WAGO I/O System Field

8-Port IO-Link Master Class A; EtherNet/IP; 24 V DC; 2.0 A;
8 × M12 Connection

765-4501/0100-0000

WAGO Kontakttechnik GmbH & Co. KG
Hansastraße 27
D - 32423 Minden
Phone: +49 571/887 – 0
Fax: +49 571/887 – 844169
E-Mail: ✉ **info@wago.com**
Internet: **www.wago.com**

Technical Support
Phone: +49 571/887 – 44555
Fax: +49 571/887 – 844555
E-Mail: ✉ **support@wago.com**

Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: ✉ **documentation@wago.com**

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

WAGO is a registered trademark of WAGO Verwaltungsgesellschaft mbH.

Table of Contents

Provisions **7**
1.1 Document Portfolio 7
1.2 Intended Use 7
1.3 Typographical Conventions 9
1.4 Legal Information 11

Safety **12**
2.1 General Safety Rules 12
2.2 Electrical Safety 12
2.3 Mechanical Safety 13
2.4 Thermal Safety 13
2.5 Indirect Safety 13

Overview **14**

Properties **15**
4.1 View 15
4.2 Connections 17
4.2.1 Power supply 17
4.2.2 Communication Interfaces 17
4.2.2.1 IO-Link (Master) 17
4.2.3 Network Connections 18
4.2.3.1 ETHERNET Interfaces 18
4.3 Circuit Diagram 18
4.4 Technical data 19
4.4.1 Product 19
4.4.2 Mechanical Data 19
4.4.3 Connection Technology 20
4.4.4 Power Supply 22
4.4.5 Electrical Safety 23
4.4.6 Environmental Conditions 23
4.4.7 Communication 23
4.5 Derating 25
4.6 Regulations and Standards 26
4.7 Approvals 26

Functions **27**
5.1 Process Image 27
5.2 Forcing 47
5.3 Monitoring Functions 48
5.4 Overload Protection 49
5.5 Parameterization Tools 49
5.5.1 Overview 49

5.5.2 WAGO IO-Link Configurator ... 51
5.5.3 WAGO Webserver I/O Field ... 51
5.5.4 WAGO I/O Field app ... 52
5.6 Communication Interfaces ... 53
5.6.1 EtherNet/IP ... 54
5.6.1.1 Event Log Object 65 ... 54
5.6.2 OPC UA Server ... 54
Planning ... 55
6.1 Structure Guidelines ... 55
6.1.1 Installation Site and Touch-Proof Protection ... 55
6.1.2 Data Security ... 55
6.1.2.1 Random Influences ... 55
6.1.2.2 Deliberate Influences ... 55
6.2 Power Supply Concept ... 56
6.2.1 Design Power Supply ... 56
6.2.2 Requirements on the Power Supply ... 60
6.2.3 Additional Measures ... 60
6.2.4 Power Supply Examples ... 61
6.3 Settings Options ... 63
6.3.1 Module Parameters ... 63
Transport and Storage ... 67
Installation and Removal ... 68
8.1 Installation ... 68
8.1.1 Tools Required for Installation ... 68
8.1.2 Before Installation ... 68
8.1.3 Installation Instructions ... 68
8.1.4 Note on Protecting against Heat Generation by the Product ... 69
8.1.5 Installation Distances ... 69
8.1.6 Installation ... 69
8.1.7 After Installation ... 69
8.1.8 Grounding ... 69
8.2 Removal ... 70
8.2.1 Tools Required for Removal ... 70
8.2.2 Before Removal ... 70
8.2.3 Removal ... 70
8.2.4 After Removal ... 70
Connection ... 71
9.1 General Information on Installation ... 71
9.2 Connect Power Supply ... 71
9.3 Connecting Cables ... 74
9.4 Connecting the Fieldbus ... 75
9.5 Connect Sensors/Actuators ... 76
Commissioning ... 80
10.1 Getting the IP Address from a DHCP Server ... 80

10.2 Configuration ... 81
10.2.1 Configuring the Module via EtherNet/IP ... 81
10.2.1.1 Selecting the Module ... 81
10.2.1.2 Selecting a Connection ... 81
10.2.1.3 Setting Parameters ... 83
10.3 Parameterization ... 83
10.3.1 WAGO Webserver I/O Field ... 83
10.3.1.1 Call WAGO Webserver I/O Field ... 83
10.3.1.2 WAGO Webserver I/O Field User Interface ... 84
10.3.1.2.1 Maintenance Information ... 84
10.3.1.2.2 Advanced Module and Port Information ... 85
10.3.1.2.3 Displaying Licenses ... 85
10.3.1.3 Opening the Product Information via WAGO Webserver I/O Field ... 85
10.3.1.3.1 Displaying Port Information ... 85
10.3.1.3.2 Displaying Measured Values and Information on Connected IO-Link Devices ... 86
10.3.1.3.3 Displaying Port Status Information ... 88
10.3.1.3.4 State ... 88
10.3.1.3.5 Quality ... 89
10.3.1.3.6 Revision ID ... 90
10.3.1.3.7 Baud Rate ... 90
10.3.1.3.8 Cycle Time ... 90
10.3.1.3.9 Input Data Length ... 90
10.3.1.3.10 Vendor ID ... 90
10.3.1.3.11 Device ID ... 90
10.3.1.3.12 Displaying Process Data ... 90
10.3.1.4 Parameterizing the Module via the WAGO I/O Field Webserver ... 91
10.3.1.4.1 Configure Ports ... 92
10.3.1.4.2 Accessing a Connected IO-Link Device ... 95
10.3.1.4.3 Configuring IP Parameters ... 98
10.3.1.4.4 Storing Maintenance Information ... 99
10.3.1.4.5 Updating Firmware ... 100
10.3.1.4.6 Resetsetting the Module to the Factory Settings ... 102
10.3.1.4.7 Configure Bluetooth ... 103
10.3.1.4.8 Logging Users on and off and Managing Them ... 105
10.3.1.4.9 Forcing Digital Inputs and Outputs ... 108
10.3.1.4.10 Forcing for IO-Link Ports ... 110
10.3.2 WAGO IO-Link Configurator ... 111
10.3.3 WAGO I/O Field app ... 111
10.3.3.1 Parameterizing a Module with the WAGO I/O Field App ... 111
10.3.4 OPC UA Server ... 111
10.3.4.1 Parameterizing the Product via OPC UA ... 112
10.3.4.1.1 Identifying Devices ... 112
10.3.4.1.2 Configuring Parameters ... 113
10.3.4.1.3 Reading Process Data ... 114
10.3.4.1.4 Reading out Measured Values ... 114
10.3.4.1.5 Reading out Diagnostic Information ... 115
10.3.4.1.6 Reading Statistics ... 116

Diagnostics ... 117

11.1 Diagnostics via Indicators ... 117

11.2 Diagnostics via EtherNet/IP ... 120

11.3 Diagnostics via IO-Link ... 122

Service ... 126

12.1 Resetting to Factory Settings ... 126

12.2 Updating Firmware 126

Decommissioning 127

13.1 Entsorgung und Recycling 127

Appendix 128

14.1 Installation Regulations Specified by Approvals 128

14.2 Operational Description 129

14.3 Protected Rights 130

Provisions

This documentation applies to the following product:

Table 1: Scope of Applicability

Item no.	Item description, long	Item description, short
0765-4501/0100-0000	8-Port IO-Link Master Class A; EtherNet/IP; 24 V DC; 2.0 A; 8 × M12 connection	8 PORT IOL-A FLD EI 24 VDC 2.0 A

1.1 Document Portfolio

Note

Observe the applicable documentation!

This product must only be installed and operated according to the instructions of the complete Instructions for use. Knowledge of the complete Instructions for use is required for proper use.

1. Carefully read the Product Manual.
2. Before commissioning, follow the instructions in section Safety [▶ 12].

Table 2: Complete instructions for use

Document Type	Contents
Product Manual	Contains all the product-specific information for a product.
Data Sheet	Contains the technical data and approvals / certificates for a product.
Instruction leaflet	Is included with each product. Contains initial information on safe handling of the product.

All documentation is available at: www.wago.com /<item number>.

Besides this documentation, the following supplementary document is available:

- Product Manual WAGO IO-Link Configurator

1.2 Intended Use

The product 0765-4501/0100-0000 is used to capture field signals on sensors, actuators and hubs which have been sent or received by a higher-level controller and output them via IO-Link.

The product works as a decentralized input/output unit in EtherNet/IP und ETHERNET TCP/IP networks.

- This product is intended for installation in automation technology systems.
- The product meets the IP67 protection type requirements.
- The product is intended for indoor and outdoor use.
- Operation of the products in Industrial area is permitted.
- Operation of the product in other application areas is only permitted when corresponding approvals and labeling are present.

Improper Use

Improper use of the product is not permitted. The following cases in particular constitute improper use:

- Non-observance of the intended use.
- Use without protective measures in an environment in which salt water, salt spray mist, icing, corrosive fumes, explosive gases, direct sunlight and ionizing radiation can occur.
- Use of the product in areas with special risk that require continuous fault-free operation and in which failure of or operation of the product can result in an imminent risk to life, limb or health or cause serious damage to property or the environment (such as the operation of nuclear power plants, weapons systems, aircraft and motor vehicles).

Warranty and Liability

The terms set forth in the General Business and Contract Conditions for Delivery and Service of WAGO Kontakttechnik GmbH & Co. KG and the terms for software products and products with integrated software stated in the WAGO Software License Contract – both available at **www.wago.com** – shall apply. In particular, the warranty is void if:

- The product is improperly used.
- The deficiency (hardware and software configurations) is due to special instructions.
- Modifications to the hardware or software have been made by the user or third parties that are not described in this documentation and that has contributed to the fault.

Individual agreements always have priority.

Obligations of Installers/Operators

The installers and operators bear responsibility for the safety of an installation or a system assembled with the products. The installer/operator is responsible for proper installation and safety of the system. All laws, standards, guidelines, local regulations and accepted technology standards and practices applicable at the time of installation, and the instructions in the the products' Instructions for Use, must be complied with. In addition, the Installation regulations specified by Approvals must be observed. In the event of noncompliance, the products may not be operated within the scope of the approval.

1.3 Typographical Conventions

Number Notation

100	Decimals: Normal notation
0x64	Hexadecimals: C-notation
‘100’	Binary: In single quotation marks
‘0110.0100’	Nibbles separated by a period

Text Formatting

italic	Names of paths or files
bold	Menu items, entry or selection fields, emphasis
`Code`	Sections of program code
>	Selection of a menu point from a menu
“Value”	Value entries
[F5]	Identification of buttons or keys

Cross References / Links

	Cross references/links to a topic in a document
	Cross references / links to a separate document
	Cross references / links to a website
	Cross references / links to an email address

Action Instructions

✓ This symbol identifies a precondition.

1. Action step
2. Action step

   ⇨ This symbol identifies an intermediate result.

⇨ This symbol identifies the result of an action.

Lists

- Lists, first level
  - Lists, second level

Figures

Figures in this documentation are for better understanding and may differ from the actual product design.

Notes

⚠ DANGER

Type and source of hazard

Possible consequences of hazard that also include death or irreversible injury

- Action step to reduce risk

⚠ WARNING

Type and source of hazard

Possible consequences of hazard that also include severe injury

- Action step to reduce risk

⚠ CAUTION

Type and source of hazard

Possible consequences of hazard that include at least slight injury

- Action step to reduce risk

NOTICE

Type and source of malfunction (property damage only)

Possible malfunctions that may restrict the product's scope of functions or ergonomics, but do not lead to foreseeable risks to persons

- Action step to reduce risk

Note

Notes and information

Indicates information, clarifications, recommendations, referrals, etc.

1.4 Legal Information

Intellectual Property

Unless barred by applicable legal provisions, unauthorized copying and distribution of this document, as well as the use and communication of its content are strictly prohibited unless expressly authorized by prior agreement. Third-party products are always mentioned without any reference to patent rights. WAGO Kontakttechnik GmbH & Co. KG, or for third-party products, their manufacturer, retain all rights regarding patent, utility model or design registration.

Third-party trademarks are referred to in the product documentation. The "®" and "TM" symbols are omitted hereinafter. The trademarks are listed in the Appendix (Protected Rights [▶ 130]).

Subject to Change

The instructions, guidelines, standards, etc., in this manual correspond to state of the art at the time the documentation was created and are not subject to updating service. The installer and operator bear sole responsibility to ensure they are complied with in their currently applicable form. WAGO Kontakttechnik GmbH & Co. KG retains the right to carry out technical changes and improvements of the products and the data, specifications and illustrations of this manual. All claims for change or improvement of products that have already been delivered – excepting change or improvement performed under guarantee agreement – are excluded.

Licenses

The products may contain open-source software. The requisite license information is saved in the products. This information is also available under www.wago.com.

Safety

This section contains safety rules that must be followed for hazard-free use of the product.

This section is aimed at the following target groups:
- Planners and installers
- Operators
- Qualified assembly personnel
- Qualified installation personnel (electrical installation, technician network installation etc.)
- Qualified operating personnel
- Qualified service and maintenance personnel

Obey the following safety rules:

2.1 General Safety Rules

- This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user of the product. In addition, ensure that any supplement to this documentation is included, if necessary.
- The product must only be installed and put into operation by qualified electrical specialists per EN 50110-1/-2 and IEC 60364.
- Comply with the laws, standards, guidelines, local regulations and accepted technology standards and practices applicable at the time of installation.

2.2 Electrical Safety

Power Supply

- Only operate the product with safe extra low voltage power sources (PELV or SELV).
- Connecting impermissible current or frequency values may destroy the product.

Grounding/Protection/Fuses

- Connect the product and system to functional ground (FE).
- When handling the product, please ensure that environmental factors (personnel, work space and packaging) are properly equalized. Do not touch any conducting parts.

Cables

- Maintain spacing between control, signal and data lines and the power supply lines.
- Only use conductor cross-sections sufficient for the current load.

Protection

- When working on the system (e.g., during maintenance), protect the Facility part in question from accidental or unauthorized restart.

Shielding/Network

- Observe the applicable standards for EMC-compatible installations.

2.3 Mechanical Safety

- Cooling of the product must not be impaired. Ensure air can flow freely and that the minimum clearances from adjacent products/areas are maintained.
- Do not install the product on or in the vicinity of easily flammable materials.
- Before startup, please check the product for any damage that may have occurred during shipping. Do not put the product into operation in the event of mechanical damage.

2.4 Thermal Safety

- The surface of the housing heats up during operation. Under special conditions (e.g., in the event of a fault or increased surrounding air temperature), touching the product may cause burns. Allow the product to cool down before touching it.
- If the surface temperature of the product can exceed 55 °C, wear protective gloves and attach protective covers and/or touch-proof protection.

2.5 Indirect Safety

- Only use a dry or cloth or a clothed dampened with water to clean the product. Do not use cleaning agents, e.g., abrasive cleaners, alcohols or acetone.
- Do not allow the product to come into contact with ketones (e.g., acetone) or chlorinated hydrocarbons (e.g., dichloromethane) under any circumstances.
- Do not use hard objects that could cause scratches for cleaning.
- Clean tools and materials are imperative for handling the product.
- If automation solutions are implemented that can cause personal injury or major property damage in the event of failure, you must take appropriate measures to ensure that the system remains in a safe operating state even in the event of failure.
- Before installation and operation, please read the product documentation thoroughly and carefully. In addition, note the information on the product housing and further information, e.g. at **www.wago.com**/<item number>.
- Only permit skilled personnel approved by WAGO to perform repair work.

Overview

The product is part of the WAGO I/O System Field 765. It is intended for industrial use within an ETHERNET network and communicates with a central controller and/or directly with the control level, if necessary. Several sensors/actuators can be connected to the product for connection in the field level. The product electronics are protected from environmental influences by the completely encapsulated product housing.

The product has a metal housing and is suitable for screw mounting on a carrier.

Function Overview

- ETHERNET TCP/IP communication to the higher-level controller
  - Cyclic I/O data
  - Configuration and parameterization via EtherNet/IP
- Bluetooth® interface for diagnostics and configuration using the WAGO I/O Field app and a mobile device
- WAGO I/O Field Webserver: Integrated Webserver with the configuration, parameterization, diagnostic, testing and firmware update functions
- Forcing function: Forcing output signals, simulating input signals
- Measured values by channel:
  - Output and supply current
  - Supply voltage
  - Temperature measurement
- Monitoring functions by channel:
  - Maximum current
  - Over and undervoltage
  - Over and undertemperature
  - Line break detection
- Total current monitoring
- Protective functions: Shutdown of the switching or supply outputs if the maximum current at a pin is exceeded
- Integrated OPC UA server in compliance with “IO-Link Companion Specification” expanded to include diagnostic functions
- 8 ports
  - IO-Link Master Class A
  - Pin 4 can be configured as an IO-Link Master, digital input or digital output
  - Pin 2 can be configured as a digital input or digital output

Properties

4.1 View

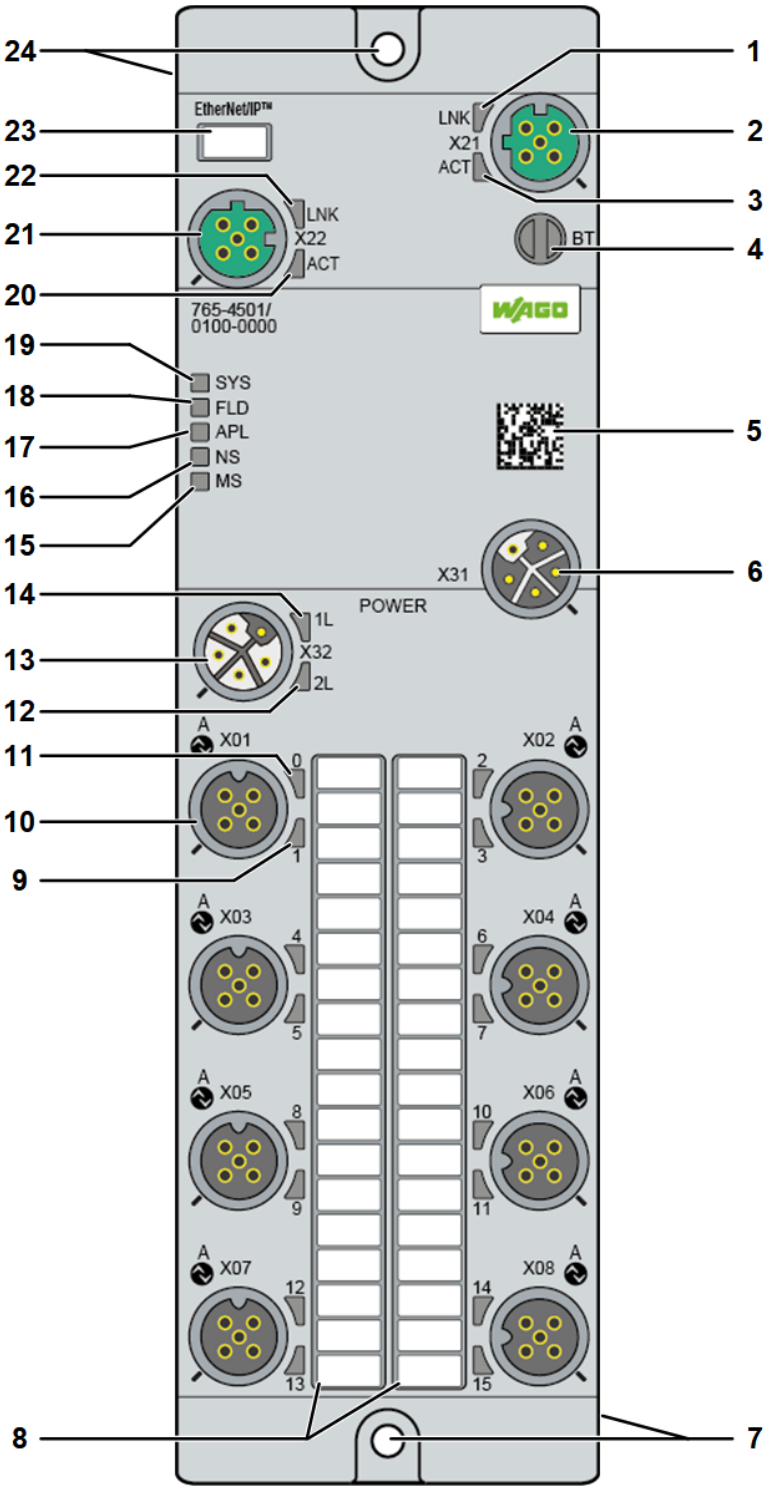


Figure 1: View

Table 3: Legend for "View" Figure

Function	Position	Custom Name	Description
ETHERNET	2	X21	ETHERNET interface, M12, D-coded, EtherNet/IP port 1

Function	Position	Custom Name	Description
	1	LNK (X21)	Link LED for port X21
	3	ACT (X21)	Activity LED for port X21
	21	X22	ETHERNET interface, M12, D-coded, EtherNet/IP port 2
	22	LNK (X22)	Link LED for port X22
	20	ACT (X22)	Activity LED for port X22
Bluetooth®	4	BT	Bluetooth® antenna, including Bluetooth® LED
Indicators	19	SYS	System LED
	18	FLD	Field LED
	17	APL	Application LED
	16	NS	EtherNet/IP network status LED
	15	MS	EtherNet/IP module status LED
Identification	5	-	Data Matrix Code (DM Code) Contains the serial number of the module (UII)
Supply voltage	6	X31	Power supply input (Power In)
	13	X32	Power supply output (Power Out)
	14	1L (X32)	1L power supply LED (24 VDC)
	12	2L (X32)	2L power supply LED (24 VDC)
IO-Link Class A	10	X01 ... X08	IO-Link port, ports X01 X08, M12, A-coded
	9	1, 3, 5, 7, 9, 11, 13, 15	IO-Link port LEDs for ports X01 ... X08, channel (pin 2)
	11	0, 2, 4, 6, 8, 10, 12, 14	IO-Link port LEDs for ports X01 ... X08, IO-Link or channel A (pin 4)
Marking	8	-	Port marking (WMB Inline and marking strips)
	23	-	Module marking (WMB Inline)
Assembly	7	-	Mounting hole for front or side mounting
	24	-	Mounting hole for front or side mounting

4.2 Connections

4.2.1 Power supply

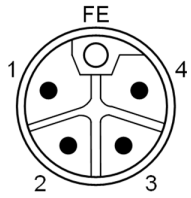
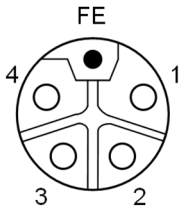
The product is powered through the X31 connection (Power in). Two supply cables can be connected to the plug:

- Supply cable 1: 1L+ (U_{1L}) and reference potential 1L−
- Supply cable 2: 2L+ (U_{2L}) and reference potential 2L−

Both supply cables are electrically isolated from each other and functional ground.

Each pin of plug X31 (Power in) is connected to the same pin of socket X32 (Power out) and makes it possible to pass the power on to the next device.

Table 4: Supply voltage

Supply Voltage Input	Supply Voltage Output	Pin	Signal	Description
		1	1L+	24 VDC supply voltage U_{1L} for system and sensor/actuator
		2	2L−	Reference potential for 2L
		3	1L−	Reference potential for 1L
		4	2L+	24 VDC auxiliary/control voltage U_{2L}
		FE	FE	Functional ground
M12, L-coded, plug, 5-pin (4 + FE)	M12, L-coded, socket, 5-pin (4 + FE)			

Note

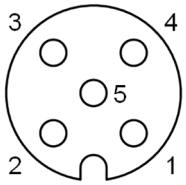
Upper limit on current consumption from X32 (Power out)

Before connecting one or more products to the power supply on socket X32 (Power out), read section **Power Supply Examples [▶ 61]**. There you will find information on the maximum permitted current consumption.

4.2.2 Communication Interfaces

4.2.2.1 IO-Link (Master)

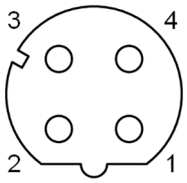
Table 5: IO-Link (class A)

IO-Link (Class A)	Pin	Signal	Description	Wire Color
	1	1L+	24 VDC supply voltage U_{1L} for sensor/actuator	Brown
	2	DIO B (DI B/ DQ B)	Digital input/output channel B	White
	3	1L–	Reference potential for 1L+	Blue
	4	C/Q DIO A (DI A/ DQ A)	IO-Link data or digital input/output channel A	Black
M12, A-coded, socket, 5-pin	5	n. c.	Not connected	-

4.2.3 Network Connections

4.2.3.1 ETHERNET Interfaces

Table 6: ETHERNET Interfaces

ETHERNET	Pin	Signal	Description
 M12, D-coded, socket, 4-pin	1	TX+	Positive send data
	2	RX+	Positive receive data
	3	TX–	Negative send data
	4	RX–	Negative receive data
	Housing	Shield	Shield connection; housing is connected to functional ground

4.3 Circuit Diagram

The following figure shows the schematic circuit diagram of the product.

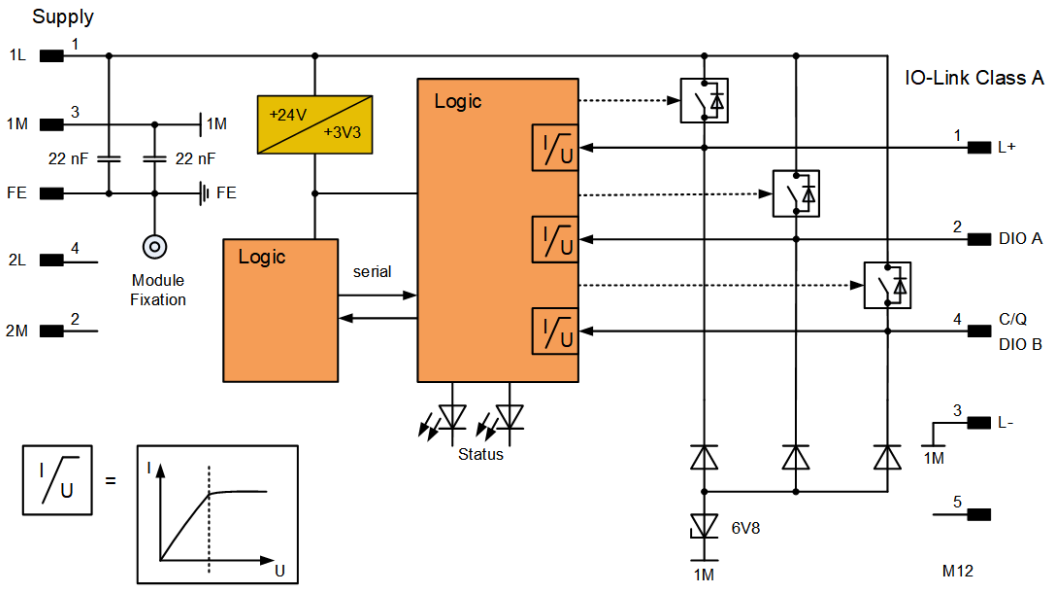


Figure 2: Circuit Diagram for Each Port

4.4 Technical data

4.4.1 Product

Table 7: Product

Property	Value
Item Number	0765-4501/0100-0000
Product function	8-Port-IO-Link Master Class A
Product name (short)	8 PORT IOL-A FLD EI 24 VDC 2.0 A
Product name (long)	8-Port IO-Link Master Class A; EtherNet/IP; 24 V DC; 2.0 A; 8 × M12 connection

4.4.2 Mechanical Data

Table 8: Mechanical Data

Property	Value
Width	60 mm
Height	30 mm
Length	210 mm
Weight	610 g
Housing	Zinc Die Casting
Mounting type	Screw mount, 2 × M4
Tightening torque	M4: 1.2 Nm
Mounting holes	Diameter: 4.5 mm
	Distance from each: 198.0 mm ± 0.2 mm

4.4.3 Connection Technology

Table 9: Connection technology

Property	Value
Power connection	PWR IN: M12 L-coded, 5-pin, plug
	PWR OUT: M12 L-coded, 5-pin, socket
EtherNet/IP connection	2 × M12, D-coded, socket, 4-pin
IO-Link ports	8 × M12, A-kodiert, Buchse, 5-polig
Tightening torque	M12: 1.0 Nm

IO-Link Port (Class A)

Table 10: IO-Link Port (Class A)

Property	Value
IO-Link Master (Class A)	
Specification	V1.1
Port mode	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 with transmission mode COM 3)
Digital Input	
Characteristic	Type 3 (IEC 61131-2)
Parameters	Digital software input filter: without, 3 ms ... 20 ms
	The input signal change must be at most 2.5 kHz for correct device-internal detection of changes. However, it should be noted that the transfer and processing of the process data (in the device and in the controller) also take time and reduce the maximum input signal change.
Recording cycle	200 µs
Circuit	The digital input is not resistant to reverse power feeding. The input voltage must not exceed the supply voltage.
Indicators	On/off status LED
Digital Output	
Output voltage	24 VDC, 1L powered
Current	Normal operation: max. 2.0 A per channel
	Overload operation: max. 2.4 A per channel, per IEC 61131-2
Residual current	Less than 1 mA
Circuit	High-side driver The digital output is not resistant to reverse power feeding. The input voltage must not exceed the supply voltage.
Voltage drop through high-side path	Less than 250 mV
Self-protection	Overcurrent, overload, overtemperature and overvoltage
Maximum capacitive load	100 µF parallel to 12 Ω; 10 Hz
Maximum inductive load	1.15 H / 2 A; 0.2 Hz; DC13
Diagnostics	Events: overcurrent, overload and overtemperature
Actuator/Sensor Power Supply	
Output voltage	24 VDC, 1L powered

Property	Value
Output current, L1	Maximum: 4.0 A per channel per IEC 61131-2
Output current, L1 with IO-Link operating mode	Maximum 1.0 A with conductor size AWG 22/0.34 mm^2 and cable length of up to 20 m (per IO-Link specification) Maximum 4.0 A with increased conductor cross-section or reduced cable length (max. voltage drop of 1.2 V for both feed and return line individually)
Output current, L2	Maximum: 4.0 A per channel per IEC 61131-2
Output current, L2 with IO-Link operating mode	Maximum 1.0 A with conductor size AWG 22/0.34 mm^2 and cable length of up to 20 m (per IO-Link specification) Maximum 4.0 A with increased conductor cross-section or reduced cable length (max. voltage drop of 1.2 V for both feed and return line individually)
Circuit	High-side driver The 1L+/2L+ output is not resistant to reverse power feeding. The input voltage must not exceed the supply voltage.
Self-protection	Overcurrent, overload, overtemperature and overvoltage
Voltage drop through high-side path	Less than 200 mV
Maximum capacitive load	1000 µF parallel to 24 Ω; 0.1 Hz
	470 µF parallel to 12 Ω; 0.1 Hz
	220 µF parallel to 6 Ω; 0.1 Hz
Maximum inductive load	1.15 H / 2 A; 0.2 Hz; DC13
Diagnostics (1L+)	Events: overcurrent, overload, overtemperature and overvoltage

4.4.4 Power Supply

Table 11: Power supply

Parameters	Value
Supply voltage, 1L, 2L	24 VDC, –25 %/+30 % (18 VDC … 31.2 VDC) Voltages above 34 V can permanently damage the device. Voltages below approx. 11 V lead to device reset.
Undervoltage warning, 1L	18.0 V (± 5 % at 25 °C) message On, 18.3 V (± 5 % at 25 °C) message Off
Overvoltage warning, 1L	30.0 V (± 5 % at 25 °C) message On, 29.7 V (± 5 % at 25 °C) message Off
Module power consumption	1L: 100 mA (at 24 VDC) 2L: 10 mA (at 24 VDC)
Power consumption of supply connections	Max. 16 A; ensure external limitation or use fuses in the cables. The maximum total current of the device, including transmission between the power supply connections, must not exceed 16 A for both 1L and 2L individually. If additional modules are connected to X32 (PWR OUT), it may be necessary for the maximum total current to be monitored with external power supply management. Maximum current: Observe derating depending on the temperature.
Conductor cross-section	For UL-compliant use: 2.5 mm^2
Reverse voltage protection	Yes

4.4.5 Electrical Safety

Table 12: Electrical Safety

Property	Value
Insulation resistance	60 VDC
Test voltage	550 VAC RMS
Min. creepage distance	0.7 mm

Requirements

- Use of PELV/SELV power supplies (limited to 60 VDC)
- When SELV power supplies are used: SELV power supplies with supply via the same network phase
- If PELV (Protective Extra Low Voltage) power supplies are used: PELV (Protective Extra Low Voltage) power supplies with a secondary power supply connection to the common reference point

4.4.6 Environmental Conditions

Table 13: Environmental Conditions

Property	Value
Surrounding air temperature (operation)	–25 °C ... +70 °C
Surrounding air temperature (storage)	–40 °C ... +80 °C
Maximum temperature change	3 K/min
Relative humidity (operation)	5 % ... 95 %
Pollution degree	3 (EN 60664-1)
Operating altitude	0 ... 2000 m
Overvoltage category	II (EN 60664-1)
Protection type	IP67 (EN 60529)
Protection class	III (EN 61140)
Vibration resistance	5g (IEC 60068-2-6)
Shock resistance	50g (IEC 60068-2-27)

4.4.7 Communication

Table 14: Communication

Property	Value
Communication Interfaces	ETHERNET, IO-Link, Bluetooth®
Protocols	EtherNet/IP, HTTP, OPC UA, IO-Link

Table 15: Communication – EtherNet/IP device

Property	Value
Connection 1 (Exclusive Owner – 32 bytes per IO-Link port)	Input data: 276 bytes; output data: 276 bytes
Connection 2 (Exclusive Owner – 32 bytes per IO-Link port without config)	
Connection 3 (Listen only – 32 bytes per IO-Link port)	Input data: 276 bytes; output data: 0 bytes
Connection 4 (Input Only – 32 bytes per IO-Link port)	
Connection 5 (Exclusive Owner – 16 bytes per IO-Link port)	Input data: 148 bytes; output data: 148 bytes
Connection 6 (Exclusive Owner – 16 bytes per IO-Link port without config)	

Property	Value
Connection 7 (Listen Only – 16 bytes per IO-Link port)	Input data: 148 bytes; output data: 0 bytes
Connection 8 (Input Only – 16 bytes per IO-Link port)	
Connection 9 (Exclusive Owner – 4 bytes per IO-Link port)	Input data: 52 bytes; output data: 52 bytes
Connection 10 (Exclusive Owner – 4 bytes per IO-Link port without config)	
Connection 11 (Listen Only – 4 bytes per IO-Link port)	Input data: 52 bytes; output data: 0 bytes
Connection 12 (Input Only – 4 bytes per IO-Link port)	
I/O connection types (implicit)	Exclusive Owner
	Input Only
	Listen Only
I/O connection trigger type	Cyclic
DHCP	Supported (default setting)
BOOTP	Supported
Fixed IP address	Supported
Duplex mode	Half-duplex, full-duplex, autonegotiation
MDI mode	MDI, MDI-X, Auto MDI-X
ACD (Address Conflict Detection)	Supported
Integrated switch	Supported
Reset services	CIP reset services: identity object, type 0 and 1 reset services
Data transport layer	Ethernet II, IEEE 802.3
Interface type	10BASE-T/100BASE-TX, potential-free

Table 16: OPC UA Server

Parameters	Value
OPC UA Server	Per “IO-Link Companion Specification”: http://opcfoundation.org/UA/IOLink/ Manufacturer-specific information model with diagnostic functions: http://www.wago.com/UA/Diagnostics/
Server profile	Micro Embedded Device
Protocol	OPC UA TCP
User access	Anonymous (read access only) Username/password (read and write access)
Number of sessions	2
Number of subscriptions per session	2
Number of “monitored items” per session	20
Data coding	UA binary

Table 17: Communication – Bluetooth transmitter

Property	Value
Modulation	GFSK
Data rate	1 Mbit/s
Operating frequency	2402 ... 2480 MHz
Maximum power, including tune-up tolerance	Output power: +8 dBm
	Tolerance: +2 dBm / −3 dBm
Antenna type	PCB monopole

Property	Value
Maximum antenna gain	1.25 dBi

We declare that we meet the EN 62479 standard with respect to the limiting value for low powers less than 20 mW. Therefore, the product fundamentally corresponds to the European limiting values for high-frequency radiation.

4.5 Derating

Please note the derating for use of the product. The surrounding air temperature and the current affect the product's heat generation.

The derating curve was created with the following conditions of use: "without air movement and with 0.5 m/s air movement" and "mounting on wall with poor heat conductivity." The real conditions of use may lead to better heat dissipation from the product, e.g. due to greater air movement or better dissipation of heat to the mounting wall. The product provides measured values for temperature and current, which you can display with WAGO Webserver I/O Field or read out via OPC UA.

The following figure shows the maximum permissible current (I) that can flow into the product as a function of the surrounding air temperature (T).

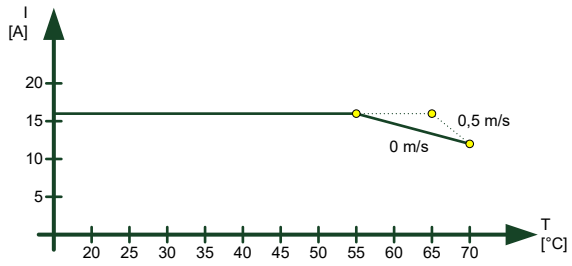


Figure 3: Derating, 0765-4501/0100-0000

4.6 Regulations and Standards

The following regulations and standards were used in the development of the module:

Table 18: Standards and Regulations

Standard	Title
EN 61000-6-2	Electromagnetic compatibility (EMC) – Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) – Emission standard for industrial environments
IEC 61158	EtherNet/IP

4.7 Approvals

The following approvals have been granted for the product:

CE	Conformity marking

cULus	UL	UL 61010-1 and UL 61010-2-201, “Ordinary Location”	Pending

Bluetooth®	Bluetooth®	This module has an RF transmitter with the following specifications: • Operating frequency: 2402–2480 MHz • Maximum RF output power: < 20 mW

RED	Certificate number: R20-0935-01-TEC (Wideline)

FCC	FCC ID: 2AKUE-WIDELINE

ISED	Certificate number: 22322-WIDELINE

Note

More information on approvals

You can find detailed information on the approvals online at: **www.wago.com**/<item number>

Functions

5.1 Process Image

This section describes the process data. The structure of the process data depends on which connection (connection 1, connection 2 etc.) is used between the EtherNet/IP scanner and the module. The module offers multiple connections; a connection was selected during configuration of the EtherNet/IP scanner.

List of Connections

- Connection 1: Exclusive Owner – 32 bytes per IO-Link port
- Connection 2: Exclusive Owner – 32 bytes per IO-Link port without config
- Connection 3: Listen Only – 32 bytes per IO-Link port
- Connection 4: Input Only – 32 bytes per IO-Link port
- Connection 5: Exclusive Owner – 16 bytes per IO-Link port
- Connection 6: Exclusive Owner – 16 bytes per IO-Link port without config
- Connection 7: Listen Only – 16 bytes per IO-Link port
- Connection 8: Input Only – 16 bytes per IO-Link port
- Connection 9: Exclusive Owner – 4 bytes per IO-Link port
- Connection 10: Exclusive Owner – 4 bytes per IO-Link port without config
- Connection 11: Listen Only – 4 bytes per IO-Link port
- Connection 12: Input Only – 4 bytes per IO-Link port

The following sections describe the process image for each connection.

Input Process Data of Connections 1 to 4

The following table describes the structure of the input process data of connections 1 through 4.

Table 19: Input Process Data – Connections 1 to 4

Byte Offset	Byte Count	Input Process Data	Description
1	1	DI status	0: DI data invalid. 1–255: DI data valid.
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DI data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01: IO-Link PQI	See **Process Image [▶ 47]**.
6	1	Dummy byte	Reserved, 0
7 ... 38	32	Port X01 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X01 (pin 4) functions as a digital input: input data	Byte 7: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 38: reserved.
		Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0.

Byte Offset	Byte Count	Input Process Data	Description
			Byte 8 ... 38: reserved.
39	1	Port X02: IO-Link PQI	See Process Image [▶ 47].
40	1	Dummy byte	Reserved, 0
41 ... 72	32	Port X02 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as a digital input: input data	Byte 41: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 42 ... 72: reserved.
		Port X02 (pin 4) functions as digital output: output data	Byte 41: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 42 ... 72: reserved.
73	1	Port X03: IO-Link PQI	See Process Image [▶ 47].
74	1	Dummy byte	Reserved, 0
75 ... 106	32	Port X03 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as a digital input: input data	Byte 75: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 76 ... 106: reserved.
		Port X03 (pin 4) functions as digital output: output data	Byte 75: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 76 ... 106: reserved.
107	1	Port X04: IO-Link PQI	See Process Image [▶ 47].
108	1	Dummy byte	Reserved, 0
109 ... 140	32	Port X04 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X04 (pin 4) functions as a digital input: input data	Byte 109: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 110 ... 140: reserved.
		Port X04 (pin 4) functions as digital output: output data	Byte 109: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 110 ... 140: reserved.
141	1	Port X05: IO-Link PQI	See Process Image [▶ 47].
142	1	Dummy byte	Reserved, 0
143 ... 174	32	Port X05 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as a digital input: input data	Byte 143: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 144 ... 174: reserved.

Byte Offset	Byte Count	Input Process Data	Description
		Port X05 (pin 4) functions as digital output: output data	Byte 143: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 144 ... 174: reserved.
175	1	Port X06: IO-Link PQI	See **Process Image [▶ 47]**.
176	1	Dummy byte	Reserved, 0
177 ... 208	32	Port X06 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X06 (pin 4) functions as a digital input: input data	Byte 177: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 178 ... 208: reserved.
		Port X06 (pin 4) functions as digital output: output data	Byte 177: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 178 ... 208: reserved.
209	1	Port X07: IO-Link PQI	See **Process Image [▶ 47]**.
210	1	Dummy byte	Reserved, 0
211 ... 242	32	Port X07 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X07 (pin 4) functions as a digital input: input data	Byte 211: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 212 ... 242: reserved.
		Port X07 (pin 4) functions as digital output: output data	Byte 211: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 212 ... 242: reserved.
243	1	Port X08: IO-Link PQI	See **Process Image [▶ 47]**.
244	1	Dummy byte	Reserved, 0
245 ... 276	32	Port X08 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X08. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X08 (pin 4) functions as a digital input: input data	Byte 245: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 246 ... 276: reserved.
		Port X08 (pin 4) functions as digital output: output data	Byte 245: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 246 ... 276: reserved.

The process data of the digital inputs can be transferred on a port basis (default) or pin basis. The following tables show the port and pin assignment.

Table 20: Process Data of the Digital Inputs (Port-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)

Byte Offset	Bit	Input Process Data
	1	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X04, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X04, pin 2: DI B or mirrored DO B (depending on configuration)
4	0	Port X05, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X05, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Table 21: Process Data of the Digital Inputs (Pin-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X02, pin 4: DI A or mirrored DO A (depending on configuration)
	...	...
	6	Port X07, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
4	0	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	1	Port X02, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X07, pin 2: DI B or mirrored DO B (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Input Process Data of Connections 5 to 8

The following table describes the structure of the input process data of connections 5 through 8.

Table 22: Input Process Data – Connections 5 to 8

Byte Offset	Byte Count	Input Process Data	Description
1	1	DI status	0: DI data invalid. 1–255: DI data valid.
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DI data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01: IO-Link PQI	See **Process Image [▶ 47]**.
6	1	Dummy byte	Reserved, 0
7 ... 22	16	Port X01 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X01 (pin 4) functions as a digital input: input data	Byte 7: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 22: reserved.
		Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0.

Byte Offset	Byte Count	Input Process Data	Description
			Byte 8 ... 22: reserved.
23	1	Port X02: IO-Link PQI	See **Process Image [▶ 47]**.
24	1	Dummy byte	Reserved, 0
25 ... 40	16	Port X02 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as a digital input: input data	Byte 25: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 40: reserved.
		Port X02 (pin 4) functions as digital output: output data	Byte 25: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 40: reserved.
41	1	Port X03: IO-Link PQI	See **Process Image [▶ 47]**.
42	1	Dummy byte	Reserved, 0
43 ... 58	16	Port X03 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as a digital input: input data	Byte 43: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 58: reserved.
		Port X03 (pin 4) functions as digital output: output data	Byte 43: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 58: reserved.
59	1	Port X04: IO-Link PQI	See **Process Image [▶ 47]**.
60	1	Dummy byte	Reserved, 0
61 ... 76	16	Port X04 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X04 (pin 4) functions as a digital input: input data	Byte 61: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 62 ... 76: reserved.
		Port X04 (pin 4) functions as digital output: output data	Byte 61: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 62 ... 76: reserved.
77	1	Port X05: IO-Link PQI	See **Process Image [▶ 47]**.
78	1	Dummy byte	Reserved, 0
79 ... 94	16	Port X05 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as a digital input: input data	Byte 79: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 80 ... 94: reserved.

Byte Offset	Byte Count	Input Process Data	Description
		Port X05 (pin 4) functions as digital output: output data	Byte 79: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 80 ... 94: reserved.
95	1	Port X06: IO-Link PQI	See **Process Image [▶ 47]**.
96	1	Dummy byte	Reserved, 0
97 ... 112	16	Port X06 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X06 (pin 4) functions as a digital input: input data	Byte 97: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 178 ... 208: reserved.
		Port X06 (pin 4) functions as digital output: output data	Byte 97: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 178 ... 208: reserved.
113	1	Port X07: IO-Link PQI	See **Process Image [▶ 47]**.
114	1	Dummy byte	Reserved, 0
115 ... 130	16	Port X07 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X07 (pin 4) functions as a digital input: input data	Byte 115: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 116 ... 130: reserved.
		Port X07 (pin 4) functions as digital output: output data	Byte 115: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 116 ... 130: reserved.
131	1	Port X08: IO-Link PQI	See **Process Image [▶ 47]**.
132	1	Dummy byte	Reserved, 0
133 ... 148	16	Port X08 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X08. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X08 (pin 4) functions as a digital input: input data	Byte 133: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 134 ... 148: reserved.
		Port X08 (pin 4) functions as digital output: output data	Byte 133: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 134 ... 148: reserved.

The process data of the digital inputs can be transferred on a port basis (default) or pin basis. The following tables show the port and pin assignment.

Table 23: Process Data of the Digital Inputs (Port-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)

Byte Offset	Bit	Input Process Data
	1	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X04, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X04, pin 2: DI B or mirrored DO B (depending on configuration)
4	0	Port X05, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X05, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Table 24: Process Data of the Digital Inputs (Pin-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X02, pin 4: DI A or mirrored DO A (depending on configuration)
	...	...
	6	Port X07, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
4	0	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	1	Port X02, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X07, pin 2: DI B or mirrored DO B (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Input Process Data of Connections 9 to 12

The following table describes the structure of the input process data of connections 9 through 12.

Table 25: Input Process Data – Connections 9 to 12

Byte Offset	Byte Count	Input Process Data	Description
1	1	DI status	0: DI data invalid. 1–255: DI data valid.
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DI data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01: IO-Link PQI	See **Process Image [▶ 47]**.
6	1	Dummy byte	Reserved, 0
7 ... 10	4	Port X01 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X01 (pin 4) functions as a digital input: input data	Byte 7: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 10: reserved.
		Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0.

Byte Offset	Byte Count	Input Process Data	Description
			Byte 8 ... 10: reserved.
11	1	Port X02: IO-Link PQI	See Process Image [▶ 47].
12	1	Dummy byte	Reserved, 0
13 ... 16	4	Port X02 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as a digital input: input data	Byte 13: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 14 ... 16: reserved.
		Port X02 (pin 4) functions as digital output: output data	Byte 13: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 14 ... 16: reserved.
17	1	Port X03: IO-Link PQI	See Process Image [▶ 47].
18	1	Dummy byte	Reserved, 0
19 ... 22	4	Port X03 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as a digital input: input data	Byte 19: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 20 ... 22: reserved.
		Port X03 (pin 4) functions as digital output: output data	Byte 19: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 20 ... 22: reserved.
23	1	Port X04: IO-Link PQI	See Process Image [▶ 47].
24	1	Dummy byte	Reserved, 0
25 ... 28	4	Port X04 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X04 (pin 4) functions as a digital input: input data	Byte 25: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 28: reserved.
		Port X04 (pin 4) functions as digital output: output data	Byte 25: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 28: reserved.
29	1	Port X05: IO-Link PQI	See Process Image [▶ 47].
30	1	Dummy byte	Reserved, 0
31 ... 34	4	Port X05 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as a digital input: input data	Byte 31: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 32 ... 34: reserved.

Byte Offset	Byte Count	Input Process Data	Description
		Port X05 (pin 4) functions as digital output: output data	Byte 31: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 32 ... 34: reserved.
35	1	Port X06: IO-Link PQI	See **Process Image [▶ 47]**.
36	1	Dummy byte	Reserved, 0
37 ... 40	4	Port X06 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X06 (pin 4) functions as a digital input: input data	Byte 37: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 38 ... 40: reserved.
		Port X06 (pin 4) functions as digital output: output data	Byte 37: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 38 ... 40: reserved.
41	1	Port X07: IO-Link PQI	See **Process Image [▶ 47]**.
42	1	Dummy byte	Reserved, 0
43 ... 46	4	Port X07 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X07 (pin 4) functions as a digital input: input data	Byte 43: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 46: reserved.
		Port X07 (pin 4) functions as digital output: output data	Byte 43: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 46: reserved.
47	1	Port X08: IO-Link PQI	See **Process Image [▶ 47]**.
48	1	Dummy byte	Reserved, 0
49 ... 52	4	Port X08 (pin 4) functions as IO-Link master: IO-Link input data	IO-Link input data of the IO-Link device on port X08. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X08 (pin 4) functions as a digital input: input data	Byte 49: Bit 0 = 0: input off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 50 ... 52: reserved.
		Port X08 (pin 4) functions as digital output: output data	Byte 49: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 50 ... 52: reserved.

The process data of the digital inputs can be transferred on a port basis (default) or pin basis. The following tables show the port and pin assignment.

Table 26: Process Data of the Digital Inputs (Port-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)

Byte Offset	Bit	Input Process Data
	1	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X04, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X04, pin 2: DI B or mirrored DO B (depending on configuration)
4	0	Port X05, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X05, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Table 27: Process Data of the Digital Inputs (Pin-Based Assignment)

Byte Offset	Bit	Input Process Data
3	0	Port X01, pin 4: DI A or mirrored DO A (depending on configuration)
	1	Port X02, pin 4: DI A or mirrored DO A (depending on configuration)
	...	...
	6	Port X07, pin 4: DI A or mirrored DO A (depending on configuration)
	7	Port X08, pin 4: DI A or mirrored DO A (depending on configuration)
4	0	Port X01, pin 2: DI B or mirrored DO B (depending on configuration)
	1	Port X02, pin 2: DI B or mirrored DO B (depending on configuration)
	...	...
	6	Port X07, pin 2: DI B or mirrored DO B (depending on configuration)
	7	Port X08, pin 2: DI B or mirrored DO B (depending on configuration)

Output Process Data of Connections 1 and 2

The following table describes the structure of the output process data of connections 1 and 2.

Table 28: Output Process Data – Connections 1 and 2

Byte Offset	Byte Count	Output Process Data	Description
1	1	DO Status	0: DO data invalid. Substitute values are used. 1–255: DO data valid (pin 2).
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DO Data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01 functions as IO-Link master: IO-Link output data release	0: IO-Link port X01 output data invalid. 1–255: IO-Link port X01 output data valid.
6	1	Port X01 (pin 4) functions as digital output: output release	0: Port X01 pin 4 output data invalid. Substitute value is used. 1–255: Port X01 pin 4 output data valid.
7 ... 38	32	Port X01 (pin 4) functions as a digital input	Reserved, 0
		Dummy byte	Reserved, 0
		Port X01 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.

Byte Offset	Byte Count	Output Process Data	Description
39	1	Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 38: reserved.
40	1	Port X01 (pin 4) functions as a digital input	Reserved, 0
41 ... 72	32	Port X02 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as digital output: output data	Byte 41: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 42 ... 72: reserved.
		Port X02 (pin 4) functions as a digital input	Reserved, 0
73	1	Port X03 functions as IO-Link master: IO-Link output data release	0: IO-Link port X03 output data invalid. 1–255: IO-Link port X03 output data valid.
		Port X03 (pin 4) functions as digital output: output release	0: Port X03 pin 4 output data invalid. Substitute value is used. 1–255: Port X03 pin 4 output data valid.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
74	1	Dummy byte	Reserved, 0
75 ... 106	32	Port X03 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as digital output: output data	Byte 75: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 76 ... 106: reserved.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
107	1	Port X04 functions as IO-Link master: IO-Link output data release	0: IO-Link port X04 output data invalid. 1–255: IO-Link port X04 output data valid.
108	1	Port X04 (pin 4) functions as digital output: output release	0: Port X04 pin 4 output data invalid. Substitute value is used. 1–255: Port X04 pin 4 output data valid.
109 ... 140	32	Port X04 (pin 4) functions as a digital input	Reserved, 0
		Dummy byte	Reserved, 0
		Port X04 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
141	1	Port X04 (pin 4) functions as digital output: output data	Byte 109: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 110 ... 140: reserved.
142	1	Port X04 (pin 4) functions as a digital input	Reserved, 0

Byte Offset	Byte Count	Output Process Data	Description
143 ... 174	32	Port X05 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as digital output: output data	Byte 143: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 144 ... 174: reserved.
		Port X05 (pin 4) functions as a digital input	Reserved, 0
175	1	Port X06 functions as IO-Link master: IO-Link output data release	0: IO-Link port X06 output data invalid. 1–255: IO-Link port X06 output data valid.
176	1	Port X06 (pin 4) functions as digital output: output release	0: Port X06 pin 4 output data invalid. Substitute value is used. 1–255: Port X06 pin 4 output data valid.
177 ... 208	32	Port X06 (pin 4) functions as a digital input	Reserved, 0
		Dummy byte	Reserved, 0
		Port X06 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
209	1	Port X06 (pin 4) functions as digital output: output data	Byte 177: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 178 ... 208: reserved.
210	1	Port X06 (pin 4) functions as a digital input	Reserved, 0
211 ... 242	32	Port X07 functions as IO-Link master: IO-Link output data release	0: IO-Link port X07 output data invalid. 1–255: IO-Link port X07 output data valid.
		Port X07 (pin 4) functions as digital output: output release	0: Port X07 pin 4 output data invalid. Substitute value is used. 1–255: Port X07 pin 4 output data valid.
		Port X07 (pin 4) functions as a digital input	Reserved, 0
243	1	Dummy byte	Reserved, 0
244	1	Port X07 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
245 ... 276	32	Port X07 (pin 4) functions as digital output: output data	Byte 211: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 212 ... 242: reserved.
		Port X07 (pin 4) functions as a digital input	Reserved, 0
		Port X08 functions as IO-Link master: IO-Link output data release	0: IO-Link port X08 output data invalid. 1–255: IO-Link port X08 output data valid.

The process data of the digital outputs can be transferred on a port basis (the default) or pin basis. The following tables show the port and pin assignment.

Table 29: Process Data of the Digital Outputs (Port-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	Port X01, pin 2: DO B
	...	...
	6	0
	7	Port X04, pin 2: DO B
4	0	0
	1	Port X05, pin 2: DO B
	...	...
	6	0
	7	Port X08, pin 2: DO B

Table 30: Process Data of the Digital Outputs (Pin-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	0
	...	...
	6	0
	7	0
4	0	Port X01, pin 2: DO B
	1	Port X02, pin 2: DO B
	...	...
	6	Port X07, pin 2: DO B
	7	Port X08, pin 2: DO B

Output Process Data of Connections 3 and 4

Connections 3 and 4 have no output process data.

Output Process Data of Connections 5 and 6

The following table describes the structure of the output process data of connections 5 and 6.

Table 31: Output Process Data of Connections 5 and 6) 765-4501

Byte Offset	Byte Count	Output Process Data	Description
1	1	DO Status	0: DO data invalid. Substitute values are used. 1–255: DO data valid (pin 2).
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DO Data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01 functions as IO-Link master: IO-Link output data release	0: IO-Link port X01 output data invalid. 1–255: IO-Link port X01 output data valid.
6	1	Port X01 (pin 4) functions as digital output: output release	0: Port X01 pin 4 output data invalid. Substitute value is used. 1–255: Port X01 pin 4 output data valid.

Byte Offset	Byte Count	Output Process Data	Description
7 ... 22	16	Port X01 (pin 4) functions as a digital input	Reserved, 0
		Dummy byte	Reserved, 0
		Port X01 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.
23	1	Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 22: reserved.
		Port X01 (pin 4) functions as a digital input	Reserved, 0
		Port X02 functions as IO-Link master: IO-Link output data release	0: IO-Link port X02 output data invalid. 1–255: IO-Link port X02 output data valid.
24	1	Port X02 (pin 4) functions as digital output: output release	0: Port X02 pin 4 output data invalid. Substitute value is used. 1–255: Port X02 pin 4 output data valid.
25 ... 40	16	Port X02 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as digital output: output data	Byte 25: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 40: reserved.
		Port X02 (pin 4) functions as a digital input	Reserved, 0
41	1	Port X03 functions as IO-Link master: IO-Link output data release	0: IO-Link port X03 output data invalid. 1–255: IO-Link port X03 output data valid.
		Port X03 (pin 4) functions as digital output: output release	0: Port X03 pin 4 output data invalid. Substitute value is used. 1–255: Port X03 pin 4 output data valid.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
42	1	Dummy byte	Reserved, 0
43 ... 58	16	Port X03 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as digital output: output data	Byte 43: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 58: reserved.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
59	1	Port X04 functions as IO-Link master: IO-Link output data release	0: IO-Link port X04 output data invalid. 1–255: IO-Link port X04 output data valid.
		Port X04 (pin 4) functions as digital output: output release	0: Port X04 pin 4 output data invalid. Substitute value is used. 1–255: Port X04 pin 4 output data valid.
		Port X04 (pin 4) functions as a digital input	Reserved, 0

Byte Offset	Byte Count	Output Process Data	Description
60	1	Dummy byte	Reserved, 0
61 ... 76	16	Port X04 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X04 (pin 4) functions as digital output: output data	Byte 61: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 62 ... 76: reserved.
		Port X04 (pin 4) functions as a digital input	Reserved, 0
77	1	Port X05 functions as IO-Link master: IO-Link output data release	0: IO-Link port X05 output data invalid. 1–255: IO-Link port X05 output data valid.
		Port X05 (pin 4) functions as digital output: output release	0: Port X05 pin 4 output data invalid. Substitute value is used. 1–255: Port X05 pin 4 output data valid.
		Port X05 (pin 4) functions as a digital input	Reserved, 0
78	1	Dummy byte	Reserved, 0
79 ... 94	16	Port X05 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as digital output: output data	Byte 79: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 80 ... 94: reserved.
		Port X05 (pin 4) functions as a digital input	Reserved, 0
95	1	Port X06 functions as IO-Link master: IO-Link output data release	0: IO-Link port X06 output data invalid. 1–255: IO-Link port X06 output data valid.
		Port X06 (pin 4) functions as digital output: output release	0: Port X06 pin 4 output data invalid. Substitute value is used. 1–255: Port X06 pin 4 output data valid.
		Port X06 (pin 4) functions as a digital input	Reserved, 0
96	1	Dummy byte	Reserved, 0
97 ... 112	16	Port X06 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X06 (pin 4) functions as digital output: output data	Byte 97: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 98 ... 112: reserved.
		Port X06 (pin 4) functions as a digital input	Reserved, 0
113	1	Port X07 functions as IO-Link master: IO-Link output data release	0: IO-Link port X07 output data invalid. 1–255: IO-Link port X07 output data valid.
		Port X07 (pin 4) functions as digital output: output release	0: Port X07 pin 4 output data invalid. Substitute value is used. 1–255: Port X07 pin 4 output data valid.

Byte Offset	Byte Count	Output Process Data	Description
		Port X07 (pin 4) functions as a digital input	Reserved, 0
114	1	Dummy byte	Reserved, 0
115 ... 130	16	Port X07 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X07 (pin 4) functions as digital output: output data	Byte 115: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 116 ... 130: reserved.
		Port X07 (pin 4) functions as a digital input	Reserved, 0
131	1	Port X08 functions as IO-Link master: IO-Link output data release	0: IO-Link port X08 output data invalid. 1–255: IO-Link port X08 output data valid.
		Port X08 (pin 4) functions as digital output: output release	0: Port X08 pin 4 output data invalid. Substitute value is used. 1–255: Port X08 pin 4 output data valid.
		Port X08 (pin 4) functions as a digital input	Reserved, 0
132	1	Dummy byte	Reserved, 0
133 ... 148	16	Port X08 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X08. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X08 (pin 4) functions as digital output: output data	Byte 133: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 134 ... 148: reserved.
		Port X08 (pin 4) functions as a digital input	Reserved, 0

The process data of the digital outputs can be transferred on a port basis (the default) or pin basis. The following tables show the port and pin assignment.

Table 32: Process Data of the Digital Outputs (Port-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	Port X01, pin 2: DO B
	...	...
	6	0
	7	Port X04, pin 2: DO B
4	0	0
	1	Port X05, pin 2: DO B
	...	...
	6	0
	7	Port X08, pin 2: DO B

Table 33: Process Data of the Digital Outputs (Pin-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	0
	...	...
	6	0
	7	0
4	0	Port X01, pin 2: DO B
	1	Port X02, pin 2: DO B
	...	...
	6	Port X07, pin 2: DO B
	7	Port X08, pin 2: DO B

Output Process Data of Connections 7 and 8

Connections 7 and 8 have no output process data.

Output Process Data of Connections 9 and 10

The following table describes the structure of the output process data of connections 9 and 10.

Table 34: Output Process Data – Connections 9 and 10

Byte Offset	Byte Count	Output Process Data	Description
1	1	DO Status	0: DO data invalid. Substitute values are used. 1–255: DO data valid (pin 2).
2	1	Dummy byte	Reserved, 0
3 ... 4	2	DO Data	The port and pin assignment of process data depends on the process data layout setting: pin-based or port-based. See the following tables.
5	1	Port X01 functions as IO-Link master: IO-Link output data release	0: IO-Link port X01 output data invalid. 1–255: IO-Link port X01 output data valid.
		Port X01 (pin 4) functions as digital output: output release	0: Port X01 pin 4 output data invalid. Substitute value is used. 1–255: Port X01 pin 4 output data valid.
		Port X01 (pin 4) functions as a digital input	Reserved, 0
6	1	Dummy byte	Reserved, 0
7 ... 10	4	Port X01 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X01. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X01 (pin 4) functions as digital output: output data	Byte 7: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 8 ... 10: reserved.
		Port X01 (pin 4) functions as a digital input	Reserved, 0
11	1	Port X02 functions as IO-Link master: IO-Link output data release	0: IO-Link port X02 output data invalid. 1–255: IO-Link port X02 output data valid.

Byte Offset	Byte Count	Output Process Data	Description
		Port X02 (pin 4) functions as digital output: output release	0: Port X02 pin 4 output data invalid. Substitute value is used. 1–255: Port X02 pin 4 output data valid.
		Port X02 (pin 4) functions as a digital input	Reserved, 0
12	1	Dummy byte	Reserved, 0
13 ... 16	4	Port X02 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X02. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X02 (pin 4) functions as digital output: output data	Byte 13: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 14 ... 16: reserved.
		Port X02 (pin 4) functions as a digital input	Reserved, 0
17	1	Port X03 functions as IO-Link master: IO-Link output data release	0: IO-Link port X03 output data invalid. 1–255: IO-Link port X03 output data valid.
		Port X03 (pin 4) functions as digital output: output release	0: Port X03 pin 4 output data invalid. Substitute value is used. 1–255: Port X03 pin 4 output data valid.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
18	1	Dummy byte	Reserved, 0
19 ... 22	4	Port X03 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X03. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X03 (pin 4) functions as digital output: output data	Byte 19: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 20 ... 22: reserved.
		Port X03 (pin 4) functions as a digital input	Reserved, 0
23	1	Port X04 functions as IO-Link master: IO-Link output data release	0: IO-Link port X04 output data invalid. 1–255: IO-Link port X04 output data valid.
		Port X04 (pin 4) functions as digital output: output release	0: Port X04 pin 4 output data invalid. Substitute value is used. 1–255: Port X04 pin 4 output data valid.
		Port X04 (pin 4) functions as a digital input	Reserved, 0
24	1	Dummy byte	Reserved, 0
25 ... 28	4	Port X04 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X04. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X04 (pin 4) functions as digital output: output data	Byte 25: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 26 ... 28: reserved.
		Port X04 (pin 4) functions as a digital input	Reserved, 0

Byte Offset	Byte Count	Output Process Data	Description
29	1	Port X05 functions as IO-Link master: IO-Link output data release	0: IO-Link port X05 output data invalid. 1–255: IO-Link port X05 output data valid.
		Port X05 (pin 4) functions as digital output: output release	0: Port X05 pin 4 output data invalid. Substitute value is used. 1–255: Port X05 pin 4 output data valid.
		Port X05 (pin 4) functions as a digital input	Reserved, 0
30	1	Dummy byte	Reserved, 0
31 ... 34	4	Port X05 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X05. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X05 (pin 4) functions as digital output: output data	Byte 31: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 32 ... 34: reserved.
		Port X05 (pin 4) functions as a digital input	Reserved, 0
35	1	Port X06 functions as IO-Link master: IO-Link output data release	0: IO-Link port X06 output data invalid. 1–255: IO-Link port X06 output data valid.
		Port X06 (pin 4) functions as digital output: output release	0: Port X06 pin 4 output data invalid. Substitute value is used. 1–255: Port X06 pin 4 output data valid.
		Port X06 (pin 4) functions as a digital input	Reserved, 0
36	1	Dummy byte	Reserved, 0
37 ... 40	4	Port X06 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X06. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X06 (pin 4) functions as digital output: output data	Byte 37: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 38 ... 40: reserved.
		Port X06 (pin 4) functions as a digital input	Reserved, 0
41	1	Port X07 functions as IO-Link master: IO-Link output data release	0: IO-Link port X07 output data invalid. 1–255: IO-Link port X07 output data valid.
		Port X07 (pin 4) functions as digital output: output release	0: Port X07 pin 4 output data invalid. Substitute value is used. 1–255: Port X07 pin 4 output data valid.
		Port X07 (pin 4) functions as a digital input	Reserved, 0
42	1	Dummy byte	Reserved, 0
43 ... 46	4	Port X07 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X07. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X07 (pin 4) functions as digital output: output data	Byte 43: Bit 0 = 0: output off. Bit 0 = 1: Input on. Bits 1 ... 7: always 0. Byte 44 ... 46: reserved.

Byte Offset	Byte Count	Output Process Data	Description
		Port X07 (pin 4) functions as a digital input	Reserved, 0
47	1	Port X08 functions as IO-Link master: IO-Link output data release	0: IO-Link port X08 output data invalid. 1–255: IO-Link port X08 output data valid.
		Port X08 (pin 4) functions as digital output: output release	0: Port X08 pin 4 output data invalid. Substitute value is used. 1–255: Port X08 pin 4 output data valid.
		Port X08 (pin 4) functions as a digital input	Reserved, 0
48	1	Dummy byte	Reserved, 0
49 ... 52	4	Port X08 functions as IO-Link master: IO-Link output data	IO-Link output data of the IO-Link device on port X08. For a description of the data, see the manual from the manufacture of the IO-Link device used.
		Port X08 (pin 4) functions as digital output: output data	Byte 49: Bit 0 = 0: output off. Bit 0 = 1: output on. Bits 1 ... 7: always 0. Byte 50 ... 52: reserved.
		Port X08 (pin 4) functions as a digital input	Reserved, 0

The process data of the digital outputs can be transferred on a port basis (the default) or pin basis. The following tables show the port and pin assignment.

Table 35: Process Data of the Digital Outputs (Port-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	Port X01, pin 2: DO B
	...	...
	6	0
	7	Port X04, pin 2: DO B
4	0	0
	1	Port X05, pin 2: DO B
	...	...
	6	0
	7	Port X08, pin 2: DO B

Table 36: Process Data of the Digital Outputs (Pin-Based Assignment)

Byte Offset	Bit	Output Process Data
3	0	0
	1	0
	...	...
	6	0
	7	0
4	0	Port X01, pin 2: DO B
	1	Port X02, pin 2: DO B
	...	...

Byte Offset	Bit	Output Process Data
	6	Port X07, pin 2: DO B
	7	Port X08, pin 2: DO B

Output Process Data of Connections 11 and 12

Connections 11 and 12 have no output process data.

Port Qualifier Information

The PQI (Port Qualifier Information) provides status information for the IO-Link port and the IO-Link device.

Table 37: Port Qualifier Information

Bit	Flag	Description
0	–	Reserved, 0
1	–	Reserved, 0
2	–	Reserved, 0
3	Event	IO-Link event The value corresponds to attribute 20 of event log object 65 (0x41). 0: The port has no IO-Link event. 1: The port has an IO-Link event. The event can be read out via event log object 65 (0x41).
4	–	Reserved, 0
5	DevCom	IO-Link device communication 0: No IO-Link device present 1: IO-Link device detected in state PREOPERATE or OPERATE
6	DevErr	Port/device error 0: No error/warning occurred 1: Error/warning occurred on port or IO-Link device
7	PQ	Validity of the device process data 0: Invalid I/O process data from IO-Link device 1: Valid I/O process data from IO-Link device

5.2 Forcing

This section describes the “Force” function for the module’s input and output data.

In forcing, the physical states of the inputs or the output values of the higher-level controller are “forcibly” overwritten with other values. The user provides these values and identifies them as forcing values. This method is helpful for commissioning systems and troubleshooting.

The “Forcing” function can be accessed through the following tools:
- WAGO I/O Field Webserver
- WAGO I/O Field app on mobile devices

Systems like SPS, TIA Portal and the like also have forcing functions. Such forcing functions should not be confused with the ones described in this section and will not be considered within the context of this section.

A distinction is made between two types of forcing:

1. Input simulation means overwriting input data with replacement values.
2. Overwriting output data with replacement values means setting or resetting the module outputs independent of the module's process image.

Forcing Outputs

To force output data for test purposes, you can control all the outputs independent of the actual process data value and set them to a specified alternative value.

For digital outputs, you can force pin 2 and pin 4.

For IO-Link, you can force port 16 data bytes.

Simulating Inputs

To simulate input data, you can set alternative values that are used for the input instead of the actual process data values. This allows you to test how the system (i.e., the module and a connected controller) responds to specific inputs.

With digital inputs, you can simulate pin 2 and pin 4.

For IO-Link, you can simulate port 16 data bytes.

Simultaneous Access

A device-internal mechanism prevents simultaneous access by multiple instances. This ensures that only one single instance at a time ever has write access.

"Forcing" Operating Mode Must Be Enabled in the Parameterization

The "Forcing" operating mode can be switched off by the higher-level controller. This is done with the "Force mode setting" parameter – see **Module Parameters [▶ 63]**. To enable forcing, the "Force mode setting" parameter value must be set to 0 ("Enable force mode"). This is the default setting in the device description file provided with the device.

5.3 Monitoring Functions

The 765 Series modules have extensive internal sensors for measuring:
- Temperatures
- Currents
- Voltages

The measurements are performed for the module and for pin 1, pin 2 and pin 4 of each port. The measured values can be displayed in the WAGO I/O Field Webserver or the WAGO I/O Field app. Alternatively, an OPC UA client can read out the measured values and display them.

In the module, the measured values are compared to limiting values. An alarm or event is generated if a value falls above or below a limiting value (e.g., a temperature limiting value). The module can send this alarm/event
- EtherNet/IP: The controller can read out the event log object (object 65, 0x41)
- to the OPC UA client upon: OPC UA: event.

The OPC UA client application can use the measured values, for example to implement load management. You can find information on load management in section **Design Power Supply [▶ 56]**.

5.4 Overload Protection

The module has internal overload protection for the output current. The output currently is constantly measured and monitored for values exceeding the maximum.

If the measured output current exceeds the maximum value, the product reduces the current or switches the corresponding loads off.

5.5 Parameterization Tools

5.5.1 Overview

There are several ways to set the product's parameters. The following table provides an overview of the tools.

Table 38: Overview of Parameterization Tools

Tool	Description
Controller with EtherNet/IP scanner	The **EtherNet/IP scanner** must be configured to exchange process data with the modules. The EDS file *wago_0765450x.eds* (x = 1 ... 4) describes a WAGO I/O System Field module. The configuration of the EtherNet/IP scanner can import this EDS file. The user can configure and parameterize a module. The user loads the configuration onto the EtherNet/IP scanner. The EtherNet/IP scanner configures the module via EtherNet/IP. Whether or not the scanner sends parameters (the port configuration) depends on the connection selected. For example, if connection 1 is used, the EtherNet/IP scanner transfers parameters to the module. For example, if connection 2 is used, the EtherNet/IP scanner transfers no parameters to the module, and the port must be configured with a different tool. **Selecting a Connection [▶ 81]** describes which connection causes EtherNet/IP scanner parameters to be transferred and which does not.
WAGO Webserver I/O Field	The **WAGO I/O Field Webserver** is a Webserver that is integrated into the 765 module. Using a Web browser, the user can display the Web pages and display and modify parameters.
WAGO I/O Field App	The **WAGO I/O Field app** is an app for mobile devices that can communicate with a 765 module via Bluetooth®.
WAGO IO-Link Configurator	**WAGO IO-Link Configurator** is software for configuring the WAGO IO-Link masters and the IO-Link devices.

Three domains are distinguished for configuration and parameterization:

1. **EtherNet/IP configuration**: select EtherNet/IP connection.
2. **Port configuration**: digital input or output
3. **IO-Link device configuration**.

The following table shows which tool can influence which domain.

Table 39: Parameterization Overview

Tool	EtherNet/IP Connection	Port Configuration	IO-Link Device Configuration
EtherNet/IP scanner	The EtherNet/IP scanner configures the EtherNet/IP connection of the 765 module.	The **EtherNet/IP scanner** must be configured to exchange process data with the modules. The EDS file wago_0765450x.eds (x = 1 ... 4) describes a WAGO I/O System Field module. The configuration of the EtherNet/	-

Tool	EtherNet/IP Connection	Port Configuration	IO-Link Device Configuration
		IP scanner can import this EDS file. The configuration of the EtherNet/IP scanner can import this EDS file. The user can configure and parameterize a module. The user loads the configuration onto the EtherNet/IP scanner. The EtherNet/IP scanner configures the module via EtherNet/IP. Whether or not the scanner sends parameters (the port configuration) depends on the connection selected. For example, if connection 1 is used, the EtherNet/IP scanner transfers parameters to the module. For example, if connection 2 is used, the EtherNet/IP scanner transfers no parameters to the module, and the port must be configured with a different tool. **Selecting a Connection [▶ 81]** describes which connection causes EtherNet/IP scanner parameters to be transferred and which does not.	
WAGO Webserver I/O Field	–	Yes	Objects of the IO-Link device can be written and read. For this purpose, the WAGO I/O Field Webserver users ISDU services (ISDU = Indexed Service Data Unit). This requires expert knowledge and the object description for the IO-Link device used. The I/O Field Webserver does not evaluate an IODD;
WAGO I/O Field App	–	Yes	Yes IODD can be used by the app to parameterize an IO-Link device.
WAGO IO-Link Configurator	-	Yes	Yes IODD can be used by the WAGO IO-Link Configurator to parameterize an IO-Link device.

ⓘ Note

Parameters via EtherNet/IP are always rewritten upon restart.

If a connection is used for which the EtherNet/IP scanner transfers parameters to the module, the scanner transfers the configuration and parameters to the module every time the EtherNet/IP communication starts up.
Port configuration parameters that were set by the I/O Field Webserver, the I/O Field app or the OPC UA client are overwritten.

If you want to (permanently) change port configuration parameters via the WAGO I/O Field Webserver, the WAGO I/O Field app or the OPC UC client, set them with the IO-Controller's configuration software.

5.5.2 WAGO IO-Link Configurator

The WAGO IO-Link Configurator is an independent commissioning, configuration and management software program. The software replaces the earlier IO-Link plug-in for WAGO-I/O-*CHECK*.

The WAGO IO-Link Configurator software is used for configuring and parameterizing IO-Link devices. It supports a large number of IO-Link masters and IO-Link sensors/actuators. Within the software, you can switch between the IO-Link masters of a node that are used without having to switch back to WAGO-I/O-*CHECK*. In addition, the handling of IODD (device description files for IO-Link modules) is more flexible. For example, you can access the IODD server directly to import IODDs.

The WAGO IO-Link Configurator software can be launched as a stand-alone program from the Start menu or with the desktop icon, or in connection with WAGO I/O-*CHECK*. It then provides the functions necessary for connecting to accessible WAGO IO-Link masters or searching for them.

You can find further information in the product manual WAGO IO-Link Configurator.

The manual is available in the download area for the WAGO IO-Link Configurator software at **www.wago.com**, item number 0765-4501/0100-0000.

5.5.3 WAGO Webserver I/O Field

The WAGO I/O System Field module has an integrated Webserver. It can be accessed with a standard Web browser in order to use the following functions:

- Display port information for ports X01, X02 etc.
- Display and modify module settings.
- User setup and management, as well as user login and logout
- Reset module to factory settings and restart firmware.
- Simulating inputs; forcing outputs

Examples of port information include:

- Display current measured values for the ports: temperature, voltage, current and state on pins 1, 2 and 4
- Display information about the connected IO-Link module
- Display the status information for the entire port
- Configure ports, e.g. set operating mode
- Read and write access to the connected IO-Link devices
- Show process data

The module settings include:

- Select method for obtaining IP address
- Select the origin of the configuration data used
- Display and enter maintenance information
- Reset module to factory settings.
- Load firmware onto the module
- Display and set parameters for Bluetooth® connection to the module
- Update Bluetooth® firmware

Function overview

The following overview shows the functions offered by WAGO Webserver I/O Field that is integrated into the product and the menu items/tabs in the user interface that can be used to address these functions:

Table 40: Function Overview for WAGO I/O Field Webserver and WAGO IO-Link Modules

Menu	Tab	Description	Section
Dashboard	-	Displaying product information	
Port X01, X02, ...	(All)	Port information and settings for IO-Link ports X01, X02, ...	Configure Ports [▶ 92]
	Information	Display measured values of a port and information on the connected IO-Link device (temperature, voltage, current and state on pins 1, 2 and 4)	
	Status	Displays status information for the entire port	
	Configuration	Make port settings (such as operating mode or product check for validation and backup)	
	IOL	Access to connected IO-Link devices	
	Process data	Displays the process data (input/output)	
Settings	(All)	Product settings	
	Device configuration	Configure parameters for IP connection	Configuring IP Parameters [▶ 98]
	Maintenance information	Save maintenance information	Storing Maintenance Information [▶ 99]
	Factory reset	Resetting the product to factory settings	Resetsetting the Module to the Factory Settings [▶ 102]
	Firmware upgrade	Update firmware	Updating Firmware [▶ 100]
	Bluetooth	Access via Bluetooth	Configure Bluetooth [▶ 103]
DIOForcing	-	Forcing for digital inputs and outputs	Forcing Digital Inputs and Outputs [▶ 108]
IOLForcing	-	Forcing for IO-Link ports	Forcing for IO-Link Ports [▶ 110]
User administration	-	Set up and manage users	Logging Users on and off and Managing Them [▶ 105]
Sign-in, Sign-out	-	Log users on and off	

5.5.4 WAGO I/O Field app

The WAGO I/O Field app is an app for maintenance, diagnostics, operation and monitoring of installed WAGO I/O System Field modules and IO-Link devices.

This app allows you to display product information, read and write process data and adjust settings and parameters for both fieldbus modules and IO-Link devices. The communication this requires takes place through the *Bluetooth*® interface of the mobile device once a Data Matrix code has been scanned to select the product.

Users and the associated access rights can be set up and managed. Outputs can be forced and inputs set in order to support commissioning of systems. The current measured values of a port can be displayed (temperature, voltage, current and states) and configured (including operating mode and filters). Products can be reset to the factory settings and firmware restarted.

Short Overview

- Scanning a data matrix code of an I/O field module for product selection
- Establishing a Bluetooth® BLE (Bluetooth Low Energy) connection for wireless communication
- Querying product information including serial number (UII – Unique Item Identifier)
- Managing known devices for direct selection without scanning the DM code
- Querying sensor/actuator data (diagnostics, manufacturer, configuration, status, cycle time etc.)
- Parameterizing ports (input, input filters, output and substitute value strategy)
- Forcing outputs (DO)
- Simulating inputs (DI)
- Parameterizing WAGO IO-Link Masters*
- Guided download of IODDs from the Internet for IO-Link devices (IODDfinder)*
- Importing the device description file (IODD) of the IO-Link device*
- Parameterizing IO-Link devices*
- Managing customer-specific product names
- Displaying diagnostic and status information
- Managing product-specific documents (datasheets, manuals etc.)
- User and rights management

* Only applies to modules with integrated IO-Link master ports

The functional scope described can vary depending on the module type.

ⓘ Note

Read the online help!

You can find Product-specific information on the WAGO App I/O Field in the online help for the app.

An iOS version of the WAGO I/O Field app is available for free in the Apple App Store, and an Android version in the Google Play Store.

5.6 Communication Interfaces

The module has the following interfaces and supports the following protocols:

- ETHERNET Interfaces
  - EtherNet/IP
  - HTTP for WAGO I/O Field Webserver

  - TCP for the OPC UA server
  - UDP for WAGO IO-Link Configurator
- Bluetooth® for the WAGO I/O Field app

5.6.1 EtherNet/IP

The module exchanges the process data with the controller via EtherNet/IP. The process data communication requires the controller and module to be configured and parameterized.

5.6.1.1 Event Log Object 65

IO-Link events are logged in event log object 65 (0x41). The controller or a diagnostic tool can read event log object 65 (0x41).

5.6.2 OPC UA Server

The module has an integrated OPC UA server.

Function Overview

- Read module identification
- Read configuration
- Read measured values: current, voltage, temperature
- Events: overcurrent, overload and overtemperature
- Read status information
- Read process data
- Read statistics: minimum/maximum current per pin, minimum/maximum voltage per pin, minimum/maximum temperature
- User access: anonymous (only read access) or username/password (read and write access)

Planning

6.1 Structure Guidelines

6.1.1 Installation Site and Touch-Proof Protection

The product does not require an additional enclosure.

6.1.2 Data Security

Professional planning and design is an important requirement for securing data confidentiality, availability and integrity.

6.1.2.1 Random Influences

Random Influences

Data transmission and processing can be disrupted by random influences, such as temporary electromagnetic disturbances. Proper setup can significantly reduce the likelihood of corruption or destruction of data.

6.1.2.2 Deliberate Influences

Use in ETHERNET Areas

ETHERNET products are designed for use on local networks. Please note the following when using ETHERNET products in your system:

- Do not connect control components and control networks to an open network such as the Internet or an office network.
  WAGO recommends protecting control components and control networks against unauthorized outside access by using a firewall.
- Limit physical and electronic access to all automation components to authorized personnel only.
- To reduce the risk of unauthorized access to your system, change the default passwords during initial commissioning.
- To reduce the risk of unauthorized access to your system, regularly change the passwords used.
- To verify that the measures taken meet your security requirements, regularly perform threat analyses.
- To restrict access to and control of individual products and networks, employ a “defense-in-depth” mechanism in your system’s security configuration (📖 **White Paper Cybersecurity in Production Facilities**).

Table 41: Additional documentation

Document Type	Name
📖 White Paper	Cybersecurity in Production Facilities

All the documentation is available at: **www.wago.com**.

6.2 Power Supply Concept

6.2.1 Design Power Supply

NOTICE

Device damage if permissible current feedthrough exceeded

There is a risk of damage to the device and/or other devices connected to it if the maximum permissible current feedthrough is exceeded.

Power Supply of the Module and the Connected Sensors/Actuators

The 24 V power supply is fed in via the X31 (PWR IN) supply input. The module has two electrically isolated supply cables.

- Supply cable 1 connects 1L+ (pin 1) to 1L- (pin 3).
- Supply cable 2 connects 2L+ (pin 4) to 2L- (pin 2).

The sensors or actuators are powered through ports X01, X02 etc. The design of the power supply must take the demand of the connected sensors and actuators into account.

Successive devices can be powered through the X32 (PWR OUT) supply output. This current feedthrough must also be taken into account in the design of the power supply.

Protective Functions

The module has integrated protective functions (see section **Overload Protection [▶ 49]**) to prevent damage in overload situations such as overcurrent or short circuit. However, it is important not to rely on these protective functions alone, but also to limit the currents externally,

because these protective functions do not cover the current feedthrough for powering successive devices through the supply output (X32). The maximum current for the current feedthrough through X31 and X32 must be limited through fuse protection (see datasheet), which must take their own individual consumption values, including those of the connected loads of the connected modules, into account.

Consumption

For each supply cable, it is necessary to take into account the consumption that depends on the connected devices.

Supply Cable 1:

- Logic supply (about 200 mA)
- Power supply of all connected sensors/actuators via 1L
- Power supply of successive devices via 1L

Supply Cable 2:

- Power supply of all connected sensors/actuators via 2L
- Power supply of successive devices via 2L

Rules

In addition to the consumption of the connected devices, rules for the maximum load capacity must be followed. Comply with the following rules to prevent damage to the product:

- Supply voltage input X31 (PWR IN) and supply voltage input X32 (PWR OUT)
  - Rule 1: Take maximum load capacity of each connection contact (pin) into account
  - Rule 2: Take 1L and 2L current feedthrough into account
- Ports X01, X02 etc.
  - Rule 3: The current load of pin 3 must not exceed 4 A, since the sum of the pin 1, 2 and 4 currents flows back through pin 3.

Rules 1 and 2: Supply Input X31 and Output X32

The currents for the electrically isolated supply cables 1 and 2 should be considered separately. The two supply cables 1 are defined as follows:

- Supply cable 1 corresponds to the current flow path that starts from pin 1 (signal 1L+) of supply voltage connection PWR IN (X31) and passes through the device to pin 3 (signal 1L-) of PWR IN. This is shown in blue in the current flow figure under Connection > Connect Sensors/Actuators.
- Supply cable 2 corresponds to the current flow path that starts from pin 4 (signal 2L+) of supply voltage connection PWR IN (X31) and passes through the device to pin 2 (signal 2L-) of PWR IN. This is shown in red in the current flow figure under Connection > Connect Sensors/Actuators.

The following rule applies to both supply cables:

Rule 1: Upper limit of 16 A for current in the entire supply cable (1L or 2L)

An upper limit of 16 A applies to the total current in a supply cable. If this upper limit is exceeded, there is a risk of destruction of or damage to the device if the safety measures are not taken.

Also observe the derating, i.e. the maximum current as a function of the surrounding air temperature. In this regard, see section **Derating [▶ 25]**.

The following partial currents contribute to the total current in supply cable 1:

1. The I_{logic} current for powering the device's internal electronics (the device is powered via supply cable 1)
2. The I_{X0i_1L} currents for powering the connected devices, sensors and actuators (for each port i)
3. The I_{X32_1L} current that flows through the supply voltage output PWR OUT (X32) to other connected devices (current feedthrough)

The following partial currents contribute to the total current in supply cable 2:

1. The I_{X0i_2L} currents for powering the connected devices, sensors and actuators (for each port i)
2. The I_{X32_2L} current that flows through the supply voltage output PWR OUT (X32) to other connected devices

The following rule applies to both supply cables:

Rule 2: Current feedthrough limiting

The supply voltage for the devices of a supply cable that are connected to the output supply connection PWR OUT is passed on through the device via the input supply connection. The maximum permissible current feedthrough for the respective supply cable is limited by the current load capacity of the pluggable connector on the input supply connection and the PCB. The latter is max. 16 A, where the total current in the supply cable must not exceed the current load capacity.

Note the following:

1. When switching on digital outputs, it may be necessary to factor the current that flows through these outputs into the current feedthrough accordingly.
2. In the worst case, the permissible current feedthrough may reach a value of **0 A**!
3. The passthrough connection between the supply voltage input and output has **no protective device** against overcurrent!

Therefore, the safety measures given in **Power supply [▶ 17]** (fuse protection, regulated power supply with current limitation and additional monitoring of the measured values of the sensors) are necessary.

Rule 3: Ports X01, X02 etc.

The following rules apply to each port of the product individually:

Rule 3: Upper limits for current on the individual pins of the ports

The following upper limits apply to the currents on the pins of the individual ports:

Table 42: Upper Limits for Current on the Individual Pins of the Connections

Pin	Normal Operation	Overload Operation
1	4 A	4 A
2	2 A	2.4 A
3	4 A	4 A
4	2 A	2.4 A

The device is designed in such a way that it can be used in overload operation without time limit. The following applies to all pins:

If the maximum load capacity (upper limit of overload operation) of the pin is exceeded, there is a risk of destruction of or damage to the pluggable connector or PCB of the device.

⚠ CAUTION

Note significance of pin 3

Note that the sum of the currents of pins 1, 2 and 4 flows to pin 3.

Product-Specific Information

For supply cable 1 of the 0765-4501/0100-0000 IO-Link product, the currents declared in the following table must be taken into account:

Table 43: 0765-4501/0100-0000 IO-Link Product – Currents in Supply Cable 1

Current	Description
I_{X31_1L}	Current to connection PWR IN (X31): current 1L+ / reverse current 1L−
I_{X32_1L}	Current to connection PWR OUT (X32): current 1L+ / reverse current 1L−

Current	Description
I_{logic}	Logic supply
I_{X01_1L}, I_{X02_1L}, ..., I_{X08_1L}	Total current for supply cable 1 at digital input/output port X0i (i.e., port X01, X02, ..., X08) corresponds to the current $I_{X0i\_pin3\_1L}$ at pin 3 (ground). This current is the sum of the currents on pins 1, 2 and 4 of port X0i: $I_{X0i\_1L} = I_{X0i\_pin3\_1L} = I_{X0i\_pin1\_1L} + I_{X0i\_pin2\_1L} + I_{X0i\_pin4\_1L}$
I_{module_1L}	Module current $I_{module\_1L} = I_{X01\_pin3\_1L} + I_{X02\_pin3\_1L} + ...+ I_{X08\_pin3\_1L}$

For supply cable 2 of the 0765-4501/0100-0000 IO-Link product, the currents declared in the following table must be taken into account:

Table 44: 0765-4501/0100-0000 IO-Link Product – Currents in Supply Cable 2

Current	Description
I_{X31_2L}	Current to connection PWR IN (X31): current 2L+ / reverse current 2L−
I_{X32_2L}	Current to connection PWR OUT (X32): current 2L+ / reverse current 2L−
I_{module_2L}	Module current $I_{module\_2L} = 0$

For this product, supply cable 2 is only used for transmission between the PWR IN (X31) and PWR OUT (X32) connections.

During operation of the 0765-4501/0100-0000 IO-Link product, the rules below for the currents in supply cables 1 and 2 must be followed at all times:

Table 45: Rules for Supply Cables 1 and 2

Current	Supply Cable 1	Supply Line 2
Total current for the supply cable (rule 1)	$I_{X31\_1L} \leq 16$ A $I_{X31\_1L} = I_{logic} + I_{X32\_1L +} I_{module\_1L}$	$I_{X31\_2L} \leq 16$ A $I_{X31\_2L} = I_{X32\_2L} + I_{module\_2L}$
Permissible current feedthrough (rule 2)	$I_{X32\_1L} \leq 16$ A – I_{logic} - I_{module_1L}	$I_{X32\_2L} \leq 16$ A - I_{module_2L}
Ports	Ports X01, ... , X08 (henceforth summarized as port X0i for $1 \leq i \leq 8$)	-
Supply current on pin 1 (rule 3)	$I_{X0i\_pin1\_1L} \leq 4$ A	-
Signal current on pin 2/4 in normal operation (rule 3)	$I_{X0i\_pin2\_1L} \leq 2$ A $I_{X0i\_pin4\_1L} \leq 2$ A	-
Signal current on pin 2/4 in overload operation (rule 3)	$I_{X0i\_pin2\_1L} \leq 2.4$ A $I_{X0i\_pin4\_1L} \leq 2.4$ A	-
Reverse current to pin 3 (ground) (rule 3)	$I_{X0i\_pin3\_1L} \leq 4$ A	-

6.2.2 Requirements on the Power Supply

Power Source

Note

PELV or SELV power source required

Only device the product with 24 VDC PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage) voltage sources. Failure to do so may result in electric shock.

If L1 and L2 are to be supplied separately (e.g., for safe switch-off of L2), then either central grounding must be implemented using two power supply units, or the power supply connection must be made on the same phase. However, the use of two separate power supply units is not mandatory.

Note

Note the following when L1 and L2 are supplied separately:

If L1 and L2 are to be supplied separately (e.g., for safe switch-off of L2), then either central grounding must be implemented using two power supply units, or the power supply connection must be made on the same phase. Use of two separate power supply units is not mandatory.

Fuse Protection

Always protect the power supply lines from the power supply unit to the first module with a device circuit breaker or fuse. For this purpose, use a 24 VDC / max. 16 A fuse or circuit breaker with type B trip characteristics.

Note

Device damage if maximum supply current exceeded

The maximum supply current must not be exceeded. Otherwise, there is a risk of damage to the PCB of the device and the pluggable connector.

6.2.3 Additional Measures

The setup must ensure that the total current the flows back through pin 3 does not exceed the load limit.

The values of all currents on all pins of all connections (except for pin 3 = ground pin) and the calculated total currents of the two supply cables are measured by the chip used in the 765 Series products and thus can be recorded by a monitoring application. These values can be accessed via the OPC UA server, for example.

On the basis of these measured values, a monitoring application with integrated current management can be implemented. This can regularly verify that all monitoring functions are satisfied on the basis of the measured current values and also monitor the temperatures and voltages on the connections.

6.2.4 Power Supply Examples

The product can be powered alone with its operating voltage or form part of a power supply group along with multiple products.

Power supply groups of multiple products can be formed in two ways:

1. Via the PWR OUT connection:
   One or more additional products can be powered via the PWR OUT (X32) power supply output and then form a power supply group together with the product.
2. Through an IO-Link hub*:
   One product forms a common power supply group with IO-Link hubs (765-170x/0200-0000) connected via IO-Link.

* Only applies to modules with integrated IO-Link master ports

In what follows, we present one example for the 765-4204/0100-000 product with four IO-Link inputs/outputs for each of the following:

- Individual power supply
- Power supply group via PWR OUT connection (with calculation of the permissible current feedthrough)
- Power supply group with IO-Link hubs

These examples assume that the IO-Link inputs/outputs are configured as digital outputs.

Example of Individual Power Supply

This example considers a single 765-4501/0100-0000 module where no additional devices are powered through its PWR OUT connection (X32).

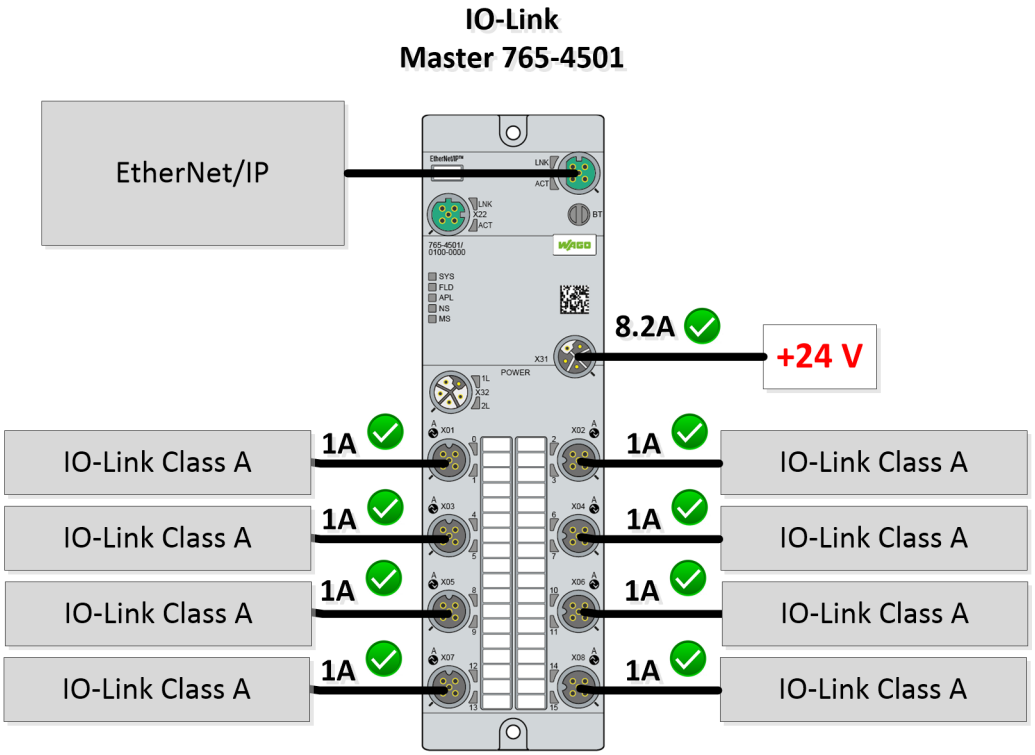


Figure 4: Connection Example for 765-4501/0100-0000 Module with Individual Power Supply

One IO-Link class A device with max. current consumption of 1 A is connected to each of ports X01 through X08 of the module. The module's current consumption is 0.2 A.

Supply cable 1 then has a total current consumption of 2 × 2 A + 0.2 A = 4.2 A, and supply cable 2 has a total current consumption of 2 × 2 A = 4.0 A.

These do not exceed the maximum permissible value of 16 A per supply cable and are thus permissible.

Example of a Power Supply Group via PWR OUT

If you connect another device to the PWR OUT (X32) power supply output, this forms a supply group. The maximum permissible current feedthrough that this module can require is 16 A – 4.2 A = 11.8 A for supply cable 1 (1L) und 16 A – 4.0 A = 12 A for supply cable 2 (2L).

Example of a Power Supply Group with an IO-Link Hub

In what follows, we consider a power supply group consisting of a 765-4501/0100-0000 IO-Link Master and a 765-1701/0200-0000 IO-Link Hub. The two products are connected via IO-Link.

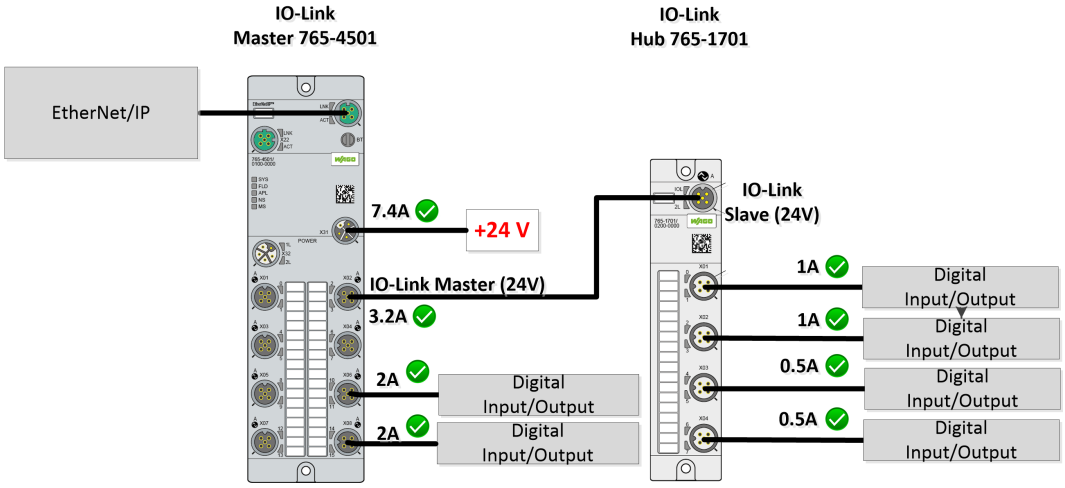


Figure 5: Power Supply Group with 765-4501/0100-0000 – Connection Example 1

Three devices are connected to the 765-4504/0100-0000 module:
- On port X01: the 765-1701/0200-0000 IO-Link Hub
- On port X03: one digital input/output with max. current consumption of 2 A (on pin 1)
- On port X04: one digital input/output with max. current consumption of 2 A (on pin 1)

Four devices are connected to the 765-1701/0200-0000 IO-Link Hub:
- On port X01: one digital input/output with max. current demand of 1 A (on pin 1)
- On port X02: one digital input/output with max. current demand of 1 A (on pin 1)
- On port X03: one digital input/output with max. current demand of 0.5 A (on pin 1)
- On port X04: one digital input/output with max. current demand of 0.5 A (on pin 1)

The current consumption of each of the two WAGO 765 Series products is 0.2 A.

Since the 765-1701/0200-0000 IO-Link Hub gets its operating voltage from the 765-4504/0100-0000 IO-Link master, port X01 (pin 1) of the module has a load of 3.2 A = 1 A + 1 A + 0.5 A + 0.5 A + 0.2 A, which is below the maximum load capacity of 4 A and thus permissible.

Port X02 is unused.

Ports X03 and X04 each have a load of 2 A, which is also below the maximum load capacity of 4 A and thus permissible.

Connection Example 2

Now we increase the current consumption on the two ports X01 and X02 of the 765-1701/0200-0000 IO-Link Hub to 2 A and check whether this is permissible:

The ports of the 765-1701/0200-0000 IO-Link Hub can withstand a constant load of 2 A. However, the effects on the 765-4501/0100-0000 product must be considered.

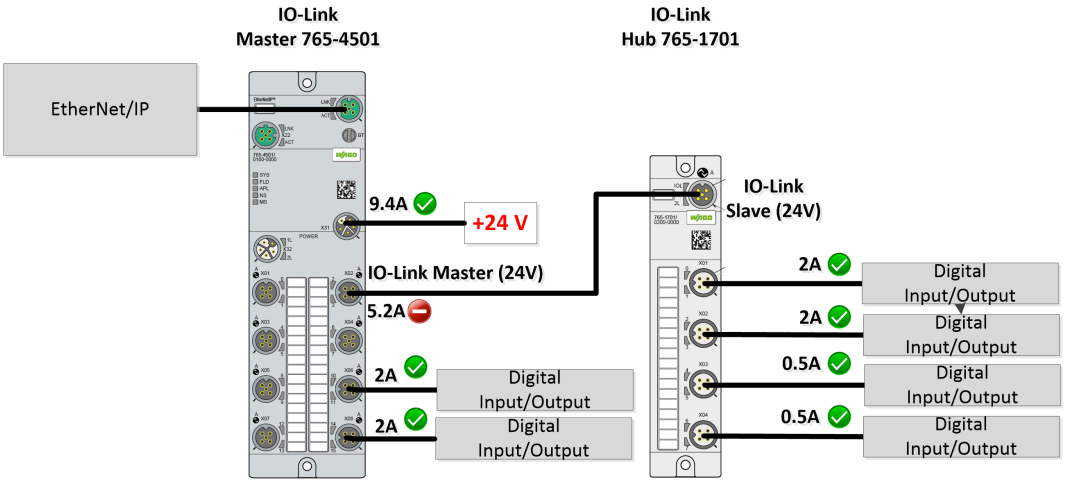


Figure 6: Power Supply Group with 765-4501/0100-0000 – Connection Example 2

To do so, we consider port X01 of the 765-4501/0100-0000 module:

This has a load of 5.2 A = 2 A + 2 A + 0.5 A + 0.5 A + 0.2 A on pin 1. This exceeds the maximum load capacity of 4 A and it thus not permitted.
If the currents on X01 and X02 of the 765-1701/0200-0000 IO-Link Hub were increased, the overload protection would constantly activate and could threaten destruction of the 765-4102/0100-0000 IO-Link Master on its port X01.

6.3 Settings Options

6.3.1 Module Parameters

The “Exclusive Owner” connections 1, 5 and 9 and the “Input Only” connections 4, 8 and 12 require the following parameters and settings. The scanner transfers these parameters to the product when the connection is established.

Parameters 10 to 85

Parameters 10 to 15 configure IO-Link port X01.
Parameters 20 to 25 configure IO-Link port X02.
...
Parameters 80 to 85 configure IO-Link port.

Table 46: IO-Link Master Parameters

No.	Parametername	Value Range	Default	Description
10, 20, ...	IO-Link port X01/ X02/... – Port mode	0 ... 4	2	Port operating mode (configuration of pin 4)
		0: Deactivated		Pin 4 is deactivated.
		1: IOL Manual		Pin 4 is operated as an IO-Link port with manual configuration.
		2: IOL Autostart		Pin 4 is operated as an IO-Link port with automatic configuration (plug and play).

No.	Parametername	Value Range	Default	Description
		3: Digital input		Pin 4 is a digital input.
		4: Digital output		Pin 4 is a digital output.
11, 21, ...	IO-Link port X01/ X02/... – Validation and backup	0 ... 4	0	Validation and backup settings
		0: No device check		The IO-Link master does not verify the compatibility of the connected IO-Link device.
		1: Type-compatible to device V1.0		The IO-Link master uses the manufacturer ID and device ID to check whether the connected IO-Link device is compatible and supports specification V1.0.
		2: Type-compatible to device V1.1		The IO-Link master uses the manufacturer ID and device ID to check whether the connected IO-Link device is compatible and supports specification V1.1.
		3: Type-compatible to device V1.1, backup and restore		The IO-Link master uses the manufacturer ID and device ID to check whether the connected IO-Link device is compatible and supports specification V1.1. The IO-Link master uses backup and restore functions to back up the IO-Link device parameters and load them onto the IO-Link device after the device is replaced.
		4: Type-compatible to device V1.1, restore only		The IO-Link master uses the manufacturer ID and device ID to check whether the connected IO-Link device is compatible and supports specification V1.1. The IO-Link master uses the restore function to load stored parameters onto the IO-Link device after the device is replaced.
12, 22, ...	IO-Link port X01/ X02/... – IQ behavior	0 ... 2	0	Configuration of pin 2
		0: Not supported		Pin 2 is not used.
		1: Digital input		Pin 2 is a digital input.
		2: Digital output		Pin 2 is a digital output.
13, 23, ...	IO-Link port X01/ X02/... – Port cycle time	0, 4 ... 191	0	Port Cycle Time 0: calculated by IO-Link master 4 ... 191: see table “Calculation of Port Cycle Time”
14, 24, ...	IO-Link port X01/ X02/... – Vendor ID	0, 1 ... 65535	0	Manufacturer ID If validation is used: expected manufacturer ID of the connected IO-Link device. Manufacturer ID: see the documentation of the IO-Link device used. Value 0 if no validation is used.
15, 25, ...	IO-Link port X01/ X02/... – Device ID	0, 1 ... 16777215	0	Device ID If validation is used: expected device ID of the connected IO-Link device. Device ID: see the documentation of the IO-Link device used. Value 0 if no validation is used.

Parameters 90 to 96

Parameters 90 to 96 configure the module.

Table 47: Module Parameters

No.	Parametername	Value Range	Default	Description
90	DIO process data layout	0: Port-based	0	Order of the process data of the digital inputs and digital outputs: Bit 0 = port X01 pin 4, Bit 1 = port X01 pin 2, bit 2 = port X02 pin 4, bit 3 = port X02 pin 2, ...
		1: Pin-based		Order of the process data of the digital inputs and digital outputs: Bit 0 = port X01 pin 4, Bit 1 = port X02 pin 4, Bit 2 = port X03 pin 4, Bit 3 = port X04 pin 4, ... Bit 8 = port X01 pin 2, Bit 9 = port X02 pin 2, ...
91	DO substitute mode	0: Set to low	0	Set all digital outputs to low level in the event of error
		1: Use substitute values		Set digital outputs to a pre-defined substitute value in the event of error. If this setting is used, the value of the “DO substitute value” parameter determines the substitute value.
		2: Hold last state		Hold digital outputs at their last value in the event of error
92	DO substitute values	0 ... 65535	0	Substitute value for the digital outputs if the “Use substitute values” setting is used. The input depends on the “DIO process data layout” parameter. Use a binary-to-decimal converter to calculate this value.
93	Disable force mode	0: Enable force mode	0	The “Forcing” operating mode may be used.
		1: Disable force mode		The “Forcing” operating mode must not be used.
94	Disable bluetooth	0: Enable bluetooth	0	The Bluetooth® interface can be enabled by an optical signal of a mobile device and in connection with the WAGO I/O Field app.
		1: Disable bluetooth		The Bluetooth® interface cannot be enabled by an optical signal of a mobile device and in connection with the WAGO I/O Field app.
95	Bluetooth timeout	6 ... 59 [s]	30	Switch-off time of the Bluetooth interface if not used. A new Bluetooth connection can be established by an optical signal after the Bluetooth interface is enabled again. The unit for the switch-off time is seconds. Entering 0 is not allowed, since the Bluetooth interface must always switch off after the switch-off time elapses.
96	Reserved	0	0	–

Parameters 100 to 147

Parameters 100 to 103, 132 and 140 configure IO-Link port X01.
Parameters 104 to 107, 133 and 141 configure IO-Link port X02.
...
Parameters 128 to 131, 139 and 147 configure IO-Link port X08.

Table 48: Port Parameters

No.	Parametername	Value Range	Default	Description
100, 104, ...	DI Port X01/X02/... – CQ pin polarity	0: Normally open	0	Pin 4 is a digital input. The input signal is not inverted.
		1: Normally closed		Pin 4 is a digital input. The input signal is inverted.
101, 105, ...	DI port X01/X02/... – CQ pin signal filter	0: Deactivated	0	No filter active for detecting a signal change of the pin 4 digital input signal.
		3: 3 ms filter time		Filter time setting for detecting a signal change of the pin 4 digital input signal. The filter time is the amount of time the signal must be present in order for a signal change to be detected.
		15: 15 ms filter time		
		20: 20 ms filter time		
102, 106, ...	DI port X01/X02/... – IQ pin polarity	0: Normally open	0	Pin 2 is a digital input. The input signal is not inverted.
		1: Normally closed		Pin 2 is a digital input. The input signal is inverted.
103, 107, ...	DI port X01/X02/... – IQ pin signal filter	0: deactivated	0	No filter active for detecting a signal change of the pin 2 digital input signal.
		3: 3 ms filter time		Filter time setting for detecting a signal change of the pin 2 digital input signal. The filter time is the amount of time the signal must be present in order for a signal change to be detected.
		15: 15 ms filter time		
		20: 20 ms filter time		
132, 133, ...	DO port X01/X02/... – IQ pin mode	0: Normal	0	Pin 2 is a digital output.
		1: static on		Pin 2 is a digital output and switched on (+24 VDC).
140, 141, ...	DO port X01/X02/... – CQ pin mode	0: Normal	0	Pin 4 is a digital output.
		1: static on		Pin 4 is a digital output and switched on (+24 VDC).

Table 49: Calculation of Port Cycle Time

Value Range	Time Basis (Bits 6 and 7)	Factor (Bits 0 to 5)	Port Cycle Time (Formula)	Example
4 ... 63	0.1 ms (00)	4 ... 63	0.1 ms × factor	4: 400 µs 16: 1.6 ms 32: 3.2 ms 48: 4.8 ms
64 ... 127	0.4 ms (01)	0 ... 63	6.4 ms + 0.4 ms × factor	68: 8.0 ms 93: 18.0 ms 100: 20.8 ms
128 ... 191	1.6 ms (10)	0 ... 63	32 ms + 1.6 ms × factor	133: 40.0 ms 158: 80.0 ms 183: 120.0 ms
192 ... 255	Reserved (11)	0 ... 63	This value range is reserved	–

Transport and Storage

The original packaging offers optimal protection during transport and storage.

- Store the product in suitable packaging, preferably the original packaging.
- Only transport the product in suitable containers/packaging.
- Make sure the product contacts are not contaminated or damaged during packing or unpacking.
- Observe the specified ambient climatic conditions for transport and storage (Technical data [▶ 19]).

Installation and Removal

8.1 Installation

8.1.1 Tools Required for Installation

The following tools are required for installation:
- Allen wrench for the M4 hex head mounting screws

The following additional items are only required for installation where no threaded hole is present:
- M4 thread cutter (bottoming tap or hand tap set)
- Drill (for pre-drilling mounting holes for the module and installing the system)

You also need two M4 cylinder head hex screws per DIN 912 / ISO 4762 of adequate length.

8.1.2 Before Installation

Always note the following information:
- The product must only be installed and put into operation by qualified electrical specialists per EN 50110-1/-2 and IEC 60364.
- Observe the safety information in section Safety [▶ 12].
- Before installation, check the product for damage, such as transport damage. Damaged products must not be put into operation.

8.1.3 Installation Instructions

Note the following for selection of the installation location:
- Install the product in such a way that it is protected against weather exposure (no direct sunlight; no salt water or spray).
- Note that the module should not be installed in the immediate vicinity of objects or devices that can get hot. For a high level of module utilization, the temperature-dependent operating range can be extended by installing metal surfaces or profiles or the like, or by installation in a ventilated outdoor environment. The modules' internal temperature measurement can be used for optimization.
- Screw the product down only on flat contact surfaces to protect it from mechanical warping.
- To protect the product from tensile forces that may arise, do not bridge spaces with it.
- To avoid damaging the product, do not mount it in shearing zones of moving devices. Furthermore, lay the cables in such a way that they cannot get into the shearing zone of movable equipment parts.
- Leave sufficient space for easy product replacement and for hooking up the pluggable connections.
- Ensure that the requirements on the product concerning exposure to vibration and shock are met at the installation location.
- Install the product in such a way that the product's diagnostic LEDs remain visible.

Note the following concerning the installation procedure:
- Disconnect the power supply from the system before beginning mounting
- Ensure sufficient potential equalization in your system

- When mounting, be sure not to contaminate the connections. The contamination damages the contacts, which can limit the reliability of the contacts.

8.1.4 Note on Protecting against Heat Generation by the Product

During operation, the product can get hot! Therefore, always note the following information:

- Cooling of the product must not be impaired
- Ensure that the air supply is unobstructed
- Do not install the product near sources of strong heat
- Do not install the product on or in the vicinity of easily flammable materials

8.1.5 Installation Distances

No particular distances need to be maintained between the field I/O modules, or between a module and a cabinet door or cover. The installation distances are determined exclusively by the plugs and cables used and their bending radii. Depending on the housing, a field-assembly pluggable connector may protrude past the edge of the housing.

Where high surrounding air temperatures occur at the same time as high current loads, field I/O modules should not be installed directly next to each other, to prevent them from each other and to give them a large surface to dissipate heat to the surrounding air.

8.1.6 Installation

You can install the product directly on your equipment with screws. Mount the product on a flat, fixed surface with two screws, each of which screws into a threaded hole. You can find the tightening torque specifications in Mechanical Data [▶ 19].

The procedure for this is as follows:

1. Hold the product up to the desired position and mark the two locations where the threads should be cut. Ensure that there is sufficient space around the product to enable you to connect all cables without difficulty.
2. With the M4 thread cutter, cut one M4 thread at each of the marked locations. If applicable, pre-drill with the drill.
3. Use the Allen key to screw the product into the threaded holes with two M4 cylinder head screws of adequate length on the top and bottom. Observe the tightening torque.

8.1.7 After Installation

Note the information on grounding.

8.1.8 Grounding

Functional Ground

The L-coded M12 pluggable connectors of the product's power supply have one FE (functional ground) pin, which is connected to the metal housing of the product. The metal housing in turn has a central grounding point for functional ground. You can ground the module as follows:

- Grounding via the metal housing, and/or
- Grounding via functional ground of the power supply connection, and/or

- Grounding can be done separately via a cable lug and the mounting hole if the module is installed on a non-conductive subsurface

Ensure proper contacts and a sufficient cable cross-section.

8.2 Removal

8.2.1 Tools Required for Removal

For removal, you need an Allen key to unscrew the M4 cylinder head hex screws per DIN 912/ISO 4762.

8.2.2 Before Removal

⚠ CAUTION

Device gets hot

During operation, high surface temperatures can arise on the metal housing and metal connection sockets. If the product has been in operation, allow it to cool before touching it, or use gloves.

Prepare for removal as follows:

1. If the product is contaminated, clean it before removal. It is especially important to clean contaminated screw-clamp connections.
2. Before removal, loosen all screw connections on the connectors and disconnect the cables.
3. Ensure that the equipment part on which you mounted the product is de-energized.
4. Unscrew the two M4 cylinder head screws and remove the product.

8.2.3 Removal

To remove the product, e.g., when replacing a device, proceed as follows:

1. Ensure that the equipment part on which you mounted the module is de-energized.
2. Unscrew the two M4 cylinder head screws with the Allen key.
3. Remove the product.

8.2.4 After Removal

If the product that has been removed is defective, mark it as defective to prevent reuse of the product.

Connection

9.1 General Information on Installation

When laying cables, the local conditions and the applicable regulations are crucial for implementation.

Be sure to maintain the minimum clearances between the cabling and possible sources of interference (including machines, welding equipment and power lines) to prevent loss and corruption of data. For planning and installation of a system, observe the regulations and standards.

Mechanical Stress

Protect the cables against mechanical stress. Observe the following information:

- Select the correct type of cable for the application Ensure a sufficient wire cross-section
- Take the minimum bending radius into account
- Ensure that cables cannot get in the shearing zone of movable machine parts
- Do not lay the cables across transport paths and the paths of machine movements
- Use cable ducts or cable bridges

Interference

Follow the following instructions to reduce interference:

- Lay network cables (e.g., fieldbus cables) in their own cable ducts
- Do not lay network cables parallel to power supply cables through which high power flows
- When installing shielded pluggable connectors (screws, cap nuts), ensure the best possible contact between the shielding and ground. Before initial commissioning, check the grounding or shielding connection of the cables for low-resistance conductivity.

Grounding Concept

There are basically two grounding options, which can also be used simultaneously:

- Via cable
- Via the housing

The I/O System Field operates in the extra-low voltage range (SELV/PELV). In these devices, interference is discharged via functional ground (FE). Functional ground (FE) is merely for discharging interference. It does not provide touch-proof protection for persons. Functional grounding is essential for fault-free operation of the device.

If you wish to perform additional grounding via the metal housing:

- Use conductive mounting screws on the mounting holes and ensure there is a good contact there
- Ensure that the mounting surface is level

9.2 Connect Power Supply

Two voltages are distinguished for the I/O System Field:

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

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

NOTICE

Damage to electronics

Connect each of the supply voltages (each to +24 V and 0 V) completely. Connecting multiple supply voltages through one 0 V connection is not permitted, since this would exceed the current load capacity of the contacts.

Power Supplies 1L and 2L

The voltages 1L and 2L are electrically isolated and are fed in on connection X31.

The 1L power supply is required to power the module electronics and the connected sensors/actuators. Connect it to connection X31. If you want to power additional products through this current path, connect the cable for the additional power supply to connection X32.

The following procedure is especially advantageous:
- Install the power supply for the module electronics independently of the power supply for the actuators
- Provide independent fuse protection for the power supplies

This allows the network to continue to run even when peripheral parts are switched off.

NOTICE

Damage to electronics

The current load capacity of the L-coded M12 pluggable connector is 16 A per current path (1L or 2L). This value must not be exceeded. To limit the sum of current paths 1L and 2L even in the event of short circuit, it may be necessary to provide fuse protection for them. For the calculation of the maximum permissible current feedthrough, see section **Power Supply Examples [▶ 61]**.
Note that the connection for the additional supply voltage is not monitored for overload. If the maximum current carrying capacity is exceeded, this can damage the pluggable connectors.

WAGO recommends using pre-assembled cables.

The following figure gives an example of feeding in and passing on the supply voltages:

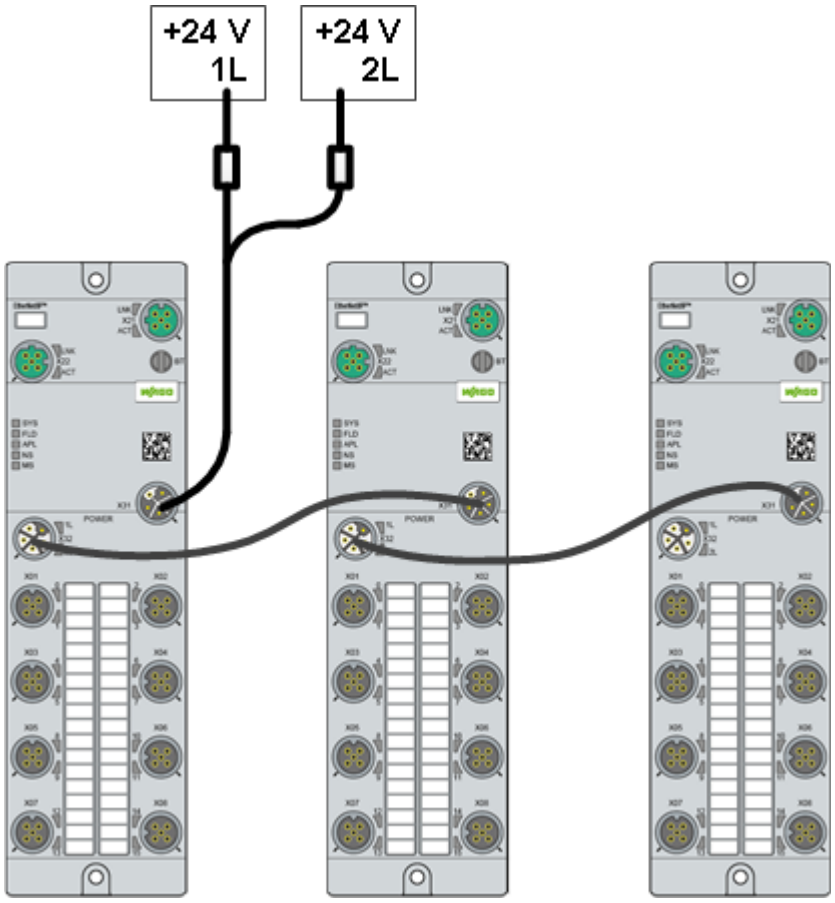


Figure 7: Example of Feeding in and Passing on the Supply Voltages

In connection with this figure, note that the cables illustrated for current paths 1L and 2L are realized not as separate cables, but rather as separate wires within one common cable.

Supply Cable and Power Supply (M12)

Take the current load capacities into account. In this regard, see section **Design Power Supply [▶ 56]**.

NOTICE

Damage to electronics

For passthrough of the supply voltage, the following should be noted:
The maximum total current permitted on 1L is 16 A.
The maximum total current permitted on 2L is 16 A.
The temperature also affects the permissible total current. To take the effects of higher temperatures into account, note the information on temperature-dependent derating in section **Derating [▶ 25]**.

Example Calculations

You can find examples for calculating the maximum permissible current feedthrough under **Power Supply Examples [▶ 61]**.

To determine whether long cable lengths still supply the product with sufficient voltage, the voltage losses on the cable can be calculated as follows:

$U = 2 \times I \times R$

where:

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

For WAGO 4 × 1.5 mm² supply cables, the cable resistance R_L per wire $R_L \leq 13.7\ \Omega/km$.

Example of Voltage Drop for Feed and Return Lines with a Current of 8 A on the WAGO 4 × 1.5 mm² Supply Cable

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

This corresponds to a voltage drop of 2.19 V per 10 m of cable length for feed and return lines.

Example of Voltage Drop per Wire with a Current of 16 A on a 4 × 2.5 mm² Supply Cable

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

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

If the resistance of the cable used is not known, it can be calculated approximately with the following formula:

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

where:

R_L	Cable resistance
l	Cable length
K	Cable resistance according to manufacturer's specifications
A	Cable cross-section

9.3 Connecting Cables

WAGO recommends using 765 Series connecting cables, pluggable connectors and accessories for 756 Series products, which have been tailored specifically to the WAGO I/O System Field.

The tightening torques given in section **Connection Technology [▶ 20]** apply to the pluggable connectors of the connecting cables.

9.4 Connecting the Fieldbus

To establish a connection to an EtherNet/IP scanner, it is necessary to connect the module to an ETHERNET network.

To establish a connection to an IO controller, connect the product to a network with a transmission rate of 100 Mbit/s in full duplex operation.

You can find the connection assignment for the ETHERNET ports under **ETHERNET Interfaces [▶ 18]**.

If you do not use a pre-assembled ETHERNET cable, a shielded M12 plug with protection type IP 67 should be connected to it.

For a cable that is pre-assembled on one end only (e.g., item no. 756-1201/0060-xxxx), proceed as follows to connect it to an RJ45 plug (e.g., item no. 750-0975):

Contact	Connection	Color	Contact of the RJ45 plug
1	TX+	Yellow	1
2	RX+	White	2
3	TX–	Orange	3
4	RX–	Blue	6

Figure 8: RJ45 Pin Assignment

Because the Auto MDI(X) functionality is enabled for the respective ETHERNET connection, a crossover cable is not necessary. This functionality automatically detects the direction for sending data and receiving data, so it is irrelevant which cable type is used (crossed or uncrossed).

Connecting an Individual Product to an ETHERNET Network

To connect the product to the ETHERNET network, proceed as follows:

1. Disconnect the power supply from the equipment parts on which you have mounted the module.
2. Connect the product to the ETHERNET network by plugging the socket of the ETHERNET cable onto the X21 connection.
3. Tighten the pluggable connector using the knurled-head screw.

Connecting Multiple Products to One ETHERNET Network

The fieldbus module of the WAGO I/O System Field has two connections with an integrated switch to allow wiring of a line topology.

The network topology in the following figure consists of a mixed star and line topology. An ETHERNET switch is required in order to set up a star topology or a mixed topology. The number of products in a star topology is limited only by the IEEE 802.3 Ethernet specification.

Multiple products can be connected to the ETHERNET network as shown in the following example:

1. De-energize the section of your system to which you wish to mount the product.
2. For the star topology, connect each ETHERNET cable (W1, W2) to port X21 of one 765 Series product and one ETHERNET switch as shown in the following figure. Then tighten the plugs of the ETHERNET cable.

3. For a line topology, connect the ETHERNET cables (W3, W4) to ports X21 and X22 on the product as shown in the following figure. Then tighten the plugs of the ETHERNET cable.

The following figure shows a mixed star and line topology:

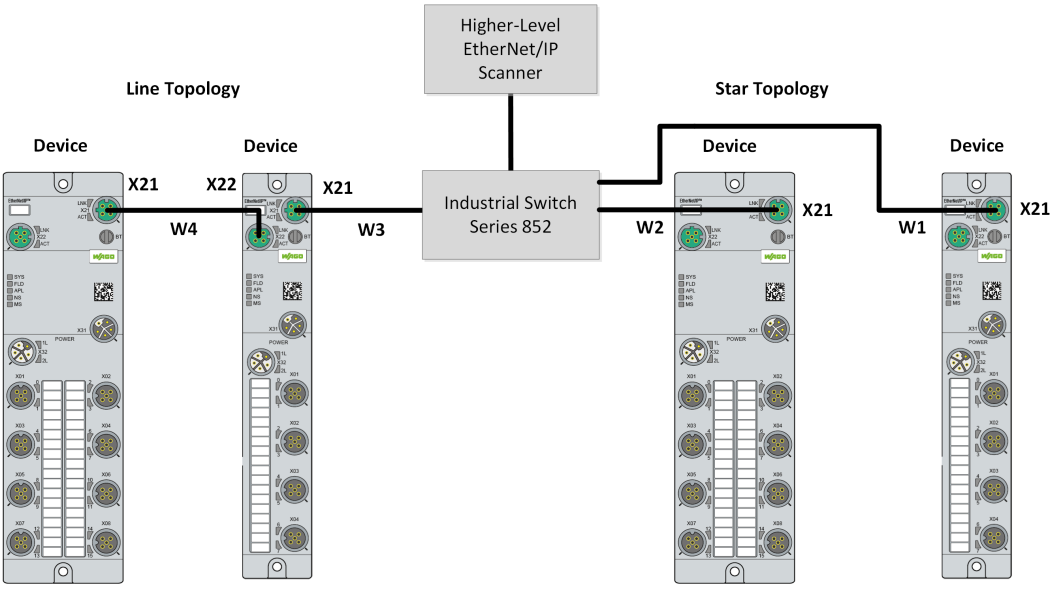


Figure 9: Network Topology (Module Appearance May Differ)

9.5 Connect Sensors/Actuators

The sensor/actuator cable provides power to the connected sensors/actuators and transfers the sensor and actuator signals.

Note the current load capacity of the supply contacts; see “Rule 3” in **Design Power Supply [56]**, section *Rule 3: Ports X01, X02 etc*.

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

If a port is operated in IO-Link mode, then at most 1 A can flow through pin 1 and pin 3 without additional measures. The use of standard cables allows lengths up to 20 m as long as the current remains under 1 A.

Higher currents are possible and require a larger cable cross-section or shorter cable length to keep the voltage drop for the outgoing and return paths below 1.2 V.

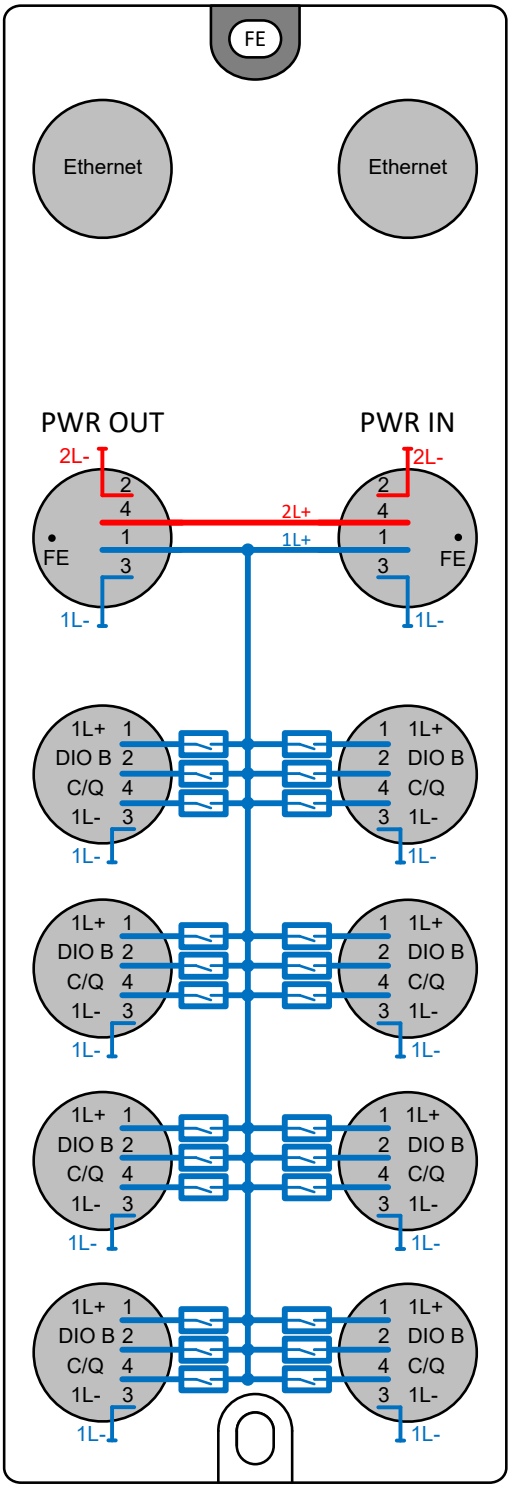
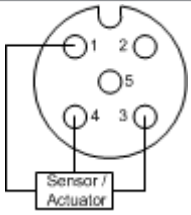
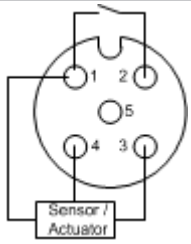
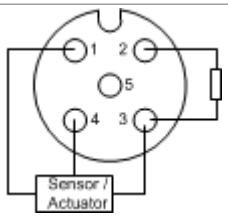
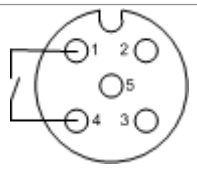
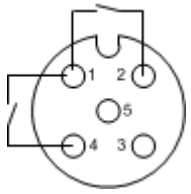
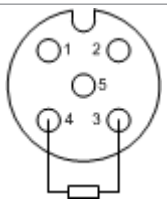
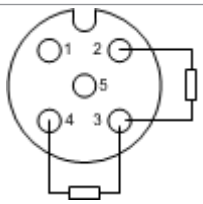
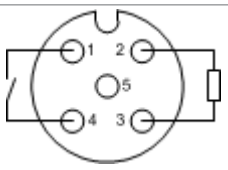
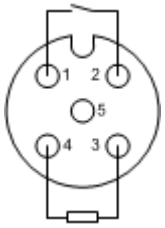


Figure 10: Schematic Circuit Diagram of the Power Supply

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

Table 50: Connecting an IO-Link Device or Digital Input or Output

Connection Option	Description
	Connection of an IO-Link device Required port configuration: IO-Link master and pin 2 disabled.
	Connection of an IO-Link device and a digital input on 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 on channel B. Required port configuration: IO-Link master and pin 2 as a digital output.
	Connection of a digital input at channel A. Required port configuration: pin 4 as digital input and pin 2 disabled.
	Connection of two digital inputs on channels A and B. Required port configuration: pin 4 and pin 2 as digital inputs.
	Connection of a digital output on channel A. Required port configuration: pin 4 as a digital output and pin 2 disabled.
	Connection of two digital outputs on channels A and B. Required port configuration: pin 4 and pin 2 as digital outputs.
	Connection of a digital input on channel A and a digital output on channel B. Required port configuration: pin 4 as a digital input and pin 2 as a digital output.

Connection Option	Description
	Connection of a digital output on channel A and a digital input on channel B. Required port configuration: pin 4 as a digital output and pin 2 as a digital input.

Commissioning

10.1 Getting the IP Address from a DHCP Server

The module requires an IP address so it can be addressed via the ETHERNET network. It has no IP address when delivered. As soon as the module starts up, it sends queries to a DHCP server to get an IP address.

If there is already a DHCP server on the network, ask your network administrator for the IP address assigned to the module and use its MAC address for identification.

Using a DHCP Server on Your Computer

If no DHCP server exists on the network, or you want to use a DHCP server on the local network for test purposes, you can use Open DHCP Server, for example.

Please note:

- If a DHCP server is installed on your computer, you should never connect it to a larger network. Since global networks usually have a DHCP server, collisions could occur and crash the network.
- Only use a DHCP server on your computer if there is no DHCP server on the network.

Installing and Using Open DHCP Server

You can install Open DHCP Server on your computer. To configure the DHCP server, you need the IP address of your computer's network connection. On Windows, you can use the `ipconfig` command to show your computer's IP address(es).

Proceed as follows:

1. Launch the "ETHERNET Device Configuration" software.
2. Download Open DHCP Server from **http://dhcpserver.sourceforge.net/**
3. Install Open DHCP Server.
4. In the Open DHCP Server installation directory, open the `OpenDHCPServer.ini` file in a text editor.
5. Under [`LISTEN_ON`], enter the IP address of your computer's network card on which the DHCP server should work.
6. Save the `OpenDHCPServer.ini` file.
7. Under [`RANGE_SET`], enter the IP address range the DHCP server is allowed to assign.
8. Then run the `RunStandAlone.bat` file.

   ⇨ The DHCP server is now ready.

⇨ In the output window, Open DHCP Server shows the query and the assigned IP address.

10.2 Configuration

10.2.1 Configuring the Module via EtherNet/IP

For the EtherNet/IP scanner and EtherNet/IP adapter to exchange process data, you need to configure the EtherNet/IP scanner. This requires the device description file (EDS file) for the module used:

- wago_07654501.eds

Carry out the following steps in the configuration software of the EtherNet/IP scanner used:

- Import the EDS file.
- Select the module from the device catalog.
- Add the module to the configuration project.
- Select a connection: connection 1, connection 2 etc.
- Set the parameters.

The individual steps are describe in detail below.

10.2.1.1 Selecting the Module

Select the module used from the device catalog.

Module: 0765-4501/0100-0000

Designation:8 PORT IOL-A FLD EI 24 VDC 2.0 A

10.2.1.2 Selecting a Connection

The module offers multiple connections. Select a connection for your application. By selecting the connection, you determine the following:

- Connection type: “Exclusive owner,” “Input only” or “Listen only”
- Whether or not the scanner transfers the port parameters to the product
- Maximum amount of IO-Link process data of all connected IO-Link devices: 4, 16 or 32 bytes

Connection Type

The module offers multiple connection types:

- Input only: The scanner can only read input process data. This is the default connection type.
- Listen only: The scanner can only read input process data. This connection type requires another scanner that establishes an “Input only” connection to the product.

Scanner Sends IO-Link Parameters to the Module (Only for Modules with IO-Link Master Ports)

With “Exclusive Owner without Config” and “Listen Only” connections, the scanner does not transfer any port parameters. For these connection types, the port parameters are set with a different tool. You can find an overview of the tools you can use to set the port parameters under Parameterization Tools.

With “Exclusive Owner” and “Input Only” connections, the scanner transfers the port parameters to the module that you set up previously with the scanner’s configuration software. The scanner sends these parameters to the module every time a connection is established.

Maximum Amount of IO-Link Process Data

By selecting the connection, you determine the maximum number of bytes of the IO-Link process data, which applies to all connected IO-Link devices: 4, 16 or 32 bytes By selecting the connection, you also specify the process data memory required in the controller.

If you use one or more IO-Link device with more than 16 bytes of IO-Link process data, select a connection with “... 32 bytes per IO-Link port.” This connection requires 276 input data bytes and 276 output data bytes in the controller.

If you use only IO-Link devices wit 16 bytes of IO-Link process data or less, and you would like to use less process data memory in the controller, select a connection with “... 16 bytes per IO-Link port.” This connection requires 148 input data bytes and 148 output data bytes in the controller.

If you use only IO-Link devices wit 4 bytes of IO-Link process data or less, and you would like to use as little process data memory in the controller as possible, select a connection with “... 4 bytes per IO-Link port.” This connection requires 52 input data bytes and 52 output data bytes in the controller.

List of Connections

Table 51: Connections

Connection	Name	Description
Connection 1	Exclusive Owner – 32 bytes per IO-Link port	• Standard connection • The port parameters are set with the configuration software of the scanner and transferred to the module through this connection. • The scanner can read the module’s input data and write the output data. • IO-Link devices with up to 32 IO-Link input and output data points each can be used.
Connection 2	Exclusive Owner – 32 bytes per IO-Link port without config	• No port parameters are transferred to the module through this connection. • The scanner can read the module’s input data and write the output data. • IO-Link devices with up to 32 IO-Link input and output data points each can be used.
Connection 3	Listen only – 32 bytes per IO-Link port	• No port parameters are transferred to the module through this connection. • The scanner can read the module’s input data. • An additional scanner that communicates with module via an “Exclusive Owner” connection is necessary. • IO-Link devices with up to 32 IO-Link input and output data points each can be used.
Connection 4	Input Only – 32 bytes per IO-Link port	• The port parameters are set with the configuration software of the scanner and transferred to the module through this connection. • The scanner can read the module’s input data. • IO-Link devices with up to 32 IO-Link input and output data points each can be used.
Connection 5	Exclusive Owner – 16 bytes per IO-Link port	• Standard connection • The port parameters are set with the configuration software of the scanner and transferred to the module through this connection. • The scanner can read the module’s input data and write the output data. • IO-Link devices with up to 16 IO-Link input and output data points each can be used.

Connection	Name	Description
Connection 6	Exclusive Owner – 16 bytes per IO-Link port without config	• No port parameters are transferred to the module through this connection. • The scanner can read the module's input data and write the output data. • IO-Link devices with up to 16 IO-Link input and output data points each can be used.
Connection 7	Listen Only – 16 bytes per IO-Link port	• No port parameters are transferred to the module through this connection. • The scanner can read the module's input data. • An additional scanner that communicates with module via an "Exclusive Owner" connection is necessary. • IO-Link devices with up to 16 IO-Link input and output data points each can be used.
Connection 8	Input Only – 16 bytes per IO-Link port	• The port parameters are set with the configuration software of the scanner and transferred to the module through this connection. • The scanner can read the module's input data. • IO-Link devices with up to 16 IO-Link input and output data points each can be used.
Connection 9	Exclusive Owner – 4 bytes per IO-Link port	Like connection 5, but IO-Link devices with at most 4 IO-Link input and output data points.
Connection 10	Exclusive Owner – 4 bytes per IO-Link port without config	Like connection 6, but IO-Link devices with at most 4 IO-Link input and output data points.
Connection 11	Listen Only – 4 bytes per IO-Link port	Like connection 7, but IO-Link devices with at most 4 IO-Link input and output data points.
Connection 12	Input Only – 4 bytes per IO-Link port	Like connection 8, but IO-Link devices with at most 4 IO-Link input and output data points.

10.2.1.3 Setting Parameters

Set the module and port parameters in the configuration software of the EtherNet/IP scanner to define the behavior of the module and the required port functions for use of the connected sensors and actuators.

You can find all the module parameters under **Module Parameters [▶ 63]**.

10.3 Parameterization

The following tools are described below:

- WAGO Webserver I/O Field
- **WAGO IO-Link Configurator [▶ 111]**
- WAGO I/O Field app
- OPC UA Server

10.3.1 WAGO Webserver I/O Field

10.3.1.1 Call WAGO Webserver I/O Field

This section describes how you can use the integrated software "WAGO Webserver I/O Field" to get access to detailed information on the current operating state of the product and make settings to affect the product's behavior.

✓ Requirement: Opening the user interface of WAGO Webserver I/O Field requires that product's IP address is configured and known.

- Proceed as follows:
  Enter the following text in the address bar of your Web browser to address the product:
  `http://<IP-address-according-to-configuration>`
  e.g., `http://192.168.10.2`.

⇨ The **Dashboard** of WAGO Webserver I/O Field appears. You can now use the functions described below.

10.3.1.2 WAGO Webserver I/O Field User Interface

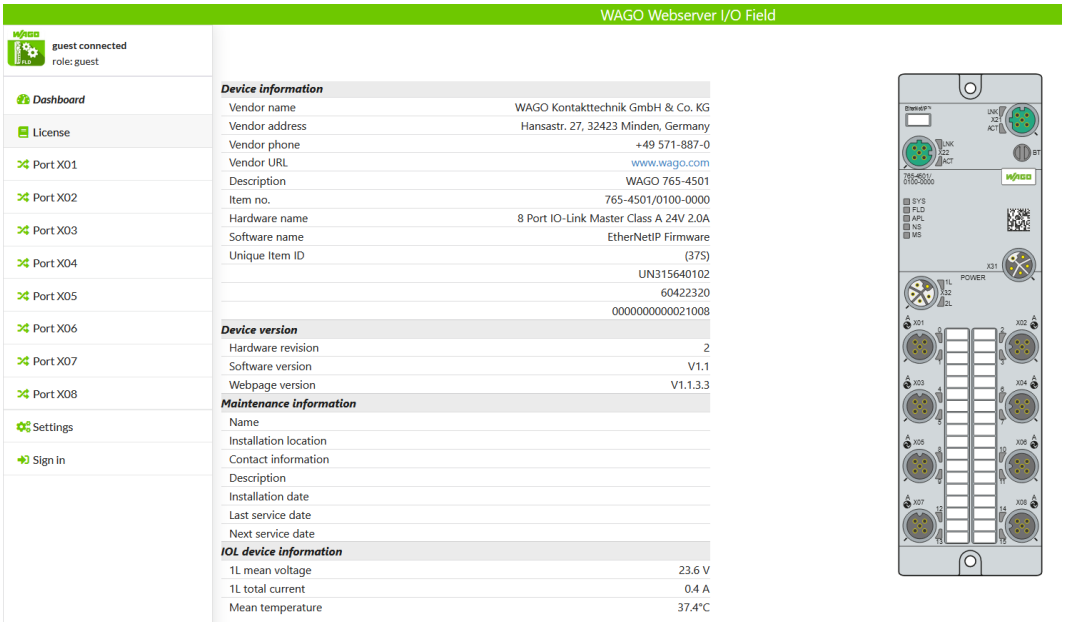


*Figure 11: **Dashboard** Menu Item, Main Page*

When the user interface of WAGO Webserver I/O Field opens, the main page of the **Dashboard** appears first.
It shows the following product information:

Table 52: Data on the "Dashboard" Page

Section	Information Displayed
Device information	Product data and WAGO contact information
Device version	Information on the product version: Hardware name and version number Software name and version number Website version number
Maintenance information	Maintenance information in text form
IOL device information	Advanced module and port information (measurement data on the module state)

10.3.1.2.1 Maintenance Information

The maintenance information includes information in text form that the user can set, e.g., the product name, installation location and date, contact information, description and date of the last and next product service. The texts can be edited by selecting **Settings** from the menu on the **Maintenance information** tab.

10.3.1.2.2 Advanced Module and Port Information

The advanced module and port information includes the following measurement data that is measured by the integrated sensors in the module:

- The module temperature
- The supply voltage (for supply cables 1L and 2L)
- The sum of all currents (for supply cables 1L and 2L)

10.3.1.2.3 Displaying Licenses

The **Licenses** menu item displays the page of the same name.

The menu item contains the following information:

- A list of the licensed software components the product contains
- A link for each licensed software component to the associated license terms

10.3.1.3 Opening the Product Information via WAGO Webserver I/O Field

10.3.1.3.1 Displaying Port Information

For each of the module's IO-Link ports (port X01, port X02 etc.), individual port information can be found on the **Information**, **Status**, **Configuration, IOL** and **Process data** tabs.

The **Configuration** tab also offers the option of making port settings.

You can access the port information as follows:

1. From the main menu of the Webserver (left), select the menu item which you want to view information about.

   ⇨ The **Information** tab opens.

2. Click the desired tab.

⇨ You can now access information about the desired port.

For each port, you can select from the following five tabs:

Table 53: Tabs for Port Information and Settings (IO-Link Ports X01, X02 etc.)

Tab	Description
Information	Displays the current measured values for temperature, voltage and current, as well as the port state, individually for each of pin 1, pin 2 and pin 4. If an IO-Link device is connected to the port via pin 4, its product data is also shown. This tab is pre-configured.
Status	Displays status information for the entire port
Configuration	For displaying and setting port parameters, such as the operating time or cycle time of the port
IOL	Read/write access to data of one of the IO-Link devices connected to the port
Process data	Displays the process data

10.3.1.3.2 Displaying Measured Values and Information on Connected IO-Link Devices

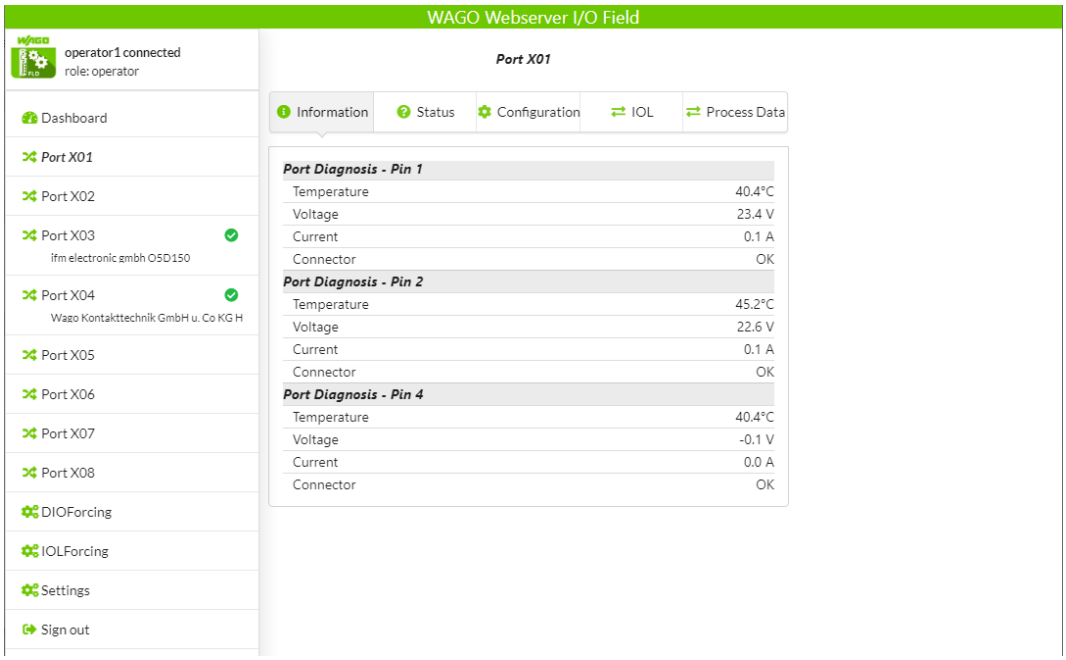


*Figure 12: **Information** Tab, **Port XX** Menu Item*

The **Information** tab shows the following information:
- The measured values and states of the port diagnostics
- The information on connected IO-Link devices

Displaying Pin- and Port-Specific Measured Values and States

The **Information** tab shows the following current measured values for each of pin 1, pin 2 and pin 4 of the selected port:
- Temperature of the pin, measured in °C
- Voltage on the pin, measured in volts
- Current flowing through the pin, measured in amperes
- State of the connection pin

States of the Connection Pin

The possible states of the connection pin are:
- OK
- Short circuit
- Module-internal overload protection has triggered
- Module-internal overtemperature protection has triggered
- Module-internal overvoltage protection has triggered
- Overcurrent
- Undercurrent
- Overtemperature
- Undertemperature
- Overvoltage
- Undervoltage
- Module-internal watchdog timer has elapsed

Displaying Information on Connected IO-Link Devices

On IO-Link ports on which an IO-Link device is connected and recognized by the product's firmware, the following product information is also displayed in the **Device information** block:

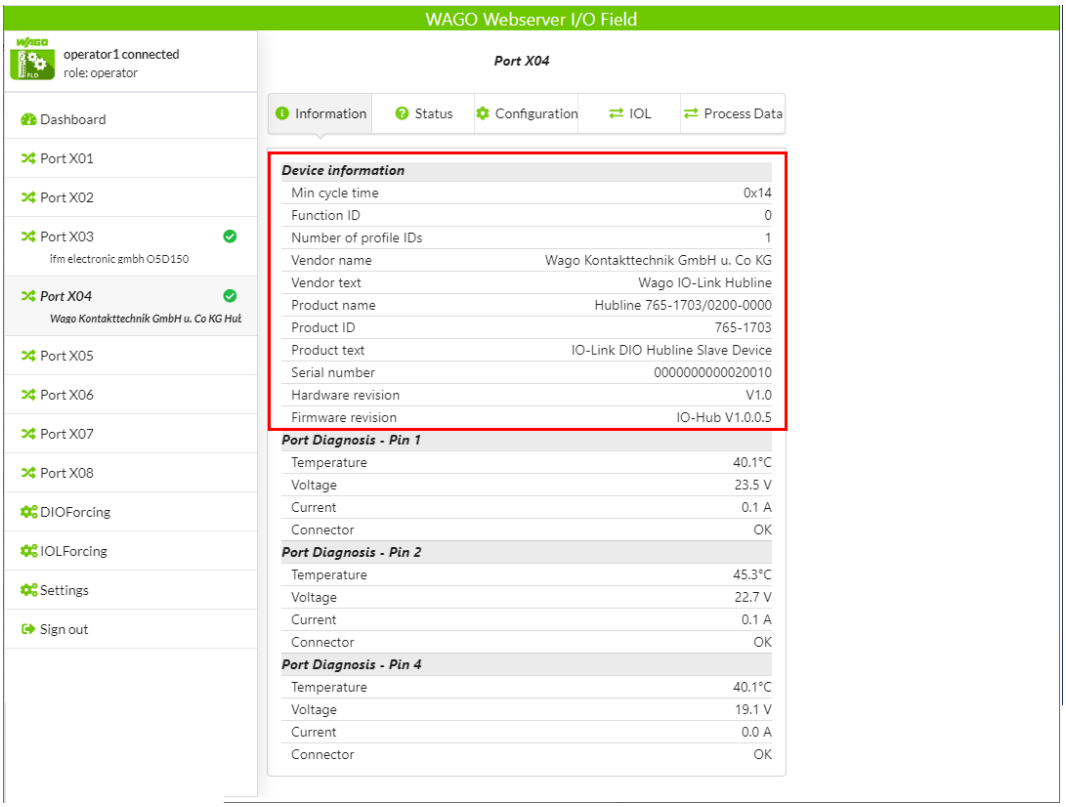


*Figure 13: **Information** Tab, **Port XX** Menu Item*

Table 54: Additional Information on the Products Connected to the Selected Port

Information	Description
Min cycle time	Minimum cycle time supported by the connected product, in units of 0.1 milliseconds
Function ID	Function ID of the connected product
Number of profile IDs	Number of profile IDs in the profile characteristic (index 0x000D) of the connected product
Vendor name	Detailed name of the manufacturer/vendor of the connected device (up to 64 characters)
Vendor text	Additional text for description of the manufacturer/vendor (up to 64 characters)
Product name	Complete name of the connected product (up to 64 characters)
Product ID	Manufacturer-specific product or type information on the connected product (up to 64 characters)
Product text	Additional text for description of the connected product (up to 64 characters)
Serial number	Individual manufacturer-specific unique serial number of the connected product (up to 16 characters)
Hardware revision	Manufacturer-specific information on the hardware version (up to 64 characters)
Firmware revision	Manufacturer-specific information on the firmware version (up to 64 characters)

10.3.1.3.3 Displaying Port Status Information

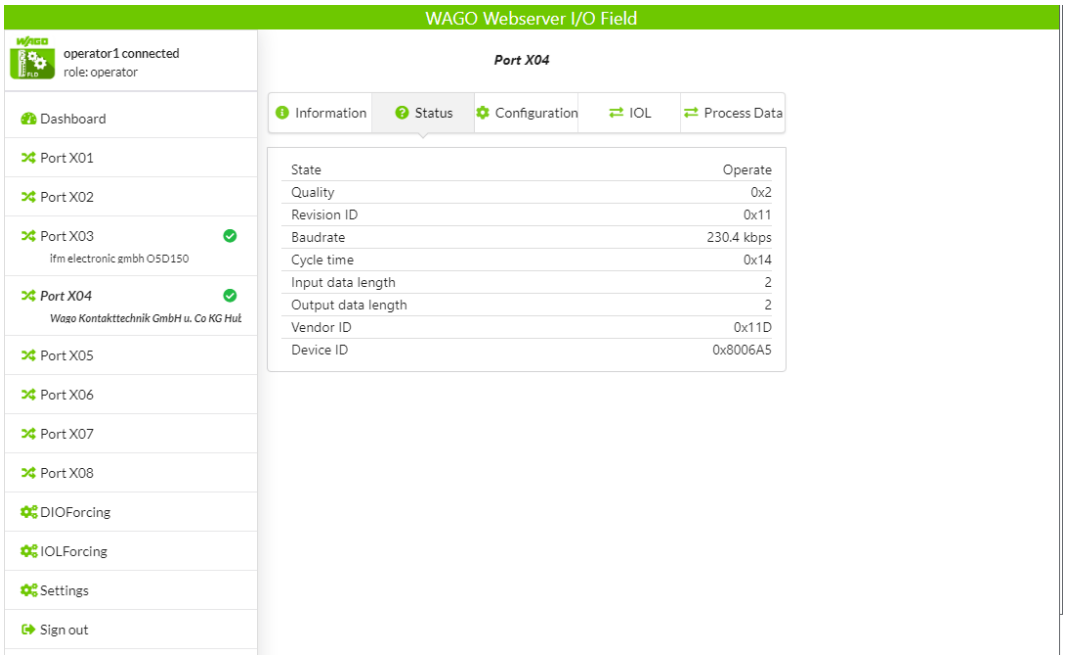


*Figure 14: **Port XX** Menu Item, **Status** Tab*

The **Status** tab shows status information for pins 2 and 4 of the selected port.

This tab answers the following questions about the selected port:

- What is the current port status of the port?
- Is the process data valid for input/output?
- Is a product connected to the selected port? If so, what is this product's version ID?
- How high is the data transmission rate between the port and a product connected there?
- How long is the communication cycle time in the **Operate** operating mode?
- What is the true input/output data length of the connected product in bytes?
- What is the manufacturer ID or product ID of the product connected to the IO-Link port?

Proceed as follows to display the status information on a specific port:

1. From the main menu of the Webserver (left), select the menu item which you want to view information about.
2. Open the **Status** tab.

⇨ The **Status** tab opens. The current port status information appears.

10.3.1.3.4 State

This shows the current port status information of the IO-Link port. The following table contains all possible values for the status of the IO-Link port:

Table 55: Possible Values of "State" (Port Status Information)

Value	Port Status	Description
0	No Device	No product is connected to the port, or there is no communication with the connected product
1	Disabled	The port is inactive

Value	Port Status	Description
2	Incorrect Device	The version or compatibility check failed
3	Preoperate	The product is ready for communication
4	Operate	The product is communicating
5	DI CQ	The port is in digital input mode
6	DO CQ	The port is in digital output mode
7	Reserved	Reserved
8	Reserved	Reserved
9	Incorrect Cycle Time	The cycle time according to the configuration does not correspond to the connected product
254	Port Power Off	The port voltage is switched off
255	Not Available	The port is not available

10.3.1.3.5 Quality

This shows the **Port Quality Info**, including information on the validity of the process data for input and output (separately). The content is binary coded.

Table 56: Meaning of the Individual Bits

Bits of Port Quality Info	Description
Bit 0	0 = input process data valid 1 = input process data invalid
Bit 1	0 = output process data valid 1 = output process data invalid
Bit 2 to bit 7	Reserved

10.3.1.3.6 Revision ID

This shows the version ID of the connected device.

A value of 0 means: no device connected.
All other values must be interpreted as the version ID of the connected device.

10.3.1.3.7 Baud Rate

If an IO-Link device is connected to the port, its data transmission rate appears here. For IO-Link, the transmission rate of the communication between the port and a connected device can 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` appears here.

10.3.1.3.8 Cycle Time

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

- Bits 0 ... 5 specify a whole-number multiplier between 0 and 63.
- Bits 6 ... 7 specify the calculation formula to use according to the following table:

Table 57: Cycle Time of the Master – Bits 6 ... 7

Bits 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

10.3.1.3.9 Input Data Length

This shows the actual input data length of the connected product in bytes.

10.3.1.3.10 Vendor ID

This value is the manufacturer ID of the connected product.

10.3.1.3.11 Device ID

This value is the device ID of the connected product.

10.3.1.3.12 Displaying Process Data

You can view the process data associated with a specific port on the **Process Data** tab.

Proceed as follows to view the process data for a port:

1. From the main menu of the Webserver (left), select the menu item which you want to view information about.
2. Open the **Process Data** tab.

⇨ The **Process Data** tab opens. The current values of the process data configured for input/output appear in hexadecimal format under Input/Output. If no process data has been configured for a data direction (input or output), the corresponding field remains empty.

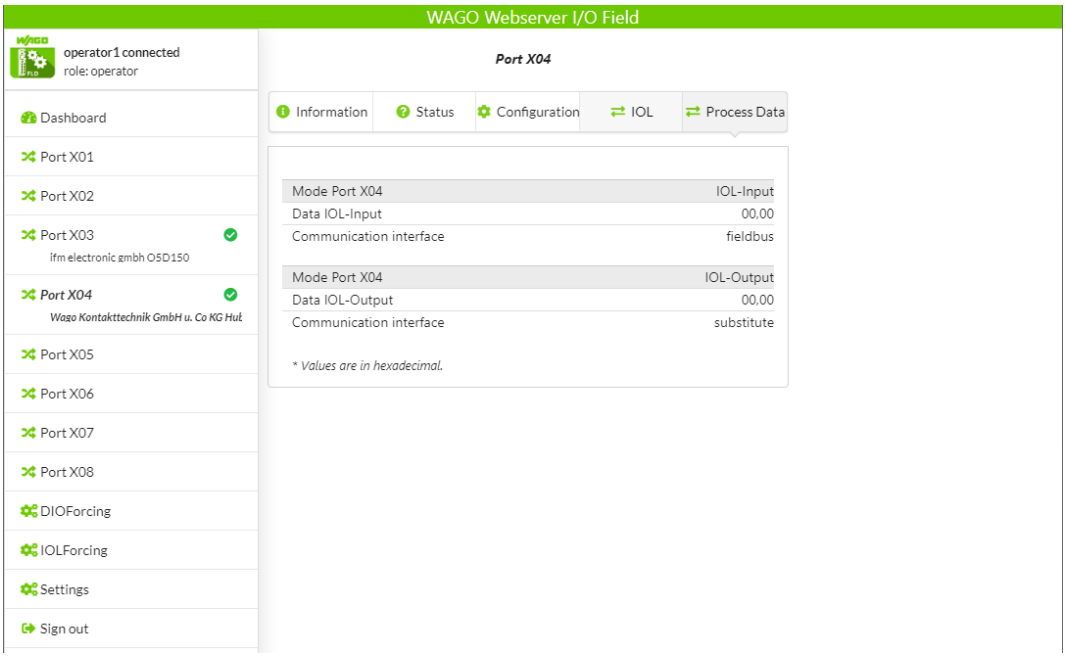


*Figure 15: **Port XX** Menu Item, **Process Data** Tab*

10.3.1.4 Parameterizing the Module via the WAGO I/O Field Webserver

You can make the following settings on the module with WAGO Webserver I/O Field:

- **Accessing a Connected IO-Link Device [▶ 95]**
- **Configuring Ports [▶ 92]**
- **Configuring IP Parameters [▶ 98]**
- **Storing Maintenance Information [▶ 99]**
- **Updating Firmware [▶ 100]**
- **Resetting Module to Factory Settings [▶ 102]**
- **Configuring Bluetooth [▶ 103]**
- **Logging Users on and off and Managing Them [▶ 105]**
- **Forcing Digital Inputs and Outputs [▶ 108]**
- **Forcing IO-Link ports [▶ 110]**

10.3.1.4.1 Configure Ports

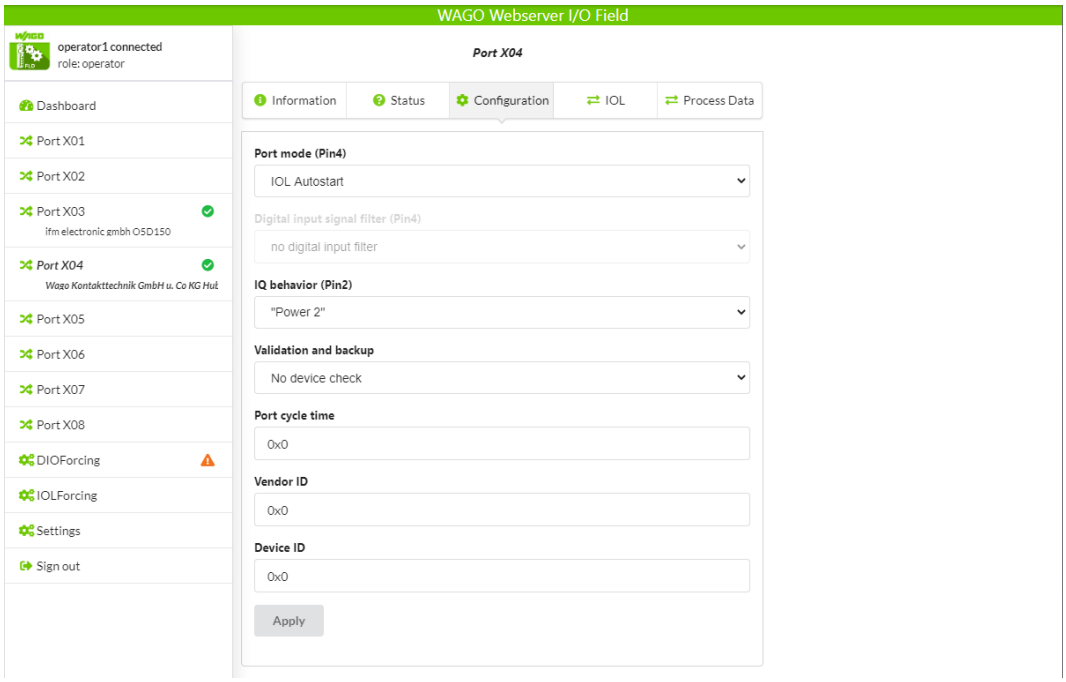


*Figure 16: **Port XX** Menu Item, **Configuration** Tab*

The **Configuration** tab is used to display and modify the following port settings for the selected port of the device:

Table 58: Port Configuration Settings for IO-Link Devices

Name	Type	Description
Port mode (pin 4)	Drop-down menu	Port operating mode (configuration of pin 4)
Digital input signal filter (pin 4)	Drop-down menu	Filter time for digital input signals on pin 4 (only for “Port mode (pin 4)” on digital input)
IQ behavior (pin 2)	Drop-down menu	IQ behavior of the port (configuration of pin 2)
Validation and backup	Drop-down menu	Validation and Backup Settings for Device Check When Replacing Devices
PortCycleTime	Input field	Expected cycle time of the port
VendorID	Input field	Expected manufacturer ID of the connected device
DeviceID	Input field	Expected device ID of the connected device

The **Validation and Backup**, **PortCycleTime**, **VendorID** and **DeviceID** settings only appear for the IOL Manual selection in the **Port mode (pin 4)** drop-down menu.

Changes to settings require operator or admin rights. If you do not have these, the **Configuration** tab is grayed out, and the displayed values cannot be edited.

If cyclic data exchange takes place via PROFINET, no configuration is possible. In this case, a message appears:
`Note: Changing configuration not allowed because interface state is “communicating.”`

To makes changes to a port’s configuration, proceed as follows:

1. Select the desired port (port X01, port X02 etc.) from the menu
2. Open the **Configuration** tab.
3. Configure pin 4 by setting the port operating mode.

4. If applicable, configure the filter time for the signals of the digital inputs.
5. If applicable, configure the device check for validation and backup.
6. If applicable, configure pin 2 by setting the I/Q behavior.
7. If applicable, enter the expected vendor ID.
8. If applicable, enter the expected device ID.
9. If applicable, set the expected cycle time.
10. Click the **[Apply]** button.

⇨ Your changes now take effect.

Configuring the Operating Mode for Pin 4 of the Port

You can select the port operating mode for pin 4 of the selected IO-Link port from the **Port mode** drop-down list. The following operating modes are available:

Table 59: "Port Mode" Drop-Down Menu: Selecting the Operating Mode for Pin 4 of the Selected IO-Link Port

Selection Option	Description
Deactivated	The port is disabled. L+ is switched off. The process data (both input and output) is set to 0. The master no longer performs actions related to this port.
IOL Manual	The port is used as an IO-Link port with manual (user-defined) configuration. The vendor ID, device ID and version ID are validated.
IOL Autostart	The port is used as an IO-Link port with automatic start. No configuration or device validation occurs.
Digital input, normally open	The port is used as a digital input. All elements of the port configuration are ignored except for the input and output data length.
Digital input, normally closed	The port is used as a digital input. The signals to the port are inverted. All elements of the port configuration are ignored except for 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 for the input and output data length.
Digital output, static on	The port is used as a digital output. The signal on pin 4 is permanently set to logic 1 (for testing purposes only).

Setting the Filter Time for Digital Inputs

The filter time for the digital inputs can be selected from the **Digital input signal filter** drop-down menu. You can select from the following values:

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

If the **No digital input filter** option is selected, no filtering occurs.

Configure Pin 2 (I/Q)

The behavior of pin 2 (I/Q) can be selected from the **IQ behavior** drop-down menu. For your IO-Link class A device, the following configuration options are available for using pin 2 as a digital input or output:

*Table 60: **IQ Behavior** Drop-Down Menu – Configuration of Pin 2 (I/Q) for IO-Link Class A Devices*

Selection Option	Explanation
Not supported	Pin 2 is not used.
Digital input, normally open	Pin 2 is a digital input.

Selection Option	Explanation
Digital input, normally closed	Pin 2 is a digital input. The signal is inverted.
Digital Output	Pin 2 is a digital output.
Digital output, static on	Pin 2 is a digital output. The signal is permanently set to logic 1 (for testing purposes only).

Configuring the Device Check for Validation and Backup

ⓘ Note

In the “IOL Autostart” operating mode (see above), this drop-down menu has no effect.

The **Validation and backup** drop-down menu can be used to determine whether a validation (device check) is performed and, if so, at what level (Inspection Level) when a connected device is replaced, and whether or not the stored operating parameters of the old device are carried over to the new one.

The following table explains the possible values for Inspection Level:

*Table 61: Possible Values of the **Inspection Level** Parameter*

Inspection Level	Description
NO_CHECK	No device check is performed.
TYPE_COMP	A device check for type compatibility is performed. For the device check, the actual vendor ID is compared to the vendor ID setting in the configuration, and the actual device ID is compared to the device ID setting in the configuration.
IDENTICAL	A device check for device identity is performed. For this purpose, a device check for type compatibility is performed. Furthermore, the actual serial number is compared to the serial number setting of the configuration.

The **Backup Level** parameter determines the system behavior when a device connected to the port is replaced in terms of continued operation with unmodified device parameters.

This parameter can have three different values:

*Table 62: Possible Values of the **Backup Level** Parameter*

Backup Level	Description
Commissioning (“Disable”)	Parameter data of the old device is not saved for transfer to the new device. Therefore, if the device is replaced, the new device must be parameterized anew.
Production (“Backup/Restore”)	Changes to all active parameters within the device are copied and saved. Thus all parameter data of the old device is stored for transfer to a new device. Device replacement with automatic or semi-automatic data storage is supported.
Production (“Restore”)	Changes to all active parameters within the device are not copied and saved. Only special parameter data of the old device is stored for transfer to a new device. Device replacement with automatic or semi-automatic data storage is only supported for these “frozen” parameters.

The **Validation and Backup** drop-down menu offers the following options for setting the **Inspection Level** and **Backup Level** parameters:

*Table 63: Setting the **Inspection Levels** and **Backup Levels** for Device Check during Validation and Backup*

Selection Option	Inspection Level	Backup Level	Description
No device check	NO_CHECK	Disable	No device check is performed.
Type compatible device (V1.0)	TYPE_COMP	Disable	Device check for type-compatible device per IO-Link specification 1.0
Type compatible device (V1.1)	TYPE_COMP	Disable	Device check for type-compatible device per IO-Link specification 1.1
Type compatible device (V1.1) with backup + restore	TYPE_COMP	Backup + Restore	Device check for type-compatible device per IO-Link specification 1.1 with backup & restore functionality
Type compatible device (V1.1) with restore	TYPE_COMP	Restore	Device check for type-compatible device per IO-Link specification 1.1 with restore functionality

VendorID Input Field

This element contains the expected manufacturer ID (VendorID, 2 bytes) of the connected device. The permissible values range from 1 to 0xFFFF. This information is required for the device check for type compatibility. It can be omitted if **[No device check]** is selected.

DeviceID Input Field

This element contains the expected device ID (DeviceID, 3 bytes) of the connected device. The permissible values range from 1 to 0xFFFFFF. This information is required for the device check for type compatibility. It can be omitted if **[No device check]** is selected.

PortCycleTime Drop-Down Menu

Depending on the selected operating mode, the expected cycle time of the port either can be selected from the **PortCycleTime** drop-down menu or is merely displayed. The encoding corresponds to the one in the port status.

10.3.1.4.2 Accessing a Connected IO-Link Device

The **IOL** tab allows read and write access to the IO-Link device connected to an IO-Link port via index and subindex. The ISDU message format (ISDU = Indexed Service Data Unit) is used for this purpose.

ⓘ Note

You can find the meaning of the index and subindex values in the documentation of the connected IO-Link device.

You can find a description of the ISDU message format in the IO-Link specification.

Required Rights

Changes to settings require operator or admin rights. If you do not have these, the tab is grayed out, and the displayed values cannot be edited.

Access to IO-Link Device

To access the data of an IO-Link device connected to the selected IO-Link port via index and subindex (ISDU message format), proceed as follows:

1. Select the port to which the IO-Link device is connected from the menu on the left.
2. Open the **IOL** tab.

⇨ The **IOL** tab appears.

Read Access

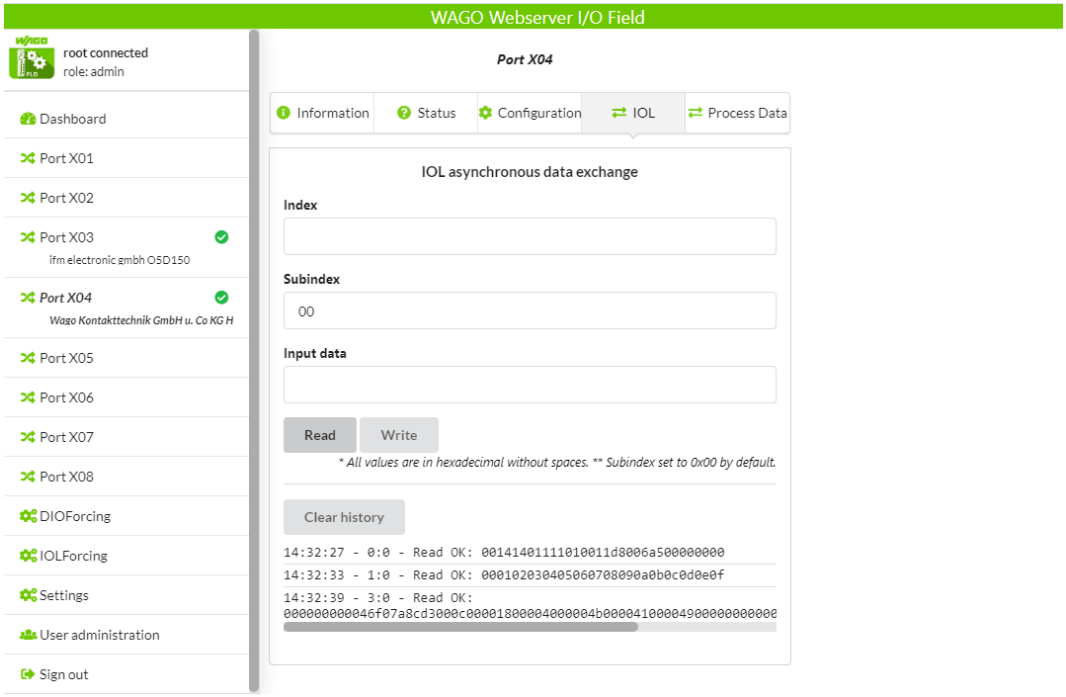


Figure 17: Ports X01 ... X08 – Read Access to IO-Link Device

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

1. On the **IOL** tab, enter the index of the connected IO-Link device you want to access into the **Index** field as a hexadecimal value.
2. On the **IOL** tab, enter the subindex of the connected IO-Link device you want to access into the **Subindex** field as a hexadecimal value; the default setting is 00
3. Click the **[Read]** button.

⇨ The read operation is performed. An entry is written to the history at the bottom of the tab and logged there with the current time.

If the operation was successful, the text `Read ok:` and the result appear in the history. The entries in the history then have the following structure:

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

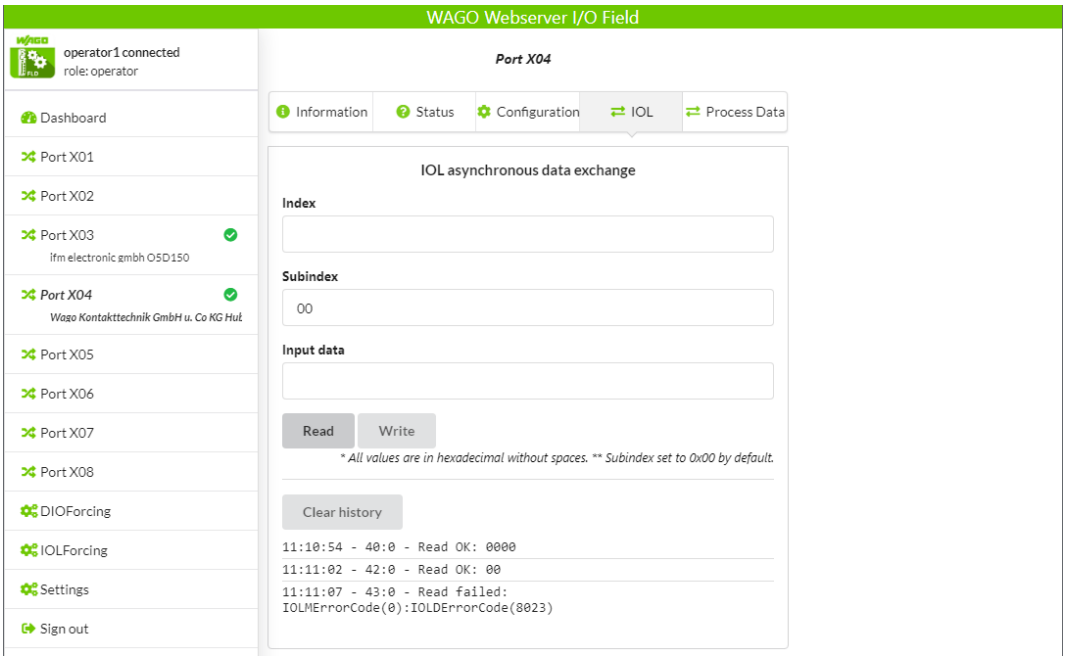


Figure 18: Ports X01 ... X08 – Read Access to IO-Link at Index 43 and Subindex 0 Unsuccessful (Read Failed)

If the operation was not successful, an error message appears in the history with error codes from the IO-Link master and IO-Link device.

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

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

ⓘ Note

You can find information on the meaning of the error codes of IO-Link masters (IOLMErrorCode) and devices (IOLDErrorCode) in the IO-Link specification.

The following applies in both cases:
- The time appears in `HH:MM:SS` format
- The index and subindex appear in hexadecimal format

Write Access

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

1. On the **IOL** tab, enter the index of the connected IO-Link device you want to access into the **Index** field as a hexadecimal value.
2. On the **IOL** tab, enter the subindex of the connected IO-Link device you want to access into the **Subindex** field as a hexadecimal value; the default setting is `00`
3. On the **IOL** tab, enter the data to write in the **Input data** field.
4. Click the **[Write]** button.

⇨ The write operation is performed.

If the operation was successful, the text `Write ok:` and the result appear in the history. The entries in the history then have the following structure:

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

If the operation was not successful, an error message appears in the history with error codes from the IO-Link master and IO-Link device. The entries in the history then have the following structure:

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

Deleting the Read and Write Access History

To delete the logged history of read and write operations:

- Click the **[Clear history]** button.

⇨ The history of read and write access operations is deleted.

10.3.1.4.3 Configuring IP Parameters

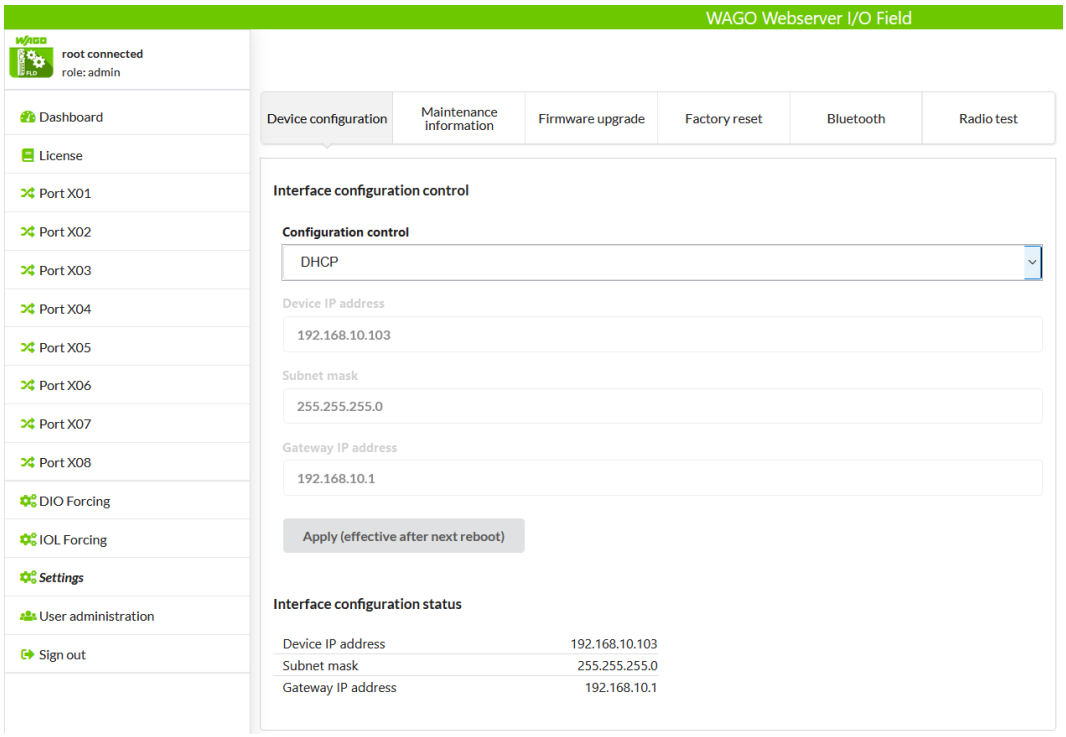


*Figure 19: **Settings** Menu Item, **Device Configuration** Tab*

The **Device configuration** tab allows you to do the following:

- Specify how the module gets its IP address (via the **Configuration control** drop-down menu with the STATIC, BOOTP und DHCP options)

*Table 64: **Configuration Control** Drop-Down Menu*

#	Option	Description
0	STATIC	The module's IP address is configured statically. This is done using the module IP address, the subnet mask and the gateway IP address entered on the "Device configuration" tab.
1	BOOTP	The module gets its IP address with the BOOTP protocol.
2	DHCP	The module gets its IP address with the DHCP protocol. This is the default setting.

- If static configuration is used, specify the IP address and subnet mask manually (the gateway IP address is optional).

*Table 65: **Device Configuration** Tab – Parameter Overview*

Parameters	Settings/Action
Device IP address	IP address for the ETHERNET configuration with static IP address configuration
Subnet mask	Subnet mask for the ETHERNET configuration with static IP address configuration
Gateway IP address	Gateway IP address for the ETHERNET configuration with static IP address configuration

10.3.1.4.4 Storing Maintenance Information

On the **Maintenance information** tab, you can store maintenance information, such as the device name, the installation location and date, contact information, a description text or the date of the last and next product service.

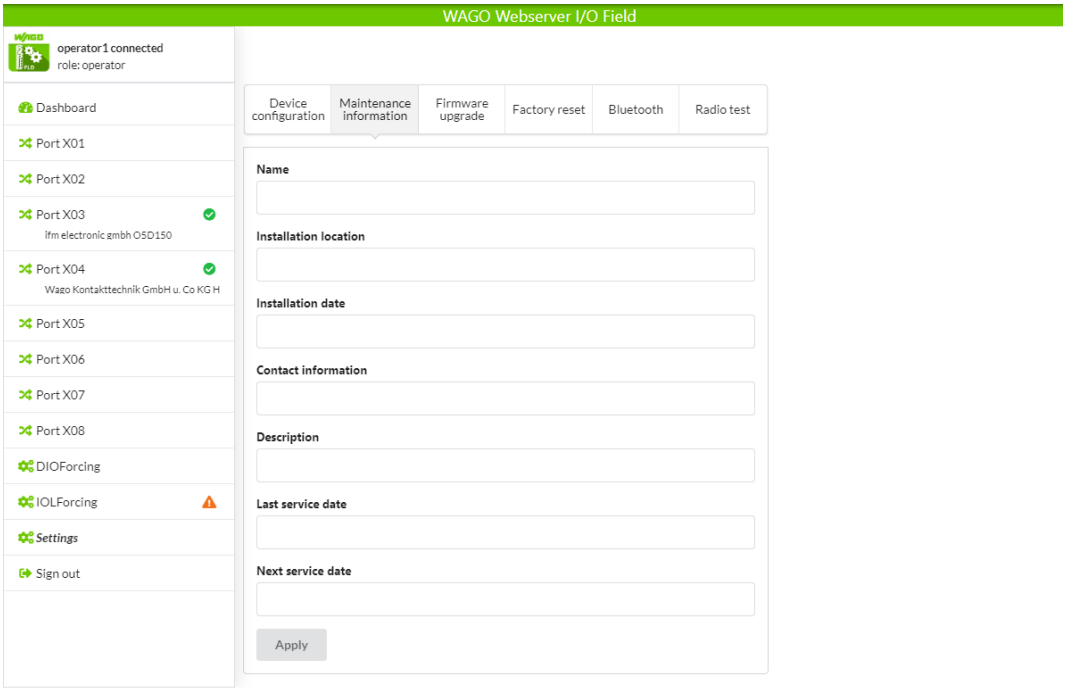


*Figure 20: **Settings** Menu Item, **Maintenance Information** Tab*

Changes to settings require operator or admin rights. If you do not have these, the **Maintenance Information** tab is grayed out and cannot be edited.

The maintenance information includes:

Table 66: Maintenance Information

Name	Data Format and Length	Description	Corresponding I&M Field
Name	Printable ASCII string, max. 64 characters	Uniform label (string) in the system for the function of this device	I&M1:TAG_FUNCTION
Installation Location	Printable ASCII string, max. 32 characters	Uniform label (string) in the system for the location where the device is installed	I&M1: TAG_LOCATION
Installation Date	ASCII time indication, max. 32 characters	Data of installation or commissioning of this device; the fieldbus organization can determine the format.	I&M2: INSTALLATION_DATE

Name	Data Format and Length	Description	Corresponding I&M Field
Contact Information	Printable ASCII string, max. 32 characters	Text for identification of a contact person for this managed node of the system, together with information on how to contact this person.	
Description	Printable ASCII string, max. 64 characters	Readable comment field (plain text) to store free text containing individual state information and comments.	I&M3: DESCRIPTOR
Signature	Printable ASCII string, max. 128 characters	Signature	I&M4: SIGNATURE
Number of changes (Change Count)	ASCII decimal number, max. 32 characters	Counter for changes to the hardware or the device parameters; only needs to be incremented if the data has really changed.	I&M0: REV_COUNTER
Date/time of the last service (Last Service Date)	ASCII time indication, max. 32 characters	Date/time of the last service, e.g., firmware update.	
Date of the next service (Next Service Date)	ASCII time indication, max. 32 characters	Date/time of the next service, e.g., firmware update	

To make changes to the maintenance information:

1. From the Webserver main menu (left), select the **Settings** menu item
   ⇨ The **Device configuration** tab appears.
2. Select the **Maintenance information** tab.
3. Modify the relevant fields there.
4. Click the **[Apply]** button.

⇨ Your changes take effect.

10.3.1.4.5 Updating Firmware

With the **Firmware upgrade** tab, WAGO Webserver I/O Field provides an option for updating the product firmware.

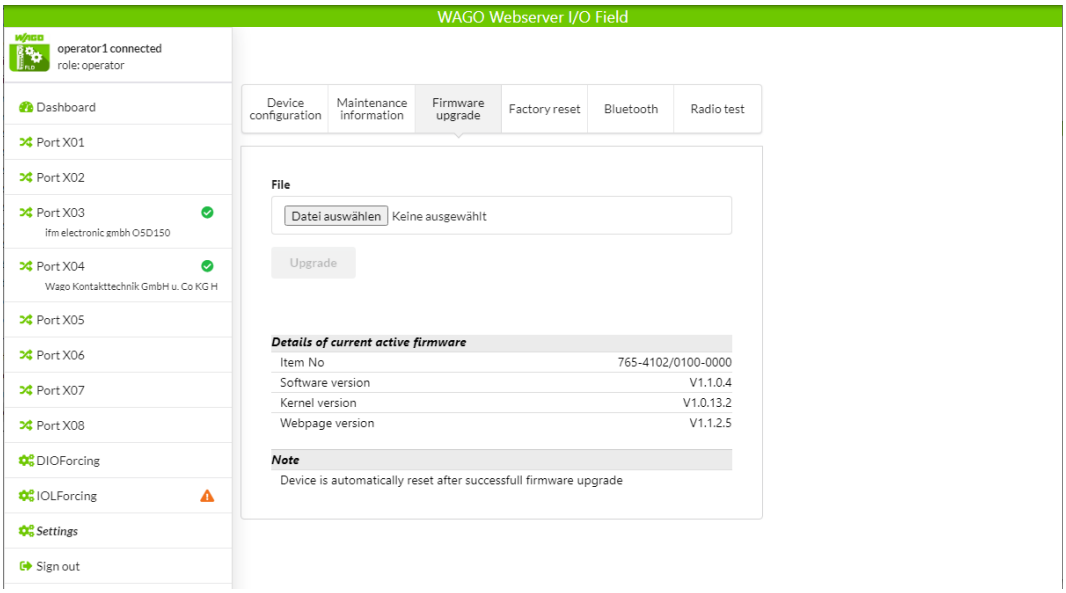


*Figure 21: **Settings** Menu Item, **Firmware Upgrade** Tab*

NOTICE

Put system in safe operating mode

Never perform a firmware update during ongoing operation of the system in which the product is installed. Before any firmware update, the system must first be properly shut down or put in a safe operating state.

Note

Create backup before update

When you update your product's firmware, the state of your product before the update, including the firmware used up to that point, can no longer be reconstructed unless a firmware and configuration data backup exists.

Changes to settings require operator or admin rights. If you do not have these, the **Settings** tab is grayed out and cannot be edited.

To update the firmware, you need a firmware container file: `FWUPDATE.ZIP`. You can get it from the Downloads section of the WAGO website: **http://www.wago.com**.

Proceed as follows to update the firmware:

1. In the left-hand column of the WAGO I/O Field Webserver, click the **Settings** menu item.

   ⇨ The **Device configuration** tab appears.
2. Select the **Firmware upgrade** tab.
3. Click the **[Select file]** button.

   ⇨ A file selection dialog opens.
4. Select the firmware container file `FWUPDATE.ZIP` from this dialog.

   ⇨ The name of the selected firmware container file appears in the **File** field.

5. Click the **[Upgrade]** button.

⇨ The firmware update is performed. After that, the port must be configured anew.

The firmware update procedure is as follows:

1. The firmware from the `FWUPDATE.ZIP` firmware container file is stored in the module's flash memory.
2. An internal reset is triggered.
3. Then the device maintenance firmware starts; this edits the firmware container file and installs the new firmware, including the module's configuration files.
4. You are notified when the installation procedure finishes.
5. The module then resets again.
6. The new firmware that has just been loaded starts.

10.3.1.4.6 Resetsetting the Module to the Factory Settings

In many cases, it can be helpful to reset the module to the factory settings. This can be done for various selectable classes of settings with the **Settings** menu item on the **Factory reset** tab.

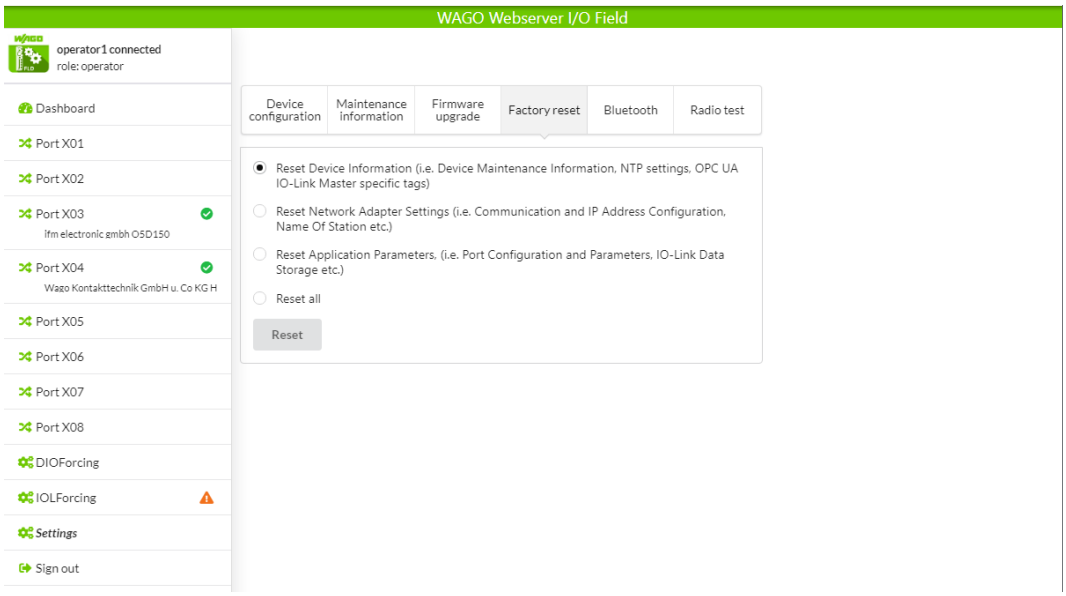


*Figure 22: **Settings** Menu Item, **Factory Reset** Tab*

Changes to settings require operator or admin rights. If you do not have these, the **Settings** tab is grayed out and cannot be edited.

Various settings can be reset according to the radio button selection:

Table 67: Options for Resetting the Module to the Factory Settings

Option	Reset Settings
Reset Device Information	Module settings (e.g., maintenance information, system time settings)
Reset Network Adapter Settings	Network adapter settings (communication settings, IP address configuration, station name)
Reset Application Parameters	Application-specific data (port configuration and parameters, remanent parameters)
Reset All	All Settings

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

1. In the left-hand column of the WAGO I/O Field Webserver, click the **Settings** menu item.

   ⇨ The **Device configuration** tab appears.

2. Select the **Factory reset** tab.
3. Use the radio buttons to select the settings that you want to reset to their factory setting values.
4. Click the **[[Reset]]** button.

⇨ The selected settings are reset to the factory settings.

10.3.1.4.7 Configure Bluetooth

The **Bluetooth**® tab allows the following:

- Displaying information on the product's Bluetooth® interface module
- Displaying diagnostic information
- Activating the Bluetooth® interface via DM code
- Starting a Bluetooth® firmware update
- Resetting the Bluetooth® firmware
- Switching the Bluetooth® wireless connection on/off
- Switching the Bluetooth® LED on/off

Proceed as follows to access these Bluetooth® functions in the WAGO I/O Field Webserver:

- Open the **Bluetooth** tab.

⇨ The **Bluetooth** tab appears.

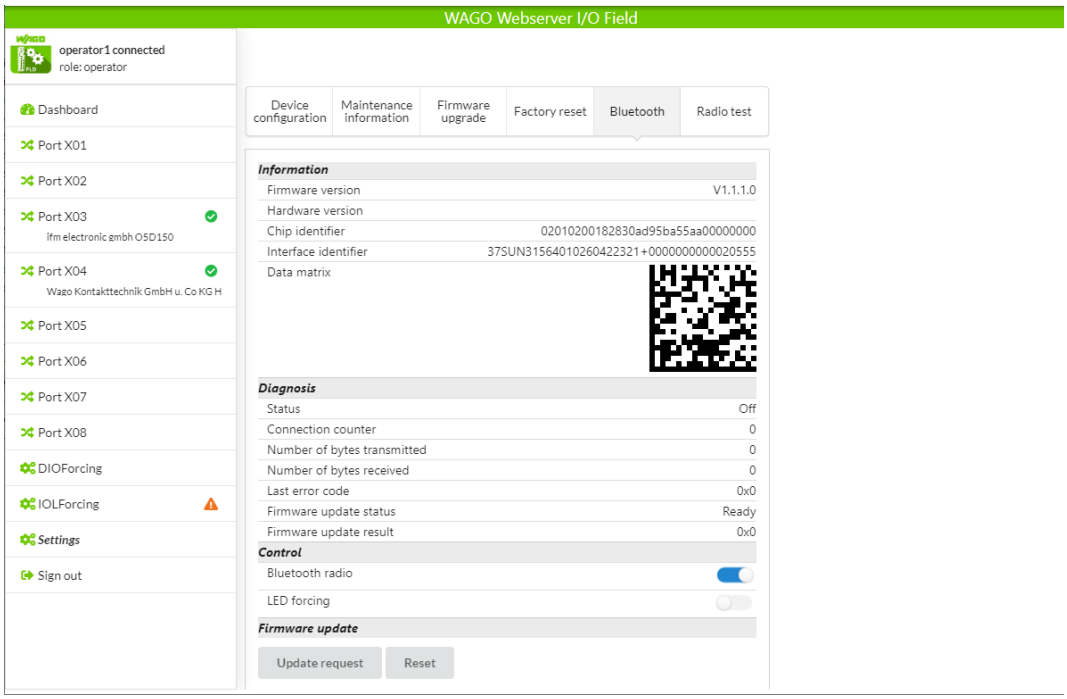


*Figure 23: **Settings** Menu Item, **Bluetooth** Tab*

Displaying Information on the Product's Bluetooth® Interface Module

The **Information** section of the **Bluetooth** tab shows the following information on the product's Bluetooth® interface module:

- Current version of the Bluetooth® firmware used
- Current version of the Bluetooth® hardware used
- Chip identifier of the Bluetooth® chip used
- Interface identifier of Bluetooth® interface module
- Individual DM code of the product
  (can be scanned by a smartphone or tablet to launch an app on it for communication with the product)

Displaying Diagnostic Information

The **Diagnostics** section of the **Bluetooth** tab shows the following diagnostic information on the Bluetooth® connection:

- Connected Status
- Connection counter; is set to 0 with each new Bluetooth® connection.
- Number of bytes sent over the Bluetooth® connection
- Number of bytes received over the Bluetooth® connection
- Last error code that occurred during operation of the Bluetooth® connection
- Status of the last Bluetooth® firmware update
- Result of the last Bluetooth® firmware update

The status of the last Bluetooth® firmware update is indicated as follows:

Table 68: Status of the last Bluetooth® firmware update

Value	Status
0	Ready for operation
1	Firmware file is being checked
2	Firmware update is being performed

Activating the Bluetooth® Interface Using the DM Code Displayed

ⓘ Note

Never use the product in areas where operation of radio equipment is prohibited.

The product contains a radio transmitter that can impair the function of electronic medical devices such as hearing aids and pacemakers.

ⓘ Note

Only use the product with Bluetooth® if the product has an approval for the specific country or region.

To enable the Bluetooth® interface, you must have the WAGO I/O Field app installed on the smartphone or tablet. Proceed as follows:

- A DM code appears in the "Information" section of the **Bluetooth** tab. Scan it with the smartphone or tablet.
  ⇨ The smartphone or tablet then sends an optical sequence (flash code) to the device's integrated light sensor.

⇨ The light sensor registers this sequence. If the sequence is recognized as correct, the Bluetooth® interface is enabled, and the product attempts to establish a Bluetooth® connection to the smartphone or tablet.

Starting a Bluetooth® Firmware Update

Proceed as follows to start a Bluetooth® firmware update:

1. Click **Update request**.
   ⇨ A dialog appears for selecting the Bluetooth® firmware file.
2. Select the firmware file.

⇨ The Bluetooth® firmware update starts.

Performing a Reset

Proceed as follows to reset the Bluetooth® firmware:

- Click **Reset**.

⇨ The Bluetooth® firmware is reverted and restarts.

Switching the Bluetooth® Interface Wireless Transmitter on/off

To switch the Bluetooth® interface wireless transmitter on:

- Slide the **Bluetooth radio** switch to the right

⇨ The Bluetooth® interface wireless transmitter switches on.

To switch the Bluetooth® interface wireless transmitter off, slide the **Bluetooth radio** switch to the left.

Switching LED Forcing on/off

Proceed as follows to switch LED forcing (externally controlled LED mode) on:

- Slide the **LED forcing** switch to the right.

⇨ LED forcing switches on. The LED on the Bluetooth® interface can now be externally controlled.

To switch LED forcing off, slide the **LED forcing** switch to the left.

10.3.1.4.8 Logging Users on and off and Managing Them

Logging Users on

Proceed as follows to log users on:

1. From the Webserver main menu (left), select the **Sign in** menu item.
   ⇨ The input screen for username and password appears:

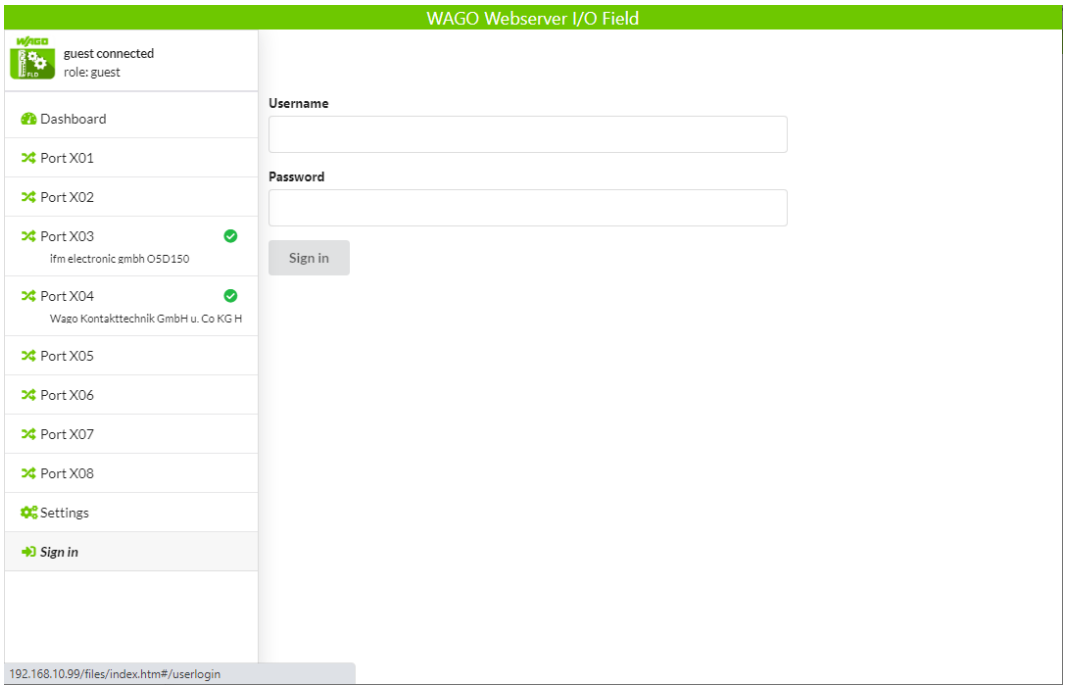


*Figure 24: **Sign in** Menu Item – Input Screen for Username and Password*

2. Enter your username and password into the corresponding fields.
3. Click the **[Sign in]** button.

⇨ If you have entered a known username correctly, you can now work with the WAGO I/O Field Webserver with this user's specified rights. The username that was used to log on is shown in the upper left-hand corner. The **Sign in** menu item changes to **Sign out**.

Logging Users off

Proceed as follows to log a user off:

- From the Webserver main menu (left), select the **Sign out** menu item.

⇨ You can now no longer work in the WAGO I/O Field Webserver with the rights you had been using till this point. The username used to log on is no longer shown in the upper left-hand corner. The **Sign out** menu item changes back to **Sign in**.

Guest User Access

By default, the Webserver recognizes the user `guest` without a password; this was set up for initial access or guest access.

Initial Login as Administrator

Upon delivery or after a reset to the factory settings, the WAGO I/O Field Webserver can be accessed with the username `root` and password `password`. This combination has administrator rights.

ⓘ Note

Change the administrator password immediately after commissioning. The factory default setting is widely known and does not provide adequate protection.

The **Administration** tab provides role-based user administration. It allows you to create and delete users and assign them roles, which their rights depend on. Users can be divided into three roles:

- Maintenance
- Operator
- Administrator

Creating a New User

When “User administration” opens, the following screen appears:

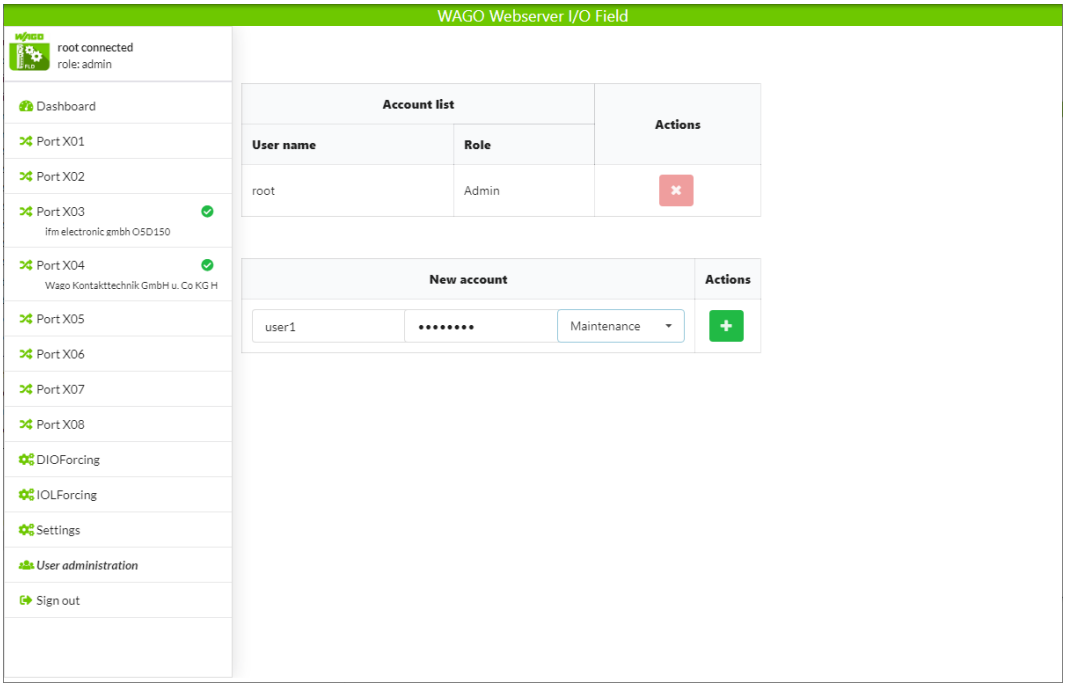


*Figure 25: **User Administration** Menu Item (Initial State)*

The user `root` with pre-set password `password` exists by default; see first row.

An additional user can be created in the second row. Proceed as follows:

1. In the **Username** field, enter the username to use for the user. Users that are already in use are not allowed here.
2. In the **Password** field, enter the password for this username.
3. Using the combo box on the right, select the role for the new user being created (the available roles are *Maintenance*, *Operator* and *Administrator*).
4. Click the green field to finish.

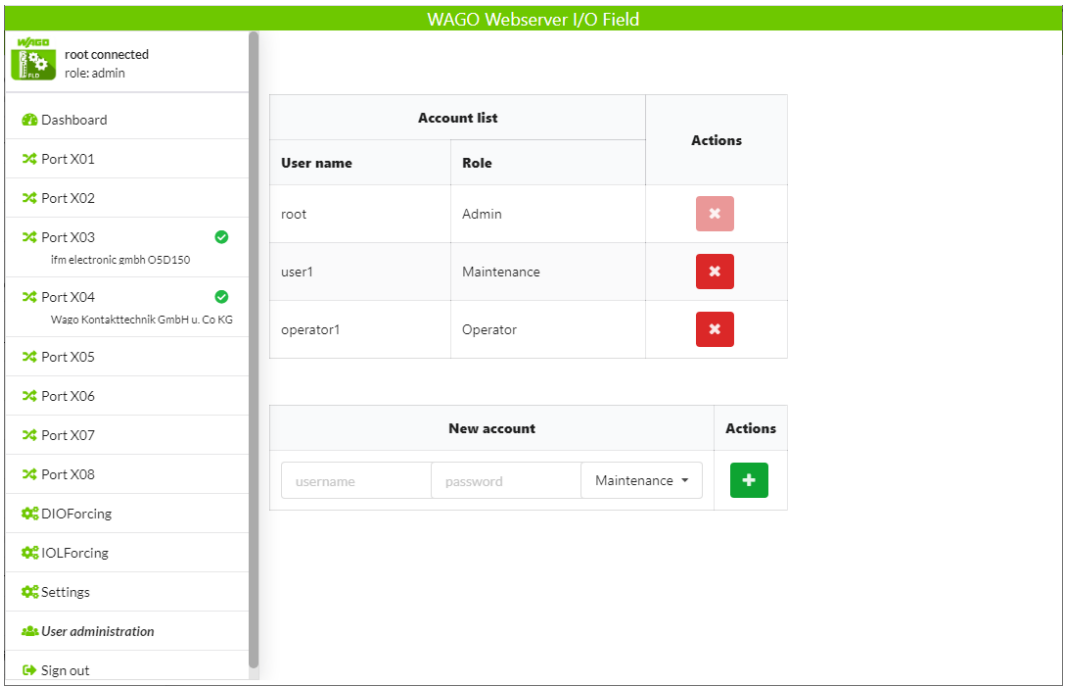


*Figure 26: **User Administration** Menu Item*

⇨ The new user is created and assigned the selected role.

Removing Users

To remove an existing user from the product's user administration, proceed as follows:

- Click the red square with the white "x" to the right of the user you want to remove.

⇨ The user is deleted.

The user `root` cannot be deleted, so the red deletion button is grayed out there.

10.3.1.4.9 Forcing Digital Inputs and Outputs

To access the forcing functionality for the digital inputs and outputs via the Webserver, you must be logged in there with operator or administrator rights. To perform forcing, proceed as follows:

1. From the Webserver main menu (left), select the **DIO Forcing** menu item.
2. Check the **Forcing enable** box.

⇨ Unless another user is already accessing it, access to the forcing functionality is now enabled. A table with checkboxes in some of its cells appears on the screen:

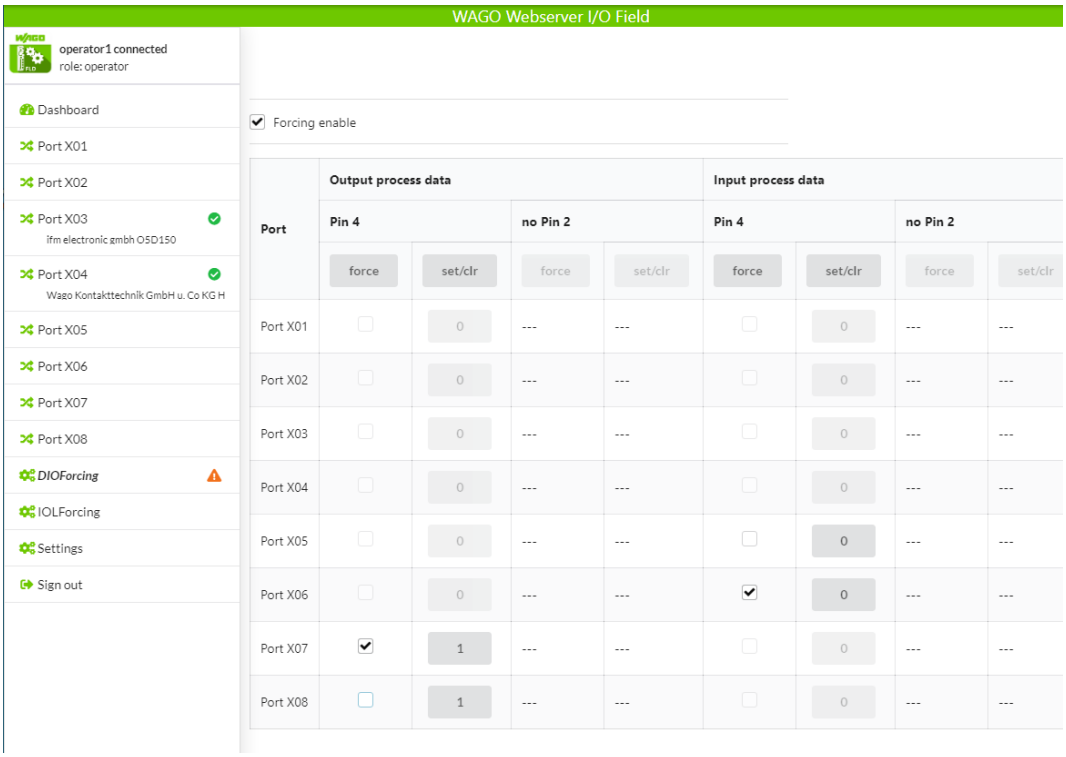


*Figure 27: **DIO Forcing** Menu Item, "DIO Forcing" Screen*

You have three options for each pin that supports the forcing function:

Table 69: Input Options for Forcing for Each Pin of a Port

Option	"Force" Checkbox	"Set/Clr" Checkbox
Forcing – substitute value bit is set (1)	Checked	Checked
Forcing – substitute value bit is deleted (0)	Checked	Not checked
No forcing for this pin	Not checked	No meaning

For entering these, there are two checkboxes in the table for each pin of a port: **force** for switching the forcing functionality on/off, and **set/clr** for setting or deleting the setpoint (1 bit); the latter checkbox is only relevant if the **force** box is checked. The following applies to this:

- All inputs for input simulation are entered in the right half of the table under "Input process data"; all the inputs for output forcing are then entered in the left half of the table under "Output process data."

You can find a description of and more information on the forcing function and explanations of terms under **Forcing [▶ 47]**.

Each of the eight ports (X01 ... X08) has its own table row.

Concurrent Access

As long as one user is accessing the forcing functionality through a forcing medium, e.g., the WAGO I/O Field Webserver, it is locked for all other users of the module. They cannot access the forcing functionality until the user that is active now terminates his or her access.

In this case, the Web browser displays a message box with the text "`Somebody else is already forcing. Try again later.`" When the forcing functionality is being accessed, a small orange icon also appears in the forcing option entry in the menu bar on the left.

10.3.1.4.10 Forcing for IO-Link Ports

To access the forcing functionality for the IO-Link module via the Webserver, you must be logged in there with operator or administrator rights. To perform forcing, proceed as follows:

- Select the **IOL Forcing** option from the main menu of the Webserver on the left and check the **Forcing enable** box at the top.

⇨ Unless another user is already accessing it, access to the forcing functionality is now enabled. The screen shows a table with checkboxes in the **force** columns and should look something like this:

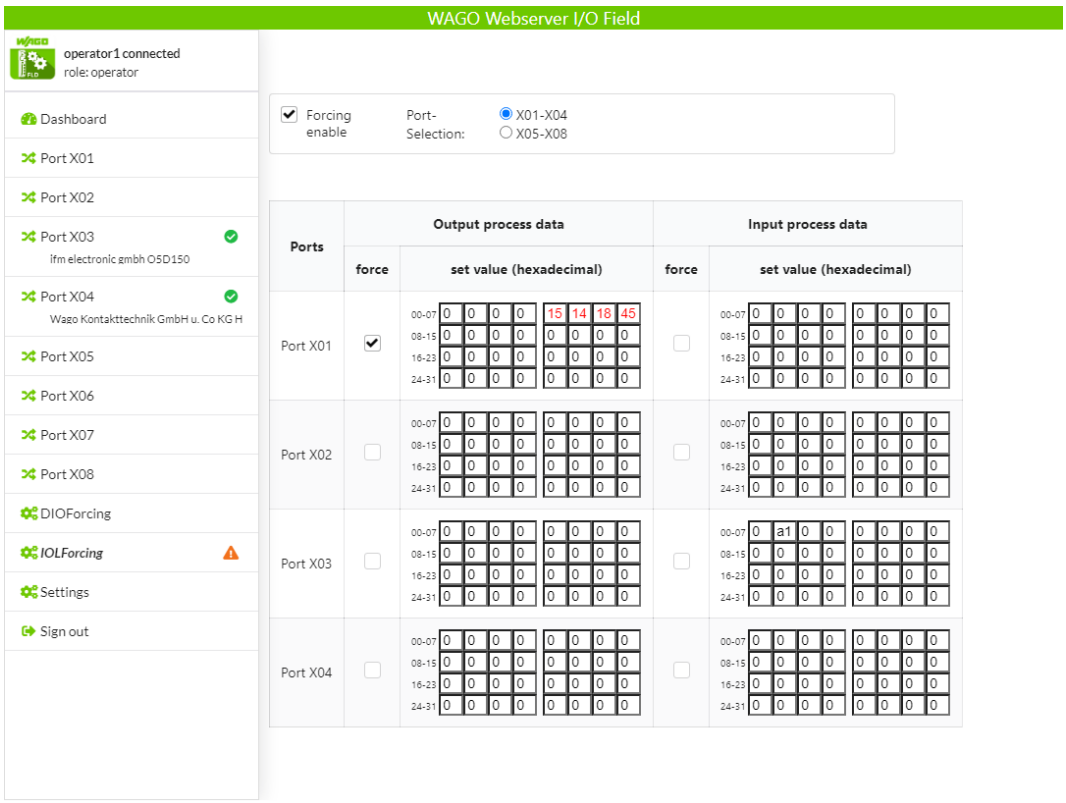


*Figure 28: **IOL Forcing** Menu Item, "IOL Forcing" Screen*

You can find a description of and more information on the forcing function, as well as explanations of terms, in section Forcing [▶ 47].

You can use the **force** checkbox to specify for each port of the port group X01…X04 or X05…X08 in its own row whether port forcing applies to this port. You can do this separately for the input and output process data. You can switch between the two port groups X01…X04 and X05…X08 with the **X01-X04** and **X05-X08** radio buttons at the top.

To enable forcing for a port and enter forcing data (i.e., substitute values) for it, proceed as follows:

1. Check the **force** box for the port in question.

2. For this port, you can enter 16 byte substitute values in hexadecimal format in the **set value (hexadecimal)** input fields of the column.

Concurrent Access

As long as one user is accessing the forcing functionality through a forcing medium, e.g., the WAGO I/O Field Webserver, it is locked for all other users of the module. They cannot access the forcing functionality until the user that is active now terminates his or her access.

In this case, the Web browser displays a message box with the text "`Somebody else is already forcing. Try again later.`" When the forcing functionality is being accessed, a small orange icon also appears in the forcing option entry in the menu bar on the left.

10.3.2 WAGO IO-Link Configurator

WAGO IO-Link masters can be used in various system environments. They can be either gateways that link IO-Link to higher-level fieldbus or ETHERNET systems, modules in modular remote I/O Systems or a fixed component of devices like controllers.

In most cases, a higher-level engineering tool is used in the relevant system environment. Often, however, there is none or at least no uniform integration option. Various options are implemented for the IO-Link device tool as easy-to-use solutions for the respective cases.

The WAGO IO-Link Configurator software can be operated as a stand-alone program or via WAGO I/O-*CHECK*.

You can find further information in the product manual WAGO IO-Link Configurator.

The manual is available in the download area for the WAGO IO-Link Configurator software at **www.wago.com**, item number 0765-4501/0100-0000.

10.3.3 WAGO I/O Field app

10.3.3.1 Parameterizing a Module with the WAGO I/O Field App

Note

Read the online help!

You can find Product-specific information on the WAGO App I/O Field in the online help for the app.

10.3.4 OPC UA Server

The device contains an OPC UA server. An OPC UA client can establish a connection wot the device and access the following parameters, among others:

- Device identification
- Configuration parameters
- Process Data
- Measured values
- Diagnostic information

- Statistical information

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

`opc.tcp://IP-address:4840`

For `IP-address`, use the device's IP address.

The client can access device parameters anonymously (only read access) or with a user-name/password (read/write access). The username and password are set with the Field IO Webserver.

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

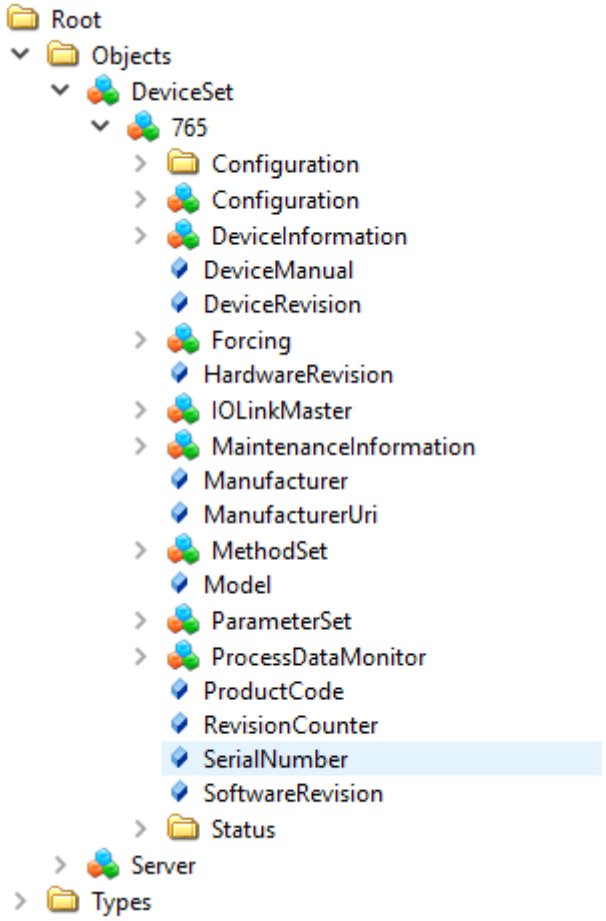


Figure 29: OPC UA: Device Information Model

10.3.4.1 Parameterizing the Product via OPC UA

10.3.4.1.1 Identifying Devices

The device provides nodes for device identification. For example, the OPC UA client can read out the version of the device firmware used in the `SoftwareRevision` node. The path to this node is:

`Root > Object > DeviceSet > [device name]`

Table 70: Identify Devices

Node Name	Node Class	Access	Description
Manufacturer	Variable	Read	Device manufacturer
ManufacturerUri	Variable	Read	URL of the device manufacturer

Node Name	Node Class	Access	Description
Model	Variable	Read	Model name of the device: “IO System Field-765-xxxx”
ProductCode	Variable	Read	Product code of the device: “765-xxxx/xxxx-xxxx”
RevisionCounter	Variable	Read	Hardware version of the device
SerialNumber	Variable	Read	Serial number of the device
SoftwareRevision	Variable	Read	Revision/version of the device firmware

10.3.4.1.2 Configuring Parameters

The OPC UA server provides nodes with configuration parameters for the device. For example, the OPC UA client can read out the upper limiting value for temperature in the `OverTemperature` node. The path to this node is:

`Root > Object > DeviceSet > [device name] > IOLinkMaster > Diagnostics > Configuration`

The following table lists device-specific configuration parameters.

Table 71: Device-Specific Configuration Parameters

Node Name	Node Class	Access	Default	Description
CurrentHysteresis	Variable	Read	10 mA	Current hysteresis; unit: mA If the current exceeds the limiting value, the current must fall back below the limiting value by the hysteresis to revoke the diagnosis.
OverTemperature	Variable	Read	70 °C	Upper limiting value for the temperature of a port; unit: 0.1 °C
OverVoltageL	Variable	Read	30 V	Upper limiting value for the voltage in supply cable 1; pins with the following functions can be monitored: L+, DI, DO, DIO, IO-Link; unit: mV
OverVoltageL2	Variable	Read	30 V	Upper limiting value for the voltage in supply cable 2; unit: mV
TemperatureHysteresis	Variable	Read	2 °C	Temperature hysteresis; unit: 0.1 °C If the temperature exceeds the limiting value, the temperature must fall back below the limiting value by the hysteresis to revoke the diagnosis.
UnderTemperature	Variable	Read	−25 °C	Lower limiting value for the temperature of a port; unit: 0.1 °C
UnderVoltageL	Variable	Read	18 V	Lower limiting value for the voltage in supply cable 1; pins with the following functions can be monitored: L+, DI, DO, DIO, IO-Link; unit: mV
UnderVoltageL2	Variable	Read	18 V	Lower limiting value for the voltage in supply cable 2; unit: mV
VoltageHysteresis	Variable	Read	300 mV	Voltage hysteresis; unit: mA If the voltage exceeds the limiting value, the voltage must fall back below the limiting value by the hysteresis to revoke the diagnosis.

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

`Root > Object > DeviceSet > [device name] > IOLinkMaster > Diagnostics > PortXX > Configuration`

The following table lists port-specific configuration parameters.

Table 72: Port-Specific Configuration Parameters

Node Name	Node Class	Access	Default	Description
OverCurrentPin1, OverCurrentPin2, OverCurrentPin4	Variable	Read	0	Warning level for current upper limit on pin 1, pin 2 or pin 4; unit: 1 mA 0: monitoring not enabled
UnderCurrentPin1, UnderCurrentPin2, UnderCurrentPin4	Variable	Read	0	Warning level for current lower limit on pin 1, pin 2 or pin 4; unit: 1 mA 0: monitoring not enabled

10.3.4.1.3 Reading Process Data

The OPC UA server provides nodes with process data. For example, the OPC UA client can read out the value on pin 2 of a port in the `Pin2ProcessData` node. The path to this node is:

```
Root > Object > DeviceSet > [device name] > IOLinkMaster > PortXX
> ProcessData
```

ⓘ Note

OPC UA client can only read process output data

The process output data is written by the EtherNet/IP scanner. The OPC UA client can only read process output data.

The following table lists port-specific process data.

Table 73: Port-Specific Process Data

Node Name	Node Class	Access	Description
Pin2ProcessData	Variable	Read	Process data on pin 2
Pin4ProcessData	Variable	Read	Process data on pin 4

10.3.4.1.4 Reading out Measured Values

The OPC UA server provides nodes with calculated measured values. For example, the OPC UA client can read out the calculated total current of supply cable 1 in the `SumCurrentL` node. The path to this node is:

```
Root > Object > DeviceSet > [device name] > IOLinkMaster > Diag-
nostics > Current
```

The following table lists device-specific (calculated) measured values.

Table 74: Device-Specific (Calculated) Measured Values

Node Name	Node Class	Access	Description
SumCurrentL	Variable	Read	Total current in supply cable 1 calculated from individual measurements; unit: mA
SumCurrentL2	Variable	Read	Total current in supply cable 2 calculated from individual measurements; unit: mA
MeanTemperature	Variable	Read	Average value for the temperature of the assembly, calculated from the temperature values measured individually on the three chips; unit: °C

Node Name	Node Class	Access	Description
MeanVoltageL	Variable	Read	Average voltage in supply cable 1; unit: mV
MeanVoltageL2	Variable	Read	Average voltage in supply cable 2; unit: mV

The OPC UA server provides nodes with measured values for each port and each individual pin. The path to this node is:

`Root > Object > DeviceSet > [device name] > IOLinkMaster > Diagnostics > PortXX > Current`

The following table lists port-specific measured values.

Table 75: Port-Specific Measured Values

Node Name	Node Class	Access	Description
CurrentPin1, CurrentPin2, CurrentPin4	Variable	Read	Measured current on pin 1, pin 2 or pin 4; unit: mA
TemperaturePin1, TemperaturePin2, TemperaturePin4	Variable	Read	Measured temperature on pin 1, pin 2 or pin 4; unit: °C
VoltagePin1, VoltagePin2, VoltagePin4	Variable	Read	Measured voltage on pin 1, pin 2 or pin 4, unit: mA

10.3.4.1.5 Reading out Diagnostic Information

The OPC UA server provides nodes with diagnostic information. For example, the OPC UA client can read out whether the device has detected an overcurrent on pin 1 of a port in the `DiagnosticsPin1` node. The path to this node is:

`Root > Object > DeviceSet > [device-name] > IOLinkMaster > PortXX > Diagnostics > Flags`

The following table lists port-specific diagnostic information.

Table 76: Port-Specific Diagnostics

Node Name	Node Class	Access	Description
DiagnosticsPin1, DiagnosticsPin2, DiagnosticsPin4	Variable	Read	Diagnostics on pin 1, pin 2 or pin 4; the numerical value contains bit-coded 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: diagnostics inactive 1: diagnostics active

10.3.4.1.6 Reading Statistics

The OPC UA server provides nodes with statistical information. For example, the OPC UA client can read out the maximum measured current on pin 1 of a port in the `MaxCurrentPin1` node. The path to this node is:

`Root > Object > DeviceSet > [device-name] > IOLinkMaster > PortXX > Statistics > Current / Temperature / Voltage`

The following table lists port-specific statistical information:

Table 77: Port Specific Statistical Information

Node Name	Node Class	Access	Description
MaxCurrentPin1, MaxCurrentPin2, MaxCurrentPin4	Variable	Read	Maximum current on pin 1, pin 2 or pin 4 since the value was reset; unit: mA
MinCurrentPin1, MinCurrentPin2, MinCurrentPin4	Variable	Read	Minimum current on pin 1, pin 2 or pin 4 since the value was reset; unit: mA
MaxTemperature-Pin1, MaxTemperature-Pin2, MaxTemperature-Pin4	Variable	Read	Maximum temperature on pin 1, pin 2 or pin 4 since the value was reset; unit: °C
MinTemperature-Pin1, MinTemperature-Pin2, MinTemperaturePin4	Variable	Read	Minimum temperature on pin 1, pin 2 or pin 4 since the value was reset; unit: °C
MaxVoltagePin1, MaxVoltagePin2, MaxVoltagePin4	Variable	Read	Maximum voltage on pin 1, pin 2 or pin 4 since the value was reset; unit: mV
MinVoltagePin1, MinVoltagePin2, MinVoltagePin4	Variable	Read	Minimum voltage on pin 1, pin 2 or pin 4 since the value was reset; unit: mV

Diagnostics

11.1 Diagnostics via Indicators

Power Supply Status

The 1L and 2L LEDs indicate the status of the supply voltages.

Table 78: Supply Voltage Status, 1L and 2L

LED	Color	State	Description
1L	Duo LED, red/green		
	Green	On	1L supply voltage OK
	Red	On	1L undervoltage (voltage between 11 V and 18 V)
	Red	Flashing	1L overvoltage (voltage above 30 V)
	Off	Off	No 1L supply voltage
2L	Duo LED, red/green		
	Green	On	2L supply voltage OK
	Off	Off	No 2L supply voltage

System Status

The SYS LED indicates the status of the system (product).

Table 79: System Status

LED	Color	State	Description
SYS (system status)	Duo LED, yellow/green		
	Green	On	System status: OK
	Yellow	On	Firmware update is active
	Off	Off	No power supply

Status of the Field-Side Functions

The FLD LED indicates the status of the field-side functions.

Table 80: Field LED

LED	Color	State	Description
FLD	Duo LED, green/yellow (yellow = simultaneously red and green)		
	Green	On	Normal operating state
	Green	Flashing (1 Hz)	Force mode is active
	Yellow	On	Configuration error
	Off	Off	Non-operational; no voltage

Application Status

The APL LED indicates the status of the application.

Table 81: APL LED

LED	Color	State	Description
APL	Duo LED, red/green/yellow (yellow = simultaneously red and green)		
	Off	Off	LED without function

EtherNet/IP Adapter Status

The MS and NS LEDs indicate the status of the EtherNet/IP module.

The LNK and ACT LEDs indicate the Ethernet status.

Table 82: Status of the EtherNet/IP module

LED	Color	State	Description
MS (module status)	Duo LED, red/green		
	Green	On	**Module in operation:** The module is in operation and working correctly.
	Green	Flashing (1 Hz)	**Standby:** The module has not been configured.
	Green/red/green	Rapid flashing: green/red/green	**Self test:** The module runs through a self test after it is switched on. The following sequence occurs during the self test: • NS LED off • MS LED lights up green for about 250 ms, turns red for about 250 ms and then lights up green again (and continues to do so until the test is completed). • NS LED lights up green for about 250 ms, turns red for about 250 ms and then goes out (and remains off until the test is completed).
	Red/green/off	Flashing sequence: red/green/off	**Flashing sequence:** The flashing sequence identifies the adapter visually. The scanner can start the flashing sequence in identity object 1 of the adapter. The MS LED and NS LED go through the flashing sequence simultaneously.
	Red	Flashing (1 Hz)	**Serious recoverable error:** The module has identified an error that is serious but can be fixed – for example, an incorrect or inconsistent configuration may be classified as a serious recoverable error.
	Red	On	**Serious unrecoverable error:** The module has identified an error that is serious and cannot be fixed.
	Off	Off	**Switched off:** The module is switched off.
NS (Network status)	Duo LED, red/green		
	Green	On	**Connected:** An IP address is configured, at least one CIP connection (of any transport class) has been established, and, for an Exclusive Owner connection, the time limit has not been exceeded.
	Green	Flashing (1 Hz)	**No connection:** An IP address has been configured, but no CIP connections have been established, and, for an Exclusive Owner connection, the time limit has not been exceeded.
	Green/red/off	Rapid flashing: green/red/off	**Self test:** The module runs through a self test after it is switched on. See the description of the “MS” LED and the description of the “Self test” status.
	Red/green/off	Flashing sequence: red/green/off	**Flashing sequence:** The flashing sequence identifies the adapter visually. The scanner can start the flashing sequence in

LED	Color	State	Description
			identity object 1 of the adapter. The MS LED and NS LED go through the flashing sequence simultaneously.
	Red	Flashing (1 Hz)	**Connection timeout:**An IP address is configured, and, for an Exclusive Owner connection for which this module is the destination, the time limit has been exceeded. The NS LED is not permanently reset to green until all Exclusive Owner connections whose time limits were exceeded are reestablished.
	Red	On	**Duplicate IP:** The module has detected that its IP address is already being used.
	Off	Off	**Switched off, no IP address:** The module has no IP address or is switched off.

Table 83: EtherNet/IP Module LED States

LED State	Definition
Flashing (1 Hz)	The LED switches on and off in phases at a frequency of about 1 Hz: on for 500 ms and then off for 500 ms.
Rapid flashing green/red/green	The MS LED or NS LED lights up green for 250 ms, then red for 250 ms, then green again (until the test is completed).
Flashing sequence red/green/off	The MS LED and NS LED both light up red for 500 ms, then light up green for 500 ms, then go out for 500 ms. The flashing sequence repeats at least six times.

Table 84: Ethernet Status

LED	Color	State	Description
LNK (Link)	LED green		
	Green	On	The module is connected to the Ethernet.
	Off	Off	The module is not connected to the Ethernet.
ACT (Activity)	LED yellow		
	Yellow	Flickering (load-dependent)	The module is sending/receiving Ethernet frames.
	Off	Off	The module is not sending/receiving Ethernet frames.

Table 85: LED States – Ethernet

LED State	Definition
Flickering (load-dependent)	The LED indicates high ETHERNET activity by switching on and off at a frequency of 10 Hz: “On” for 50 ms and then “Off” for 50 ms. The LED indicates low ETHERNET activity by switching on and off at irregular intervals.

Bluetooth Status

The Bluetooth® LED is integrated into the Bluetooth® antenna and indicates the connection status.

Table 86: LED States ®

LED	Color	State	Description
BT	Duo LED, blue/red		
	Blue	On	Bluetooth® connection established
	Off	Off	Bluetooth® inactive

IO-Link Port Status

LEDs 0 (port X01), 2 (port X02), 4 (port X03), ..., 14 (port X08) indicate the status of the IO-Link Master or digital input/output channel A.

LEDs 1 (port X01), 3 (port X02), 5 (port X03), ..., 15 (port X08) indicate the status of the digital input/output channel B.

Table 87: IO-Link Port Status (Class A)

LED	Color	State	Description
0, 2, 4, ... IO-Link Port Channel A (pin 4)	Duo LED, yellow/red/green (yellow = simultaneously red and green)		
	yellow	On	Status of digital input/output channel A: 1
	Off	Off	Status of digital input/output channel A: 0
	green	On	IO-Link communication active
	green	Flashing 1 Hz	No IO-Link communication or incorrect IO-Link device
	red	On	Overload, short circuit (pin 4 and pin 3)
	red	Flashing 1 Hz	Overload, sensor supply short circuit (pin 1 and pin 3)
1, 3, 5, ... IO-Link Port Channel A (pin 2)	Duo LED, yellow/red (yellow = simultaneously red and green)		
	yellow	On	Status of digital input/output channel B: 1
	Off	Off	Status of digital input/output channel B: 0
	red	On	Overload, short circuit (pin 2 and pin 3)
	red	Flashing 1 Hz	Overload, sensor supply short circuit (pin 1 and pin 3)

11.2 Diagnostics via EtherNet/IP

The module contains the event log object with information on IO-Link events. The controller can read the attributes of the event log object in order to get the “Event Qualifier” and “Event Code” of an IO-Link event. A CIP instance is assigned to each IO-Link port.

Event Log Object 65 (0x41)

- Instance 0 (class attribute):

The event log object contains information on IO-Link events.

Table 88: Event Log Object 65 (0x41) Class Attributes

Attribute	Name	n/a	Access	Data Type	Description	Default
1	Version	n/a	Get	UINT	Version of this object	1
0	Max. instance	n/a	Get	UINT	Number of IO-Link ports	1 – 8
32	Time format	n/a	Get	USINT	Data type identifier of the time format Only the STIME data type is supported.	204 (0xCC) = STIME
33	Present time	n/a	Get	USINT	Default for time value Applies to all instances.	0

- Instances 100, 101, ... (instance attribute):

The following table shows the assignment of CIP instances to IO-Link ports.

Table 89: Mapping CIP Instances to IO-Link Ports

IO-Link Port	CIP Instance
1	100
2	101
3	102
...	...

The following table describes the attributes of instances 100, 101 etc.

Table 90: Instance Attributes of Event Log Object 65 (0x41)

Attribute	Name	n/a	Access	Data Type	Description	Default
2	State	V	Get	USINT	Status of this instance 0: does not exist 1: stopped 2: empty 3: present 4: full/overwrite 5: full/stop 6–255: reserved	-
9	Logged Data Configuration	n/a	Get, Set	BYTE	Determines what data is saved in the event log. Bit 0 = 0: log event without time value Bit 0 = 1: log event with time value Bits 1–7: reserved (always 0)	0
10	Log Full Action	n/a	Get, Set	USINT	Determines what to do when a new event is detected and the log is full. 0: stop 1: scroll 2–255: reserved	1
11	Duplicate Event Action	n/a	Get, Set	USINT	Determines what to do if a duplicate event is detected. 0: ignore 1: add 2–255: reserved	1
12	Event/Data Log Maximum Size	V	Get	UDINT	Max. number of entries in the event log.	8
13	Event/Data Log Size	V	Get	UDINT	The current number of entries in the event log. Values: 0 to maximum (= value of attribute 12).	0
14	Event/Data Log	V	Get Get Member Remove Member	ARRAY of STRUCT	List of all logged events. An entry contains the IO-Link event qualifier (USINT) and the IO-Link event code (UINT). Attribute 9 determines whether a timestamp (STIME) is stored in addition. The structure of an entry is described below.	0
19	Log Full	V	Get	BOOL	Log full? False: log is not full True: log is full	False

At-tribute	Name	n/a	Access	Data Type	Description	Default
20	Log Contains Entries	V	Get	BOOL	Does the log contain entries? False: log is empty True: log contains events	False
21	Log Overrun	V	Get	BOOL	Log overrun? False: no log overrun True: log overrun	False
22	Sequential Event/Data Access	V	Get	STRUCT	Simple read access to event entries If there are one or more entries in the event log, Get_Attribute_Single reads the first entry, which is then removed from the event log. If there are no entries in the event log, Get_Attribute_Single supplies no data.	–
24	Event Identi-fier Format	n/a	Get, Set	USINT	Format of a log entry 0–3: reserved 4: 24 bits in the format USINT + UINT 5–255: reserved	4

- Attribute 14: structure of an entry:

The value of attribute 9 determines the structure of an entry.

Table 91: Structure of a log entry

Structure of an Entry	Description
USINT	IO-Link event qualifier, always present.
UINT	IO-Link event code, always present.
STIME	System time The system time is only present if attribute 9 bit 0 = 1.

- Services:

Table 92: Event log object 65 (0x41) services

Service Code	Service Name	Class Level	Instance Level	Description
0x05	Reset	–	Yes	Reset
0x0E	Get Attribute Single	Yes	Yes	Read one attribute
0x10	Set Attribute Single	–	Yes	Write one attribute
0x18	Get Member	–	Yes	Read entry
0x1B	Remove Member	–	Yes	Delete entry

11.3 Diagnostics via IO-Link

An IO-Link event contains an “Event Qualifier” and an “Event Code“. The “Event Qualifier” indicates whether the IO-Link event came from the master or the device.

Event Qualifier

The event qualifier provides bit-coded information on the event.

Figure 30: Event qualifier

Table 93: Event Qualifier

Bit	Name	Description
Bits 6–7	Mode	0: reserved 1: single event 2: event disappears 3: event appears
Bits 4–5	Type	0: reserved 1: notification 2: warning 3: error
Bit 3	Source	0: device (remote) 1: master/port
Bits 0–2	Instance	0: unknown 1–3: reserved 4: application 5–7: reserved

IO-Link Master Event Codes

Table 94: IO-Link Master Event Codes

Event Code	Description	Type	Corrective Action
0x0000	No malfunction	Notification	No need for action
0x1800	No IO-Link device (communication); communication with IO-Link device lost	Error	Check of whether IO-Link device is connected
0x1801	Startup parameterization error	Error	Check parameters
0x1802	Discrepancy during validation: incorrect VendorID	Error	Use correct IO-Link device type
0x1803	Discrepancy during validation: incorrect DeviceID	Error	Use correct IO-Link device type
0x1804	Short circuit on pin C/Q (pin 4)	Error	Check installation
0x1805	Overtemperature (on the port)	Error	Check temperature and load
0x1806	Short circuit on pin 1 (1L+ power supply)	Error	Check installation
0x1807	Overcurrent on pin 1 (1L+ power supply)	Error	Check power supply
0x1808	IO-Link device event overrun	Error	Check IO-Link device
0x1809	Backup inconsistency: insufficient memory (2048 octets)	Error	Delete data storage by reconfiguring the port
0x180A	Backup inconsistency: identity error	Error	Delete data storage by reconfiguring the port
0x180B	Backup inconsistency: data storage, unspecified error	Error	Delete data storage by reconfiguring the port
0x180C	Backup inconsistency: upload error	Error	Check IO-Link master, check connection to IO-Link device

Event Code	Description	Type	Corrective Action
0x180D	Parameter inconsistency: download error	Error	Check IO-Link device, check connection to IO-Link master
0x180E	Class B: undervoltage on pin 2 (2L+ power supply)	Error	Check power supply
0x180F	Class B: short circuit on pin 2 (2L+ power supply)	Error	Check installation and load
0x1810	Short circuit on pin 2 (DIO)	Error	Check installation and load
0x1811	Short circuit on pin 4 (DIO)	Error	Check installation and load
0x1812	Overcurrent on pin 2 (DIO)	Error	Check load and installation
0x1813	Overcurrent on pin 4 (DIO)	Error	Check load and installation

IO-Link Device Event Codes (General)

The following table lists standard IO-Link-Device event codes. For device-specific event codes or corrective action, consult the manual of the IO-Link device used.

Table 95: IO-Link Device Event Codes (General)

Event Code	Description	Type	Corrective Action
0x0000	No malfunction	Notification	No need for action
0x1000	General malfunction (unknown error)	Error	See the manual of the IO-Link device used
0x1800 – 0x18FF	Manufacturer-specific	–	See the manual of the IO-Link device used
0x4000	Temperature error – overload	Error	Check temperature, determine cause of overload
0x4210	IO-Link device: overtemperature	Warning	Eliminate cause of heat
0x4220	IO-Link device: undertemperature	Warning	Insulate IO-Link device
0x5000	IO-Link device: hardware error	Error	Replace IO-Link device
0x5010	Component: malfunction	Error	Repair or replace
0x5011	Loss of non-volatile memory	Error	Check batteries
0x5012	Batteries weak	Warning	Replace batteries
0x5013	HMI button pressed	Notification	-
0x5100	General power supply error	Error	Check power supply
0x5101	Fuse blown/open	Error	Replace fuse
0x5110	Primary power supply: overvoltage	Warning	Check the tolerance of the 1L+ voltage
0x5111	Primary power supply: undervoltage	Warning	Check the tolerance of the 1L+ voltage
0x5112	Secondary supply voltage: error (port class B)	Warning	Check the tolerance of the 2L+ voltage
0x6000	IO-Link device: software error	Error	Check firmware version
0x6320	Parameter error	Error	Check data sheet and values
0x6321	Parameter missing	Error	Use data sheet for check
0x6350	Parameters modified	Error	Check configuration
0x7700	Lower-level IO device: wire break	Error	Check installation
0x7701 – 0x770F	Lower-level IO device 1 … 15: wire break	Error	Check installation
0x7710	Short circuit	Error	Check installation
0x7711	Reference potential: error	Error	Check installation
0x8C00	Technology-specific application error	Error	Reset IO-Link device
0x8C01	Simulation active	Warning	Check operating mode

Event Code	Description	Type	Corrective Action
0x8C10	Process variable: range overrun – process data indeterminate	Warning	Check IO-Link device configuration
0x8C20	Measurement range overrun	Error	Check application
0x8C30	Process variable: range underrun – process data indeterminate	Warning	Check IO-Link device configuration
0x8C40	Maintenance required	Warning	Clean
0x8C41	Maintenance required	Warning	Refill
0x8C42	Maintenance required	Warning	Replace wear parts
0x8CA0 – 0x8DFF	Manufacturer-specific	–	See the manual of the IO-Link device used
0xB000 – 0xB0FF	Safety extensions	–	See the manual of the IO-Link device used
0xB100 – 0xBFFF	Profile-specific	–	See the manual of the IO-Link device used
0xFF91	Interne data storage upload request	(Individual) notification	See the manual of the IO-Link device used
0xFFB9	Error during retry	Error	See the manual of the IO-Link device used
Every other code	Reserved	–	See the manual of the IO-Link device used

Service

12.1 Resetting to Factory Settings

The device can be reset to the factory settings. Use the WAGO I/O Field Webserver for this purpose.

You can find information on the procedure under Parameterizing the Module via the WAGO I/O Field Webserver > **Resetsetting the Module to the Factory Settings [▶ 102]**.

12.2 Updating Firmware

The device's firmware can be updated. Use the WAGO I/O Field Webserver for this purpose.

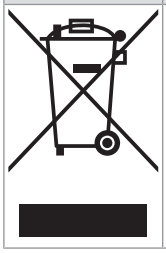
You need the firmware file corresponding to the module type. The name of the firmware file is always `FWUPDATE.zip`; you can store it in a folder with the name of the module (e.g., 0765-4501).

You can find information on performing firmware updates under Parameterizing the Module via the WAGO I/O Field Webserver > **Updating Firmware [▶ 100]**.

Decommissioning

13.1 Entsorgung und Recycling

Table 96: WEEE Mark

Logo	Description
	Electrical and electronic equipment may not be disposed of with household waste. This also applies to products without this mark.

Electrical and electronic equipment contain materials and substances that can be harmful to the environment and health. Electrical and electronic equipment must be disposed of properly after use. Environmentally friendly disposal benefits health, protects the environment from harmful substances in electrical and electronic equipment and enables sustainable and efficient use of resources.

- Observe national and local regulations for the disposal of batteries, packaging and electrical and electronic equipment.
- Clear any data stored on electrical and electronic equipment.
- Remove any batteries or memory cards installed in electrical and electronic equipment.
- Dispose of all types of packaging to ensure a high level of recovery, reuse and recycling.
- Have electrical and electronic equipment sent to a local collection point.
- The guidelines 2006/66/EG, PPWD 2018/852/EU and WEEE 2012/19/EU apply throughout Europe. National directives and laws may vary.

Appendix

14.1 Installation Regulations Specified by Approvals

Because the following information refers to language-specific regulations, standards or certifications applicable to the specific installation and operation location, it is presented in the respective original language.

EU Declaration of Conformity

Hereby, WAGO Kontakttechnik GmbH & Co. KG declares that the radio equipment type 0765-4501/0100-0000 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:
www.wago.com /0765-4501/0100-0000.

FCC/ISED

Legal information:

Radiofrequency radiation exposure Information: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

NOTICE: This device complies with Part 15 of the FCC Rules and contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and

2. this device must accept any interference received, including interference that may cause undesired operation.

L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et

2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modifications made to this equipment not expressly approved by WAGO Kontakttechnik GmbH & Co. KG may void the FCC authorization to operate this equipment.

14.2 Operational Description

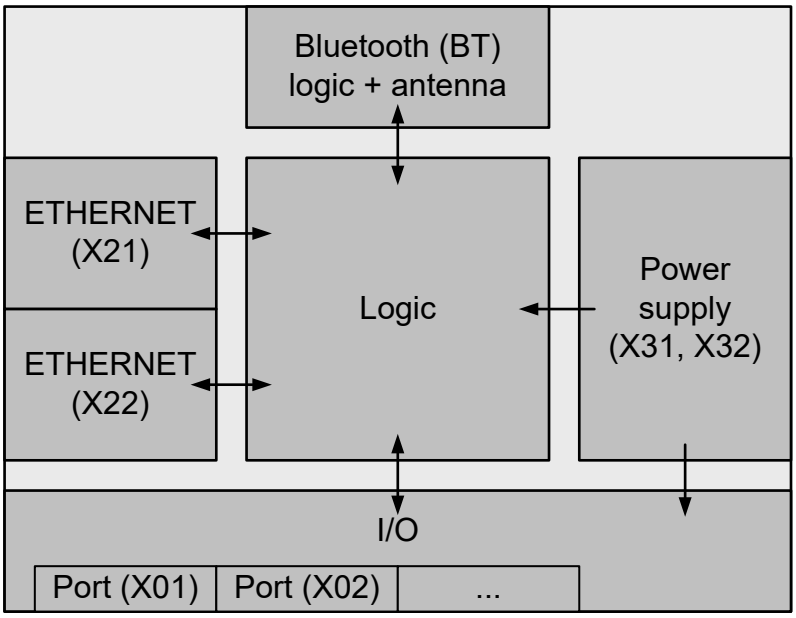
Product description

The product 0765-4501/0100-0000 is used to capture field signals on sensors, actuators and hubs which have been sent or received by a higher-level controller and output them via IO-Link.

Description of operation (FCC)

The product, a fieldbus module in the IP67 housing, serves the acquisition and output of data via sensors and actuators for the industrial control technology. The integrated Bluetooth® interface of the product allows the parameterization, operation, diagnosis, and monitoring using a mobile device and the WAGO App I/O Field.

The following figure shows the block diagram of the module.



Bluetooth® Transmitter

Table 97: Bluetooth® Transmitter

Technology used	Bluetooth® Low Energy
Modulation	GFSK
Data rate	1 Mbit/s
Work frequency	2402 ... 2480 MHz
Maximum power including tune up tolerance	Output power: +8 dBm
	Tolerance: +2 dBm / –3 dBm
Antenna type	PCB monopole
Maximum antenna gain	1.25 dBi

We declare that we meet the EN 62479 standard with respect to the limiting value for low powers less than 20 mW. Therefore, the product fundamentally corresponds to the European limiting values for high-frequency radiation.

Product Designs

SlimLine (W × H × D)	35 × 30 × 210 mm
WideLine (W × H × D)	60 × 30 × 210 mm

Temperature range

Table 98: Temperature range

Surrounding air temperature (operation)	–25 °C ... +70 °C
Surrounding air temperature (storage)	–40 °C ... +80 °C
Maximum temperature change	3 K / min

Voltage range

Table 99: Voltage range

Voltage source	24 V DC PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage)
Voltage 1L Voltage 2L	24 V DC, –25 %/+30 % (18 V DC ... 31.2 V DC)
Digital output	Output voltage 24 V DC, 1L powered
Power supply actuator/sensor	Output voltage 24 V DC, 1L powered and 2L powered
Overvoltage category	II (EN 60664-1)

14.3 Protected Rights

- Adobe® and Acrobat® are registered trademarks of Adobe Systems Inc.
- Android™ is a trademark of Google LLC.
- Apple, the Apple logo, iPhone, iPad and iPod touch are registered trademarks of Apple Inc. registered in the USA and other countries. “App Store” is a service mark of Apple Inc.
- AS-Interface® is a registered trademark of the AS-International Association e.V.
- BACnet® is a registered trademark of the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE).
- *Bluetooth*® is a registered trademark of Bluetooth SIG, Inc.
- CiA® and CANopen® are registered trademarks of CAN in AUTOMATION – International Users and Manufacturers Group e.V.
- DALI is a registered trademark of the Digital Illumination Interface Alliance (DiiA).
- EtherCAT® is a registered trademark and patented technology licensed by Beckhoff Automation GmbH, Germany.
- ETHERNET/IP™ is a registered trademark of the Open DeviceNet Vendor Association, Inc (ODVA).
- EnOcean® is a registered trademark of EnOcean GmbH.
- Google Play™ is a registered trademark of Google Inc.
- IO-Link is a registered trademark of PROFIBUS Nutzerorganisation e.V.
- KNX® is a registered trademark of the KNX Association cvba.
- Linux® is a registered trademark of Linus Torvalds.
- LON® is a registered trademark of the Echelon Corporation.

- Modbus® is a registered trademark of Schneider Electric, licensed for Modbus Organization, Inc.
- OPC UA is a registered trademark of the OPC Foundation.
- PROFIBUS® is a registered trademark of the PROFIBUS Nutzerorganisation e.V. (PNO).
- PROFINET® is a registered trademark of the PROFIBUS Nutzerorganisation e.V. (PNO).
- QR Code is a registered trademark of DENSO WAVE INCORPORATED.
- Subversion® is a trademark of the Apache Software Foundation.
- Windows® is a registered trademark of Microsoft Corporation.

List of Tables

Table 1 Scope of Applicability ... 7
Table 2 Complete instructions for use ... 7
Table 3 Legend for “View” Figure ... 15
Table 4 Supply voltage ... 17
Table 5 IO-Link (class A) ... 17
Table 6 ETHERNET Interfaces ... 18
Table 7 Product ... 19
Table 8 Mechanical Data ... 19
Table 9 Connection technology ... 20
Table 10 IO-Link Port (Class A) ... 20
Table 11 Power supply ... 22
Table 12 Electrical Safety ... 23
Table 13 Environmental Conditions ... 23
Table 14 Communication ... 23
Table 15 Communication – EtherNet/IP device ... 23
Table 16 OPC UA Server ... 24
Table 17 Communication – Bluetooth transmitter ... 24
Table 18 Standards and Regulations ... 26
Table 19 Input Process Data – Connections 1 to 4 ... 27
Table 20 Process Data of the Digital Inputs (Port-Based Assignment) ... 29
Table 21 Process Data of the Digital Inputs (Pin-Based Assignment) ... 30
Table 22 Input Process Data – Connections 5 to 8 ... 30
Table 23 Process Data of the Digital Inputs (Port-Based Assignment) ... 32
Table 24 Process Data of the Digital Inputs (Pin-Based Assignment) ... 33
Table 25 Input Process Data – Connections 9 to 12 ... 33
Table 26 Process Data of the Digital Inputs (Port-Based Assignment) ... 35
Table 27 Process Data of the Digital Inputs (Pin-Based Assignment) ... 36
Table 28 Output Process Data – Connections 1 and 2 ... 36
Table 29 Process Data of the Digital Outputs (Port-Based Assignment) ... 39
Table 30 Process Data of the Digital Outputs (Pin-Based Assignment) ... 39
Table 31 Output Process Data of Connections 5 and 6) 765-4501 ... 39
Table 32 Process Data of the Digital Outputs (Port-Based Assignment) ... 42
Table 33 Process Data of the Digital Outputs (Pin-Based Assignment) ... 43
Table 34 Output Process Data – Connections 9 and 10 ... 43
Table 35 Process Data of the Digital Outputs (Port-Based Assignment) ... 46
Table 36 Process Data of the Digital Outputs (Pin-Based Assignment) ... 46

Table 37 Port Qualifier Information ... 47
Table 38 Overview of Parameterization Tools ... 49
Table 39 Parameterization Overview ... 49
Table 40 Function Overview for WAGO I/O Field Webserver and WAGO IO-Link Modules ... 52
Table 41 Additional documentation ... 55
Table 42 Upper Limits for Current on the Individual Pins of the Connections ... 58
Table 43 0765-4501/0100-0000 IO-Link Product – Currents in Supply Cable 1 ... 58
Table 44 0765-4501/0100-0000 IO-Link Product – Currents in Supply Cable 2 ... 59
Table 45 Rules for Supply Cables 1 and 2 ... 59
Table 46 IO-Link Master Parameters ... 63
Table 47 Module Parameters ... 65
Table 48 Port Parameters ... 66
Table 49 Calculation of Port Cycle Time ... 66
Table 50 Connecting an IO-Link Device or Digital Input or Output ... 78
Table 51 Connections ... 82
Table 52 Data on the “Dashboard” Page ... 84
Table 53 Tabs for Port Information and Settings (IO-Link Ports X01, X02 etc.) ... 85
Table 54 Additional Information on the Products Connected to the Selected Port ... 87
Table 55 Possible Values of “State” (Port Status Information) ... 88
Table 56 Meaning of the Individual Bits ... 89
Table 57 Cycle Time of the Master – Bits 6 ... 7 ... 90
Table 58 Port Configuration Settings for IO-Link Devices ... 92
Table 59 “Port Mode” Drop-Down Menu: Selecting the Operating Mode for Pin 4 of the Selected IO-Link Port ... 93
Table 60 IQ Behavior Drop-Down Menu – Configuration of Pin 2 (I/Q) for IO-Link Class A Devices ... 93
Table 61 Possible Values of the Inspection Level Parameter ... 94
Table 62 Possible Values of the Backup Level Parameter ... 94
Table 63 Setting the Inspection Levels and Backup Levels for Device Check during Validation and Backup ... 95
Table 64 Configuration Control Drop-Down Menu ... 98
Table 65 Device Configuration Tab – Parameter Overview ... 99
Table 66 Maintenance Information ... 99
Table 67 Options for Resetting the Module to the Factory Settings ... 102
Table 68 Status of the last Bluetooth® firmware update ... 104
Table 69 Input Options for Forcing for Each Pin of a Port ... 109
Table 70 Identify Devices ... 112
Table 71 Device-Specific Configuration Parameters ... 113
Table 72 Port-Specific Configuration Parameters ... 114

Table 73 Port-Specific Process Data ... 114
Table 74 Device-Specific (Calculated) Measured Values ... 114
Table 75 Port-Specific Measured Values ... 115
Table 76 Port-Specific Diagnostics ... 115
Table 77 Port Specific Statistical Information ... 116
Table 78 Supply Voltage Status, 1L and 2L ... 117
Table 79 System Status ... 117
Table 80 Field LED ... 117
Table 81 APL LED ... 117
Table 82 Status of the EtherNet/IP module ... 118
Table 83 EtherNet/IP Module LED States ... 119
Table 84 Ethernet Status ... 119
Table 85 LED States – Ethernet ... 119
Table 86 LED States ® ... 119
Table 87 IO-Link Port Status (Class A) ... 120
Table 88 Event Log Object 65 (0x41) Class Attributes ... 120
Table 89 Mapping CIP Instances to IO-Link Ports ... 121
Table 90 Instance Attributes of Event Log Object 65 (0x41) ... 121
Table 91 Structure of a log entry ... 122
Table 92 Event log object 65 (0x41) services ... 122
Table 93 Event Qualifier ... 123
Table 94 IO-Link Master Event Codes ... 123
Table 95 IO-Link Device Event Codes (General) ... 124
Table 96 WEEE Mark ... 127
Table 97 Bluetooth® Transmitter ... 129
Table 98 Temperature range ... 130
Table 99 Voltage range ... 130

List of Figures

Figure 1 View ... 15
Figure 2 Circuit Diagram for Each Port ... 18
Figure 3 Derating, 0765-4501/0100-0000 ... 25
Figure 4 Connection Example for 765-4501/0100-0000 Module with Individual Power Supply ... 61
Figure 5 Power Supply Group with 765-4501/0100-0000 – Connection Example 1 ... 62
Figure 6 Power Supply Group with 765-4501/0100-0000 – Connection Example 2 ... 63
Figure 7 Example of Feeding in and Passing on the Supply Voltages ... 73
Figure 8 RJ45 Pin Assignment ... 75
Figure 9 Network Topology (Module Appearance May Differ) ... 76
Figure 10 Schematic Circuit Diagram of the Power Supply ... 77
Figure 11 Dashboard Menu Item, Main Page ... 84
Figure 12 Information Tab, Port XX Menu Item ... 86
Figure 13 Information Tab, Port XX Menu Item ... 87
Figure 14 Port XX Menu Item, Status Tab ... 88
Figure 15 Port XX Menu Item, Process Data Tab ... 91
Figure 16 Port XX Menu Item, Configuration Tab ... 92
Figure 17 Ports X01 ... X08 – Read Access to IO-Link Device ... 96
Figure 18 Ports X01 ... X08 – Read Access to IO-Link at Index 43 and Subindex 0 Unsuccessful (Read Failed) ... 97
Figure 19 Settings Menu Item, Device Configuration Tab ... 98
Figure 20 Settings Menu Item, Maintenance Information Tab ... 99
Figure 21 Settings Menu Item, Firmware Upgrade Tab ... 101
Figure 22 Settings Menu Item, Factory Reset Tab ... 102
Figure 23 Settings Menu Item, Bluetooth Tab ... 103
Figure 24 Sign in Menu Item – Input Screen for Username and Password ... 106
Figure 25 User Administration Menu Item (Initial State) ... 107
Figure 26 User Administration Menu Item ... 108
Figure 27 DIO Forcing Menu Item, “DIO Forcing” Screen ... 109
Figure 28 IOL Forcing Menu Item, “IOL Forcing” Screen ... 110
Figure 29 OPC UA: Device Information Model ... 112
Figure 30 Event qualifier ... 123

WAGO Kontakttechnik GmbH & Co. KG
Postfach 2880 · D - 32385 Minden
Hansastraße 27 · D - 32423 Minden
✉ **info@wago.com**
www.wago.com

Headquaters	+49 571/887 – 0
Sales	+49 (0) 571/887 – 44 222
Order Service	+49 (0) 571/887 – 44 333
Fax	+49 571/887 – 844169