1	Disconnect that part of the plant from the power supply to which you have mounted the device.
2	Should the device be dirty, clean it first. It is of utmost importance to clean dirty screw connections.
3	Before dismounting, loosen all screw connections and pull off the cables.

Dismounting

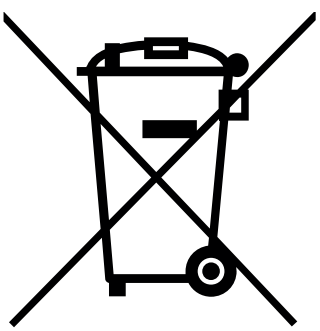
To dismount the device, for example for replacing it, proceed as follows:

Step	Action
1	Make sure that the part of the plant to which you have mounted the device is disconnected from the power supply.
2	Use the Allen key to loosen the two M4 cylinder head screws.
3	Remove the device.

After Dismounting

If the removed device is defective, mark it as such to prevent its reuse.

Disposal of Waste Electronic Equipment



Important notes from the European Directive 2002/96/EU “Waste Electrical and Electronic Equipment (WEEE)”

Waste electronic equipmentThis product must not be treated as household waste.

This product must be disposed of at a designated waste electronic equipment collecting point.

Waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.

Technical Data

XZIOM8AM12PY

Category	Parameter	Value
Product	Part number	1913.100
	Name	ZIOM8AM12PY
	Function	PROFINET IO-Device / 8 Port IO-Link Master
Power supply 1L, 2L	Supply voltage 1L, 2L	24 V DC, –25%/+30% (18 V DC … 31.2 V DC) Voltages higher than 34 V can damage the device permanently. Voltages below approximately 11 V result in a device reset.
	Low voltage warning 1L	18.0 V (± 5% at 25 °C / 77 °F) notification on, 18.3 V (± 5% at 25 °C / 77 °F) notification off
	Overvoltage warning 1L	30.0 V (± 5% at 25 °C / 77 °F) notification on, 29.7 V (± 5% at 25 °C / 77 °F) notification off
	Current consumption	1L: 0.1 A … 16 A (at 24 V DC) 2L: 0.01 A … 16 A (at 24 V DC)
	Current consumption of supply port	Maximum 16 A, consider external limitation or use fuse in the supply line. Maximum total current including transit between the current connector pins may not exceed 16 A for each 1L and 2L. If additional devices are connected to X32 (PWR OUT), then the maximum total current if necessary has to be monitored by an external power management. Maximum current: Observe the derating depending on the ambient temperature.
	Conductor cross-section	0.5 mm2 … 2.5 mm2 Observe the current carrying capacity and cable length.
	Connector	PWR IN: M12 L-coded, 5-pin, plug PWR OUT: M12 L-coded, 5-pin, socket
	Torque	1.0 Nm
	Reverse polarity protection	Yes
	Power supply	24 V DC PELV (Protective Extra Low voltage) or SELV (Safety Extra Low voltage) power supply
Total load	Maximum total load current (total of all currents of ports X1 - X8)	15.7 A
Device	Dimensions (L x W x H)	200 mm x 60 mm x 32 mm
	Weight	404 g
	Housing	Plastic
	Potting	Solvent-free electro-casting resin system based on 2 K polyurethane
	Degree of protection	IP65/IP67(EN 60529)
	Protection class	III (EN 61140)
	Mounting	Screw mounting on carrier, 2x M4

Category	Parameter	Value
Environmental conditions	Location of operation	Indoor
	Ambient temperature (operation)	–25 °C … +70 °C *(-13 °F ... 158 °F)*
	Ambient temperature (storage)	–40 °C … +80 °C *(-40 °F ... 76 °F)*
	Maximum temperature change	3 K/min
	Relative humidity	5% … 95%
	Degree of pollution	3 (EN 60664-1)
	Altitude	0 … 2000 m
	Overvoltage category	II (EN 60664-1)
	Degree of protection	IP67 (EN 60529)
	Protection class	III (EN 61140)
Electrical safety	Insulation resistance	60 V DC
	Test voltage	550 V AC RMS
	Min. creepage distance	0.7 mm
Ethernet connector	Communication interface	Ethernet
	Autonegotiation, autocrossover	Yes
	Connector	2x M12, D coded, socket, 4-pin
	Torque	1.0 Nm
IO-Link connector	Connector	8x M12, A coded, plug, 5-pin
	Torque	1.0 Nm
	Operating modes	Pin 2: DI or DOPin 4: IO-Link Master, DI or DO
Displays	SYS	System status, green/yellow
	APL	Application status, red/green
	MS	Module status (Ethernet/IP), red/green
	NS	Network status (Ethernet/IP), red/green
	LINK	Link status, green
	ACT	Activity status, yellow
	1L, 2L	Supply voltage status, red/green
	A, B	Port status: red/green/yellow (yellow by simultaneous red and green)
Compliance	RoHS	Yes
Compliance with EMC guidelines	CE sign	Yes
	UKCA sign	Yes
	Emission	EN 61000-6-4/BS EN 61000-6-4
	Immunity	EN 61000-6-2/BS EN 61000-6-2

IO-Link Port

Category	Parameter	Value
IO-Link Master (Class A)	Quantity	Maximum 8 (configurable)
	Specification	V1.1
	Port modes	Pin 4: IO-Link: autoconfig, manual, tool-based; DI, DO
		Pin 2: DI, DO
	Transmission mode	COM 1, COM 2, COM 3
	Min. cycle time	400 µs (IO-Link Frame Type_2_1 at transmission mode COM 3)
Digital input	Quantity	Maximum 16 (configurable)
	Characteristic	Type 3 (IEC 61131-2)
	Switching level high	> 11 V
	Switching level low	< 5 V
	Permitted input voltage	-3 V … 31.2 V
	Circuit	Digital input has no reverse current protection. Input voltage may not be higher than the supply voltage.
	Parameter	Digital software input filter: None, 3 ms … 20 ms The input signal may have a maximum frequence of 2.5 kHz in order to detect signal changes correctly in the device. Note, that the transfer and the processing of the process data (in the device and in the PLC) requires time and reduce the maximum change of the input signal.
	Capture cycle	200 µs
	Display	Status LED for on/off
Digital output	Quantity	Maximum 16 (configurable)
	Output voltage	24 V DC, 1L supplied
	Current	Nominal: Maximum 2.0 A per channelOverload mode: Maximum 2.4 A per channel, according to IEC 61131-2
	Residual current	below 1 mA
	Circuit	High side driver, digital output has no reverse current protection. Input voltage may not be higher than the supply voltage.
	Voltage drop by high side path	Below 250 mV
	Self-protection	Overcurrent, overload, overtemperature, and overvoltage
	Short-circuit proof	Yes
	Maximum capacitive load	100 µF parallel to 12 Ohm; 10 Hz
	Maximum inductive load	1.15 H/2 A; 0.2 Hz; DC13 UL: 1.15 H/2 A; 1 Hz; DC13; Pilot Duty
	Display	Status LED for on/off
	Diagnosis	Events: Overcurrent, overload and overtemperature
Actuator/Sensor supply	Output voltage	24 V DC, 1L supplied
	Current 1L	Maximum 4.0 A per channel

Actuator/Sensor supply	Current 1L for IO-Link operating mode	Maximum 1 A for wire cross-section AWG22 or 0.34 mm² and up to 20 m cable length (according to IO-Link specification) Maximum 4.0 A with increased wire cross-section or reduced cable length (voltage drop maximum 1.2 V per outgoing or return line)
	Circuit	High side driver, 1L+ output has no reverse current protection. Input voltage may not be higher than the supply voltage.
	Self-protection	Overcurrent, overload, overtemperature, and overvoltage
	Voltage drop by high side path	Below 200 mV
	Maximum capacitive load	1000 µF parallel to 24 Ohm; 0.1 Hz 470 µF parallel to 12 Ohm; 0.1 Hz 220 µF parallel to 6 Ohm; 0.1 Hz
	Maximum inductive load	1.15 H/2 A; 0.2 Hz; DC13 UL: 1.15 H/2 A; 1 Hz; DC13; Pilot Duty
	Diagnosis (1L+)	Events: Overcurrent, overload, overtemperature, and overvoltage

PROFINET IO-Device

Parameters	Value
Input data	16 … 288 byte Operation with 8 IO-Link 32 I / 32 O + PQI: 288 byte (= 266 byte process data + 13 byte IOPS + 9 byte IOCS) Operation with 16 DI: 24 byte (= 10 byte process data + 13 byte IOPS + 1 byte IOCS) Operation with 16 DO: 16 byte (= 2 byte process data + 5 byte IOPS + 9 byte IOCS)
Output data	16 … 280 byte Operation with 8 IO-Link 32 I / 32 O + PQI: 280 byte (= 258 byte process data + 9 byte IOPS + 13 byte IOCS) Operation with 16 DI: 16 byte (= 2 byte process data + 1 byte IOPS + 13 byte IOCS) Operation with 16 DO: 24 byte (= 10 byte process data + 9 byte IOPS + 5 byte IOCS)
Alarm types	Diagnosis alarm, process alarm, plug/pull alarm
Identification & Maintenance (I&M)	I&M0-4
Topology recognition	LLDP, SNMP V1, Physical Device Record Objects
Minimum cycle time(MinDeviceInterval)	RT_CLASS_1: 1 ms (min. SendClockFactor 32)RT_CLASS_3: 1 ms (min. SendClockFactor 32)
Media redundancy	MRP Client
Additional supported feature	"Shared Device" CAP (Client Access Point): 0xB400
PROFINET IO specifiation	V2.3, “Legacy Startup“ of specification V2.2 is supported
Conformance Class	C
Data transport layerr	Ethernet II, IEEE 802.3
Interface type	100BASE-TX, isolated
Autonegotiation, autocrossover	Yes

OPC UA Server

Parameter	Value
OPC UA Server:	According to "IO-Link Companion Specification": http://opcfoundation.org/UA/IO-Link/
Server profile	Micro Embedded Device
Protocol	OPC UA TCP
User access	Anonymous (Read access only) User name/password (Read and write access)
Number of sessions	2
Number subscriptions per session	2
Number „Monitored Items“ per session	20
Data coding	UA binary

MQTT Client

Parameter	Description
MQTT	Client
Client services	Publish
Protocols	MQTT over TCP
Topic size	Maximum 256 bytes individually per MQTT publication and up to 256 bytes of common topic prefix of the associated MQTT connection
Topics	Topic: Printable UTF-8 string, NUL-terminated, multibyte encoding (MBCS) Payload: JSON
Will Topic	Maximum 256 bytes
Quality of Service	QoS 0, QoS 1, and QoS 2
IP standard	IPv4
Port	1883 (default), MQTT unencrypted
MQTT standard	V3.1.1
Restriction	The Subscribe service is not supported.

Web Server

Parameter	Value
HTTP	HTTP/1.1
Port	80
Connections	Maximum 8 simultaneous connections One connection is being processed.
JavaScript	Required
HTTPS	Not supported

Glossary

B

Baud rate

Data transmission speed specified in the form of a number of bits transferred per second (baud rate = data rate).

BOOL

A *Boolean* type is the basic data type in computing. A `BOOL` variable can have one of these values: 0 (`FALSE`), 1 (`TRUE`). A bit that is extracted from a word is of type `BOOL`, for example: `%MW10.4` is the fifth bit of a memory word number 10.

BYTE

When 8 bits are grouped together, they are called a `BYTE`. You can enter a `BYTE` either in binary mode or in base 8. The `BYTE` type is encoded in an 8-bit format that ranges from `16#00` to `16#FF` (in hexadecimal format).

C

CIP

(Common Industrial Protocol) CIP is an industrial protocol for industrial automation applications. It encompasses a comprehensive suite of messages and services for the collection of manufacturing automation applications - control, safety , synchronization, motion, configuration and information.

Cycle time

Time to transmit an M-sequence between a master and its device including the following idle time.

D

DHCP

dynamic host configuration protocol. A TCP/IP protocol that allows a server to assign an IP address based on a device name (host name) to a network node.

DI

(Digital input)

DO

(Digital output)

DSCP

(Differentiated Services Code Point) DSCP is a computer networking architecture that specifies a mechanism for classifying and managing network traffic and providing quality of service on modern IP networks.

E

EMI

(Electromagnetic Interference) It is unwanted noise or interference in an electrical path or circuit caused by an outside source. It is also called radio frequency interference.

Ethernet

A physical and data link layer technology for LANs, also known as IEE 802.3. Ethernet uses a bus or a star topology to connect different nodes on a network.

H

HMI

(Human Machine Interface) An operator interface, usually graphical, for industrial equipment.

I

IEC 61131-9

International standard that deals with the basics of programmable controllers. Part 9 describes IO-Link under the designation Singledrop digital communication interface for small sensors and actuators (IO-Link).

IODD

(IO Device Description) IODD serves as a digital description and identity of an IO-Link device, providing information about the characteristics, parameters, and communication capabilities of the device.

N

NTP

(Network Time Protocol) NTP is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks.

O

OEM

(Original Equipment Manufacturer) It refers to any company that manufactures products or parts intended to be incorporated into a final product of another company.

OPC UA

(Open Platform Communications Unified Architecture) It is an omni-platform communication protocol for industrial automation. Regardless of their age, OPC-UA enables industrial robots, machine tools and PLCs to communicate with each other.

P

PELV

(Protective Extra Low Voltage) PELV describes a voltage that is set so low that in the event of indirect contact and small area direct contact there is no risk of electric shock. In the event of an insulation failure adequate protection must still be provided.

PLC

(Programmable Logic Controller) The PLC is the brain of an industrial manufacturing process. It automates a process as opposed to relay control systems. PLCs are computers suited to survive the harsh conditions of the industrial environment.

Port

Communication medium interface of the Master to one Device.

S

SCADA

(supervisory control and data acquisition) A system that monitors, manages, and controls industrial applications or processes, usually for entire sites or complexes of systems spread over large areas.

SELV

(safety extra low voltage) A system that follows IEC 61140 guidelines for power supplies is protected in such a way that voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for class 1 equipment) does not exceed a specified value under normal conditions or under inoperable conditions.

SIO

(Standard Input Output) Port operation mode in accordance with digital input and output defined in IEC 61131-2 that is established after power-up or fallback or unsuccessful communication attempts.

W

Wake-up

IO link procedure for causing a device to change its mode from SIO to IO-Link mode.

www.telemecaniquesensors.com

The information provided in this catalogue contains description of products sold by TMSS France, its subsidiaries and other affiliated companies ('Offer') with technical specifications and technical characteristics of the performance of the corresponding Offer.

The content of this document is subject to revision at any time without notice due to continued progress in methodology, design and manufacturing.

To the extent permitted by applicable law, no responsibility or liability is assumed by TMSS France, its subsidiaries and other affiliated companies for any type of damage arising out of or in connexion with (a) informational content of this catalogue not conforming with or exceeding the technical specifications, or (b) any error contained in this catalogue, or (c) any use, decision, act or omission made or taken on the basis of or in reliance on any information contained or referred to in this catalogue.

NEITHER TMSS FRANCE, ITS SUBSIDIARIES, NOR ITS OTHER AFFILIATES, AS THE CASE MAYBE, MAKE NO WARRANTY OR REPRESENTATION OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO WHETHER THIS CATALOGUE OR ANY INFORMATION CONTAINED THEREIN SUCH AS PRODUCTS WILL MEET REQUIREMENTS, EXPECTATIONS OR PURPOSE OF ANY PERSON MAKING USE THEREOF.

As standards, specifications and design change from time to time, please ask for confirmation of the information given in this publication.

TMSS France SAS
Share capital: 366 931 214 €
Tour Eqho, 2 avenue Gambetta
92400 Courbevoie – France
908 125 255 RCS Nanterre

October 2024 - V0.0 TESEUG000064EN