WAGO I/O System Field

8-Channel Digital Output; Profinet; DC 24 V; 2.0 A; 4 × M12 Connection

765-1104/0100-0000

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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.

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Provisions

This documentation applies to the following product:

0765-1104/0100-0000.

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 [▶ 11].

Table 1: Complete instructions for use

Document Type	Contents
Product Manual	Contains all the product-specific information for a product.
Data Sheet	Contains the technical data 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>.

1.2 Intended Use

The product is used to capture digital field signals (e.g., from sensors) that are sent to a higher-level controller, such as a programmable coupler.

The product serves as a decentralized input/output unit in PROFINET I/O networks.

- This product is intended for installation in automation technology systems.
- This product meets the requirements of protection type IP67 and is designed for use in dry indoor spaces.
- This product is intended for use in indoor industrial areas without weather exposure (no direct sunlight; no salt water or salt spray).
- 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. Improper use occurs especially in the following cases:

- Non-observance of the intended use.
- Use without additional protective measures in environments within which dust, corrosive fumes, gases or ionized 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 & 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.
- The hardware or software has been modified by the user or a third party.

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 reference / link to a section in a document
	Cross reference / link to a separate document
	Cross reference / link to a website
	Cross reference / link 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

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.

Figures

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

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 "™" symbols are omitted hereinafter. The trademarks are listed in the Appendix (**Protected Rights [▶ 121]**).

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 PELV or SELV power sources.
- 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. Make sure the pin assignment is correct.
- Only use conductor cross-sections sufficient for the current load.

Protection

- When working on the system (e.g., during maintenance), protect the Facility part concerned 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 40 °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 a PROFINET 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

- PROFINET communication to the higher-level controller
  - Cyclic I/O data
  - Configuration and parameterization via PROFINET
  - Diagnostics and alarms
- Bluetooth® interface for diagnosis and configuration using the WAGO I/O Field and Mobile Device app
- WAGO Webserver I/O Field: Integrated webserver with the configuration, parameterization, diagnostics, testing and firmware update functions
- Forcing function: Forcing output signals, simulating input signals
- Measured values per channel:
  - Output and supply current
  - Supply voltage
  - Temperature measurement
- Monitoring functions per channel:
  - Maximum current
  - Over and undervoltage
  - Over and undertemperature
  - Line break detection
- Total current monitoring
- Protective functions: Shutdown of a pin when the maximum current at this pin is exceeded
- Integrated OPC UA server
- 4 ports with two channels each: 8 digital inputs / outputs
- Pin 2 and pin 4 can be configured as a digital input or output
- Port X01 ... X02 supplied by 1L
- Port X03 ... X04 supplied by 2L

Properties

4.1 View

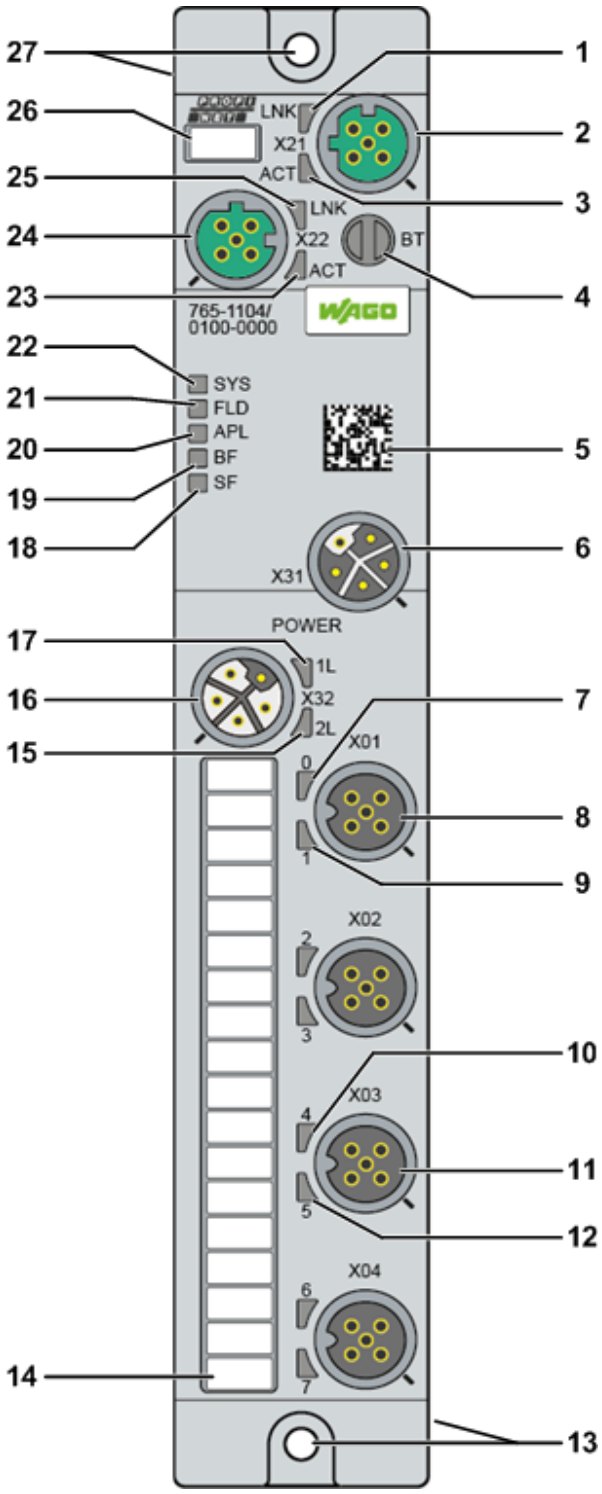


Figure 1: View

Table 2: Legend for "View" Figure

Function	Position	Custom Name	Description
ETHERNET	2	X21	ETHERNET interface, M12, D-coded, PROFINET port 1
	1	LNK (X21)	Link LED for port X21
	3	ACT (X21)	Activity LED for port X21
	24	X22	ETHERNET interface, M12, D-coded, PROFINET port 2
	25	LNK (X22)	Link LED for port X22
	23	ACT (X22)	Activity LED for port X22
Bluetooth®	4	BT	Bluetooth® antenna, including Bluetooth® LED
Indicators	22	SYS	System LED
	21	FLD	Field LED
	20	APL	Application LED
	19	BF	PROFINET bus error LED
	18	SF	PROFINET system error 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)
	16	X32	Power supply output (Power Out)
	15	2L (X32)	2L power supply LED (24 VDC)
	17	1L (X32)	1L power supply LED (24 VDC)
Digital inputs/outputs (1L powered)	8	X01 ... X02	Digital inputs/outputs, ports X01 ... X02, 2-channel, M12, A-coded
	9	1, 3	Port LEDs for ports X01 ... X02, Channel (Pin 2)
	7	0, 2	Port LEDs for ports X01 ... X02, Channel A (Pin 4)
Digital inputs/outputs (2L powered)	11	X03 ... X04	Digital inputs/outputs for ports X03 ... X04, 2-channel, M12, A-coded
	12	5, 7	Port LEDs for ports X03 ... X04, Channel B (Pin 2)
	10	4, 6	Port LEDs for ports X03 ... X04, Channel A (Pin 4)
Marking	14	-	Port marking (WMB Inline and marking strips)
	26	-	Module marking (WMB Inline)
Installation	13	-	Mounting hole for front or side mounting
	27	-	Mounting hole for front or side mounting

4.2 Connections

4.2.1 Power supply

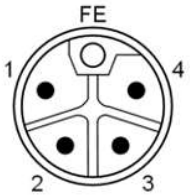
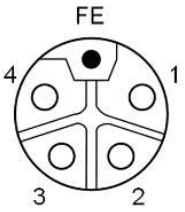
The product is powered through the X31 connection (Power in). Two supply cables can be connected to the plug:

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

The two supply cables are electrically isolated.

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

Table 3: Power supply

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}
M12, L-coded, plug, 5-pin (4 + FE)	M12, L-coded, socket, 5-pin (4 + FE)	FE	FE	Functional ground

⚠ CAUTION

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 [▶ 37]**. There you will find information on the maximum permitted current consumption.

4.2.2 Communication Interfaces

4.2.2.1 Digital inputs/outputs

Table 4: Digital input/output (2-channel, 1L powered)

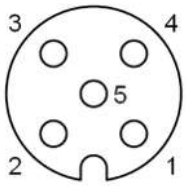
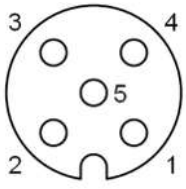
Digital Input/Output X01 - X02	Pin	Signal	Description
 M12, A-coded, socket, 5-pin	1	1L+	Supply voltage, 1L powered
	2	DIO B (DI B/DQ B)	Digital input/output channel B
	3	1L–	Reference potential for 1L +
	4	DIO A (DI A/DQ A)	Digital input/output channel A
	5	-	Not connected

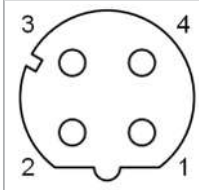
Table 5: Digital input/output (2-channel, 2L powered)

Digital Input/Output X03 - X04	Pin	Signal	Description
 M12, A-coded, socket, 5-pin	1	2L+	Supply voltage, 2L powered
	2	DIO B (DI B/DQ B)	Digital input/output channel B
	3	2L–	Reference potential for 2L +
	4	DIO A (DI A/DQ A)	Digital input/output channel A
	5	-	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.

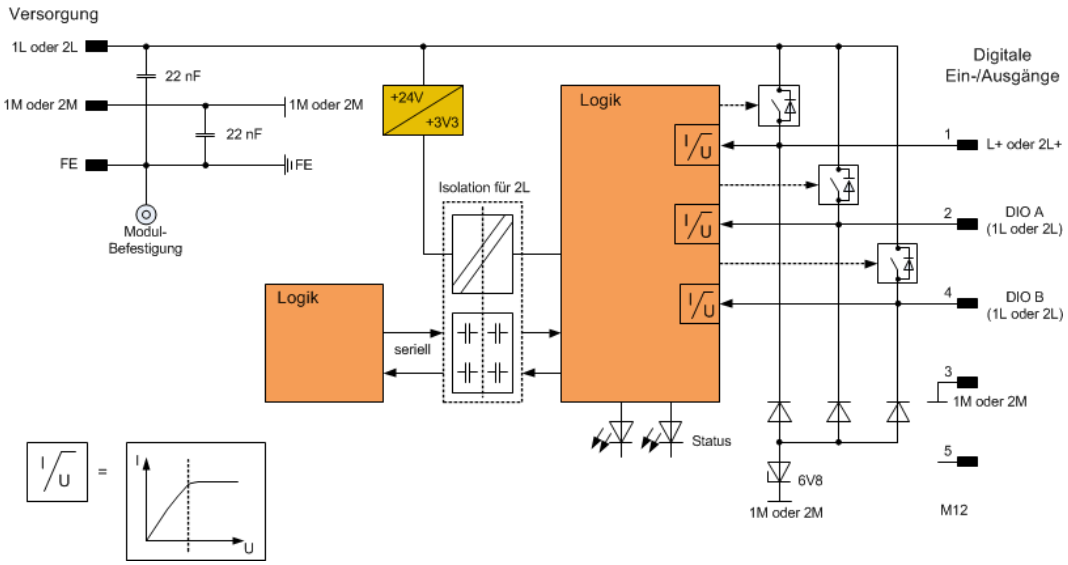


Figure 2: Circuit Diagram for Each Port

4.4 Technical data

4.4.1 Product

Item Number	0765-1104/0100-0000
Product function	8-channel digital input/output
Product name (short)	8 DIO FLD PN 24 VDC 2.0 A
Product name (long)	8-channel digital input/output; PROFINET; 24 V DC; 2.0 A; 4 × M12 connector

4.4.2 Mechanical data

Width	35 mm
Height	30 mm
Length	210 mm
Weight	380 g

Housing	Metal
Mounting type	Screw mount, 2 × M4
Tightening torque	1.2 Nm

4.4.3 Connection Technology

Power connector	PWR IN: M12 L-coded, 5-pin, plug
	PWR OUT: M12 L-coded, 5-pin, socket
PROFINET connection	2 × M12, D-coded, socket, 4-pin
Digital Inputs	4 × M12, A-coded, socket, 5-pin
Tightening torque	1.0 Nm

Digital Input/Output, 1L or 2L Powered

Digital Input	
Characteristic	Type 3 (IEC 61131-2)
Parameters	Digital software input filter: without, 3 ms ... 20 ms
	The input signal change must exceed 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
Indicators	On/off status LED
Digital Output	
Output voltage	24 VDC
	Port X01 and X02: 1L powered
	Port X03 and X04: 2L 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; no reverse current protection of the digital output
Voltage drop through high-side path	Less than 250 mV
Self-protection	Overcurrent, overload and overtemperature
Maximum capacitive load	100 µF parallel to 12 Ω; 10 Hz
Maximum inductive load	1.15 H / 2 A; 0.2 Hz; DC13
Indicators	On/off status LED
Diagnostics	Events: overcurrent, overload and overtemperature
	Output Current
	Temperature
	Line break
Actuator/Sensor Power Supply	
Output voltage	24 VDC
	Port X01 and X02: 1L powered
	Port X03 and X04: 2L powered
Current	Maximum: 4.0 A per channel acc. IEC 61131-2
Circuit	High-side driver; no reverse current protection of the 1L+ output

Self-protection	Overcurrent, overload and overtemperature
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+, 2L+)	Events: overcurrent, overload and overtemperature

4.4.4 Power Supply

Voltage 1L, 2L	24 VDC, –25 %/+30 % (18 VDC ...31.2 VDC)
	Voltages above 34 V can permanently damage the product.
	Voltages below approx. 10 V lead to a product reset.
Undervoltage warning	17.0 V (17.5 V −3 %) ON message,
	18 V (17.5 V +3 %) OFF message
Overvoltage warning	32.1 V (31.2 V +3 %) ON message,
	30.3 V (31.2 V −3 %) OFF message
Module power consumption	1L: 0.2 A (at 24 VDC)
	2L: 0.1 A (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 as a function of temperature
Conductor cross-section	For UL-compliant use: 2.5 mm^2
Reverse voltage protection	Yes

4.4.5 Electrical Safety

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

Requirements

- Use of PELV/SELV power supplies with fault voltage 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

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)

4.4.7 Communication

Communication Interfaces	ETHERNET, Bluetooth®
Protocols	PROFINET, HTTP, OPC UA

PROFINET IO-Device

Input data	8 bytes (= 2 bytes of process data + 5 bytes of IOPS + 1 byte of IOCS)
Output data	8 bytes (= 2 bytes of process data + 1 byte of IOPS + 5 bytes of IOCS)
Alarm types	Diagnostic alarm, process alarm, plug/pull alarm
Identification & Maintenance (I&M)	I&M0-4
Topology recognition	LLDP, SNMP V1, Physical Device Record Objects
Minimum cycle time (MinDeviceInterval)	RT_CLASS_1: 1 ms (min. SendClockFactor 32)
	RT_CLASS_3: 1 ms (min. SendClockFactor 32)
PROFINET IO specification	V2.3
	“Legacy Startup” of specification V2.2 is supported
Conformance Class	C
Data transport layer	ETHERNET II, IEEE 802.3
Interface type	100BASE-TX, potential-free
Autonegotiation, autocrossover	Yes

OPC UA Server

OPC UA Server	Diagnostic functions added in accordance with “IO-Link Companion Specification”
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 encoding	UA binary

Bluetooth Transmitter

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.

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).

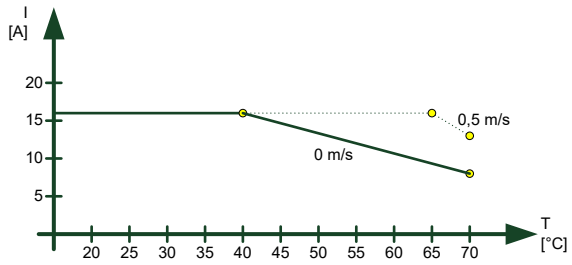


Figure 3: Derating, 0765-1104/0100-0000

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
EN 61131-2	Programmable logic controllers
IEC 61158	PROFINET

4.7 Approvals

The following approvals have been granted for the product:

CE	Conformity marking

c UL us	UL	UL 61010-1 and UL 61010-2-201, “Ordinary Location”	In progress
Bluetooth®	Bluetooth®	This module has an RF transmitter with the following specifications: • Operating frequency: 2402–2480 MHz • Maximum RF output power: < 20 mW	

ⓘ 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

Process Data of the 8 DIO Module

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

Table 19: Process Data of Digital Inputs and Outputs (Port-Based Assignment)

Byte Offset	Bit	Input Process Data (PD_IN)	Output Process Data (PD_OUT)
x	0	Port X01, DI A (Pin 4)	Port X01, DO A (Pin 4)
	1	Port X01, DI B (Pin 2)	Port X01, DO B (Pin 2)
	…	…	…
	6	Port X04, DI A (Pin 4)	Port X04, DO A (Pin 4)
	7	Port X04, DI B (Pin 2)	Port X04, DO B (Pin 2)
x + 1	0 … 7	0	0

Table 20: Process Data of Digital Inputs and Outputs (Pin-Based Assignment)

Byte Offset	Bit	Input Process Data (PD_IN)	Output Process Data (PD_OUT)
x	0	Port X01, DI A (Pin 4)	Port X01, DO A (Pin 4)
	1	Port X02, DI A (Pin 4)	Port X02, DO A (Pin 4)
	2	Port X03, DI A (Pin 4)	Port X03, DO A (Pin 4)
	3	Port X04, DI A (Pin 4)	Port X04, DO A (Pin 4)
	4 … 7	0	0
x + 1	0	Port X01, DI B (Pin 2)	Port X01, DO B (Pin 2)
	1	Port X02, DI B (Pin 2)	Port X02, DO B (Pin 2)
	2	Port X03, DI B (Pin 2)	Port X03, DO B (Pin 2)
	3	Port X04, DI B (Pin 2)	Port X04, DO B (Pin 2)
	4 … 7	0	0

Provider and Consumer Status

Table 21: Provider and Consumer Status

Bits	Name	Description
0 ... 4	-	Reserved, always 0
5 ... 6	Instance	Instance that detected the invalid data; if the value of data status (bit 7) is 1, bits 5 and 6 can be ignored
		00: detected by subslot
		01: detected by slot
		10: detected by IO-Link device
		11: detected by IO controller
7	Data status	Status of the input/output data
		0: bad; data is invalid
		1: good; data is valid

5.2 Forcing

This section describes the forcing functions for the product's input and output data.

In forcing, the actual values of the product's inputs and outputs are "forcibly" overwritten by other values, regardless of their status. 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 Webserver I/O Field
- 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.

Two types of forcing are distinguished:

1. Overwriting input data with replacement values means input simulation
2. Overwriting output data with replacement values means output forcing

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 4 and pin 2.

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 product and a connected controller) responds to specific inputs.

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

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

5.3 Monitoring Functions

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

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

In the module, the measured values are compared to limiting values, and an alarm is triggered if they fall above or below a limiting value (e.g., a temperature limit). The device can send this alarm:
- PROFINET: send alarm to controller
- OPC UA: send event to OPC UA client

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 [▶ 33]**.

5.4 Overload Protection

The product 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 22: Overview of Parameterization Tools

Tool	Description
Control with PROFINET IO-Controller	The **PROFINET IO-Controller** must be configured to exchange process data with the 765 modules. The GSDML file "GSDML-Vx.xx-wago-series765-yyyymmdd.xml" describes the WAGO I/O-System Field module. The PROFINET IO-Controller configuration software imports this GSDML file, and the user can configure and parameterize one or more 765 modules. The user loads the configuration onto the PROFINET controller. The PROFINET controller configures and parameterizes the 765 module via PROFINET.
WAGO Webserver I/O Field	**WAGO Webserver I/O Field** 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®.

Two domains are distinguished for configuration and parameterization:

1. **PROFINET configuration**: PROFINET modules and submodules
2. **Port configuration**: digital input or output

The following table shows which tool can influence which domain.

Table 23: Parameterization Overview

Tool	PROFINET Modules and Submodules	Port configuration
PROFINET IO-Controller	The PROFINET IO-Controller configures the PROFINET modules and submodules of the 765 module.	The IO-Controller sets the parameter the user selects on the basis of the parameters in the GSDML file. These parameters configure each individual port and determine whether the port is used as a digital input or digital output (or is disabled).

Table 23: Parameterization Overview

Tool	PROFINET Modules and Submodules	Port configuration
WAGO Webserver I/O Field	–	Yes
WAGO I/O Field app	–	Yes

Note

Parameters via PROFINET take precedence

Each time PROFINET communication starts up, the IO-Controller transfers the configuration and parameters to the 765 module. Port configuration parameters that were set by the I/O Field Webserver, the I/O Field app or the OPC UA client are overwritten. Parameters via PROFINET take precedence.

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

5.5.2 WAGO IO-Link Configurator

5.5.2.1 Possible Operating Modes

WAGO IO-Link Configurator can be used either as a standalone program or integrated into engineering systems that support TCI. WAGO IO-Link Configurator can also be used via WAGO-I/O-*CHECK*.

5.5.2.2 Device Description File (IO Device Description – IODD)

The "IO Device Description" specification can be downloaded from the website of the IO-Link community at www.io-link.com along with the schema and application examples.

5.5.2.3 IODD Viewer

The IODD is interpreted so as to make operation and monitoring as easy as possible for the user. In the area of PLC programming, it is necessary with most programming systems to have detailed information on the structure and addressing of the parameters, process data and diagnostics. WAGO IO-Link Configurator provides a convenient view of the IODD.

5.5.2.4 IODDfinder

IODDfinder makes it easy to find and get IODDs (see section **IODDfinder [▶ 81]**).

5.5.2.5 Tool Calling Interface (TCI)

Tool Calling Interface (TCI) is an interface between an engineering system and a device tool. It makes it possible to invoke configuration, parameterization and diagnostic software for field products from within an engineering system, giving the user an integrated control interface.
For example, with the Simatic STEP 7, TIA13 or TIA14, device tools can be launched from the hardware configuration by right-clicking them.

TCI only describes the software interface. It does not determine what technology is used for product integration. This allows tools for adaptation to FDT DTM to be connected just like tools that interpret EDDs, as well as Web browsers or tools that are specially developed or adapted for use with TCI.
WAGO IO-Link Configurator is connected directly to the TCI interface, which has the advantage of avoiding the unnecessary time and effort associated with other integration technologies. Furthermore, WAGO IO-Link Configurator can run on any other tools that are connected via TCI.
The two main functions of TCI are the following:

Invocation Interface

The invocation interface serves to launch WAGO IO-Link Configurator from the engineering system and provide it with the information necessary for operation of the connected field products.

Communication Server

WAGO IO-Link Configurator has various options for communication with the supported IO-Link masters and the IO-Link devices connected to them. The most convenient situation is when the engineering system provides a communication channel and WAGO IO-Link Configurator does not need to worry about the communication channel. This communication channel is called a communication server. STEP 7 supports PROFIBUS and PROFINET. PROFIBUS requires so-called dataset routing. Not all products support this. Therefore, WAGO IO-Link Configurator also supports its own communication options, independent of the communication server.

5.5.2.6 TCI Conformance Classes

WAGO IO-Link Configurator supports all TCI conformance classes according to the operating mode and communication system. As a general rule, TCI conformance class 3 is used for PROFIBUS and TCI conformance class 2 for PROFINET.

- TCI Conformance Class 1
  Calling only via the invocation interface; no communication with the field product
- TCI Conformance Class 2
  Calling via the invocation interface and communication via its own communication channels
- TCI Conformance Class 3
  Calling via the invocation interface and communication via the communication server

5.5.2.7 Integration of IO-Link Masters and IO-Link Devices

IO-Link masters are integrated into WAGO IO-Link Configurator by including an IOLM (IO-Link Master) device description file. The IO-Link devices are fully integrated into the configurator via the IODDs (IO Device Descriptions)

5.5.3 WAGO Webserver I/O Field

The WAGO I/O 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 product settings

- User setup and management, as well as user login and logout
- Reset product to factory settings and restart firmware
- Simulating inputs; forcing outputs

Examples of port information include:
- Display current measured values of the digital inputs and outputs: temperature, voltage, current and status on pins 1, 2 and 4
- Display the status information for the entire port
- Configure ports, e.g. set operating mode
- Show process data

Examples of product settings include:
- Select method for obtaining IP address
- Select the origin of the configuration data used
- Display and enter maintenance information
- Reset product 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 24: Function Overview for WAGO Webserver I/O Field for Digital Input/Output Modules

Menu	Tab	Description	Section
Dashboard	-	Displaying product information	
Ports X01, X02 etc.	(All)	Port information and settings for the IO-Link ports X01, X02, ...	**Configure Ports [▶ 62]**
	Information	Display current measured values for the port (temperature, voltage, current and status on pins 1, 2 and 4) and information on the connected IO-Link device	
	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 device	
	Process data	Display process data (input/output)	

Table 24: Function Overview for WAGO Webserver I/O Field for Digital Input/Output Modules

Menu	Tab	Description	Section
Settings	(All)	Product settings	
	Device configuration	Configure parameters for IP connection	**Configuring IP Parameters [▶ 66]**
	Maintenance information	Store maintenance information	**Storing Maintenance Information [▶ 66]**
	Factory reset	Resetting the product to factory settings	**Resetsetting the Module to the Factory Settings [▶ 69]**
	Firmware upgrade	Update Firmware	Updating Firmware
	Bluetooth	Access via Bluetooth	**Configure Bluetooth [▶ 70]**
DIOForcing	-	Forcing digital inputs and outputs	Forcing Digital Inputs and Outputs
User administration	-	Set up and manage users	**Logging Users on and off and Managing Them [▶ 73]**
Sign-in, Sign-out	-	Log users on and off	

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

You can find more information on the WAGO Webserver I/O Field in Section **WAGO Webserver I/O Field [▶ 27]**.

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.

This app allows you to display product information for both fieldbus and IO-Link hubs, make settings and adjust parameters. 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.)
- Guided download of IODDs from the Internet for IO-Link devices (IODDfinder)
- Parameterization of ports (input, input filters, output, substitute value strategy)
- Parameterizing WAGO IO-Link Master
- Forcing outputs (DO)
- Simulation of inputs (DI)

- Importing 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

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 I/O Field app 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 product has the following interfaces and supports the following protocols:

- ETHERNET Interfaces
  - PROFINET
  - HTTP for WAGO Webserver I/O Field
  - TCP for the OPC UA server
  - UDP for WAGO IO-Link Configurator
- Bluetooth® for the WAGO I/O Field app

5.6.1 PROFINET

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

If a value falls above or below a limiting value, e.g., a temperature limit, the module sends and alarm to the controller.

5.6.2 OPC UA Server

The product contains an integrated OPC UA server.

Function Overview

- Read product 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

This is a class A product. It may cause radio interference in residential areas. The installer/operator must take appropriate measures to avoid radio interference.

Observe the following relevant standards for the setup:
- DIN 60204 (Electrical equipment of machines)
- DIN EN 50178 (Electronic equipment for use in power installations)
- EN 60439 (Low-voltage switchgear and control-gear assemblies)

DIN 60204 and DIN EN 50178 also set the requirements on power supplies per PELV (protected extra-low voltage) and SELV (safety extra-low voltage) and the requirements on isolation of the supply cables.

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

Data transmission and processing can be disrupted by random influences, such as temporary electromagnetic disturbances. Proper design and assembly 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 in 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 putting control components and control networks behind a firewall.
- In the control components, close all ports and services (e.g., for WAGO-I/O-*CHECK* and CODESYS) not required by your application to minimize the risk of cyber attacks and to enhance cybersecurity.
  Only open the ports and services for the duration of the commissioning/configuration.
- 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 before first use.
- 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.

Table 25: 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

Product damage if permissible current feedthrough exceeded

Damage to the product and/or other products 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, actuators or hubs 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 [▶ 25]**) 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 currents 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 that 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 and hubs via 1L
- Power supply of successive devices via 1L

Supply cable 2:
- Power supply of all connected sensors/actuators and hubs 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 sum of the currents through pins 1, 2 and 4 must not exceed the maximum permissible current of pin 3, since all the currents of pins 1, 2 and 4 return 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 starting from pin 1 (signal 1L+) of supply voltage connection PWR IN (X31) through the product to pin 3 (signal 1L-) of PWR IN. This is shown in blue in the current flow figure in section **Circuit Diagram [▶ 17]**.
- Supply cable 2 corresponds to the current flow path starting from pin 4 (signal 2L+) of supply voltage connection PWR IN (X31) through the product to pin 2 (signal 2L-) of PWR IN. This is shown in red in the current flow figure in section **Circuit Diagram [▶ 17]**.

The following rule applies to both supply cables:

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

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 product or other products connected to it 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 [▶ 21]**.

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

1. The current I_{logic} for powering the product's internal electronics (the product is powered via supply cable 1)
2. The currents I_{X0i_1L} for powering the connected products, sensors and actuators through pins 1, 2 and 4 (for each port i)
3. The current I_{X32_1L} that flows through the supply voltage output PWR OUT (X32) to other connected products (current feedthrough)

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

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

The following rule applies to both supply cables:

Rule 2: Current feedthrough limiting

The supply voltage for the products of a supply cable that are connected to the output supply connection PWR OUT is passed on through the product from the input supply connection. The maximum permissible current feedthrough for the respective supply cable is limited by the current load capacity of the plug 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 section **Power supply [▶ 15]** (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 26: 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 1L of the Digital Input/Output Module 765-1104/0100-0000, the currents declared in the following table must be taken into account:

Table 27: Digital Input/Output Module 765-1104/0100-0000 - 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−
I_{logic}	Logic supply
I_{X01_1L}, I_{X02_1L}	Total current for supply cable 1 at digital input/output X0i (i.e., port X01, X02) corresponds to the current $I_{X0i\_pin3\_1L}$ at pin 3 (ground). This current is the sum of the currents at pins 1, 2 and 4 of the digital input/output 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 $I_{module\_1L} = I_{X01\_1L\_3} + I_{X02\_1L\_3}$

For supply cable 2L of the Digital Input/Output Module 765-1104/0100-0000, the currents declared in the following table must be taken into account:

Table 28: Digital Input/Output Module 765-1104/0100-0000 - 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_{X03_2L}, I_{X04_2L}	Total current for supply cable 2 at digital input/output X0i (i.e., port X03, X04) corresponds to the current $I_{X0i\_pin3\_2L}$ at pin 3 (ground). This current is the sum of the currents at pins 1, 2 and 4 of the digital input/output X0i: $I_{X0i\_2L} = I_{X0i\_pin3\_2L} = I_{X0i\_pin1\_2L} + I_{X0i\_pin2\_2L} + I_{X0i\_pin4\_2L}$
I_{module_2L}	Module current $I_{module\_2L} = I_{X03\_pin3\_2L} + I_{X04\_pin3\_2L}$

Operation of the Digital Input/Output Module 765-1104/0100-0000 requires that the rules below for the currents in supply cables 1 and 2 be followed at all times:

Table 29: Rules for Supply Cables 1 and 2

Current	Supply Cable 1	Supply Cable 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)	$I_{X32\_1L} \leq 16\text{ A} - I_{logic} - I_{module\_1L}$	$I_{X32\_2L} \leq 16\text{ A} - I_{module\_2L}$
Ports	Port X01, X02 (henceforth summarized as port X0i with $1 \leq i \leq 2$)	Port X03, X04 (henceforth summarized as port X0i with $3 \leq i \leq 4$)
Supply current on pin 1 (rule 3)	$I_{X0i\_pin1\_1L} \leq 4$ A	$I_{X0i\_pin1\_2L} \leq 4$ 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	$I_{X0i\_pin2\_2L} \leq 2$ A $I_{X0i\_pin4\_2L} \leq 2$ 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	$I_{X0i\_pin2\_2L} \leq 2.4$ A $I_{X0i\_pin4\_2L} \leq 2.4$ A

Table 29: Rules for Supply Cables 1 and 2

Current	Supply Cable 1	Supply Cable 2
Reverse current to pin 3 (ground) (rule 3)	$I_{X0i\_pin3\_1L} \leq 4$ A	$I_{X0i\_pin3\_2L} \leq 4$ A

6.2.2 Requirements on the Power Supply

Power Source

Note

PELV or SELV power source required

Only operate the product with 24 VDC PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage). Failure to comply may result in electric shock.
To power the products, always use two isolated supply cables/power supplies for 1L and 2L. If two separate power supplies are used for this purpose, ensure central grounding (functional ground). This is required if functionally safe switch-off of 2L is intended.

Fuse Protection

The relevant current path must be protected with an external fuse (16 A).

Note

Damage to product

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

6.2.3 Additional Measures

The values of all currents on all pins of all connection (except for pin 3 = ground pin) and the total currents of the two supply cables are measured by the IO-Link 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

We present below one example for the 765-1104/0100-000 product with four digital inputs/outputs for each:

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

Example of Individual Power Supply

This example considers a single 765-1104/0100-0000 module where no additional devices are powered through its PWR OUT connection (X32).

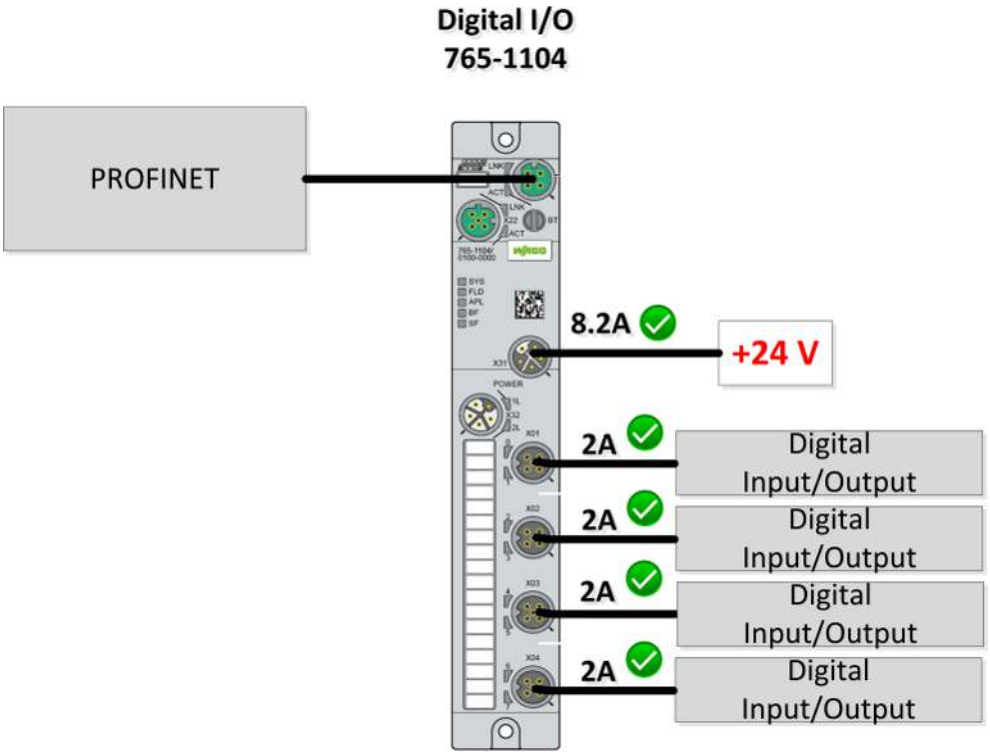


Figure 4: Connect Example with Individual Power Supply (module image may vary)

One digital input/output with a current consumption of max. 2 A is connected to connections X01 to X04 of the module. The module's current consumption is 0.2 A.

Supply cable 1 then has a total current consumption of 4 × 2 A + 0.2 A = 8.2 A.

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

Example of a Power Supply Group via PWR OUT

If you connect another device to the PWR OUT (X32) power supply output, you form a supply group. The maximum permissible current feedthrough that this module can require is 16 A – 8.2 A = 7.8 A.

6.3 Settings Options

6.3.1 PROFINET Parameters

“DIO” (Digital Input Output) Parameters

The following table describes the parameters of the DIO submodule:

Table 30: “DIO” (Digital Input Output) Parameters

Parameter Group	Parameters	Default	Value Range	Description
Digital IO layout configuration	PD layout	0	0: port-based	Order of the process data of the digital inputs and digital outputs: bit 0 = port 1 pin 4, bit 1 = port 1 pin 2, bit 2 = port 2 pin 4, bit 3 = port 2 pin 2, ...
			1: pin-based	Order of the process data of the digital inputs and digital outputs: bit 0 = port 1 pin 4, bit 1 = port 2 pin 4, bit 2 = port 3 pin 4, bit 3 = port 4 pin 4, ... bit 8 = port 1 pin 2, bit 9 = port 1 pin 2, ...
DO substitute configuration	DO substitute configuration	0	0: set low	Set all digital outputs to low level in the event of error
			1: set to defined value	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 sets the substitute value
			2: hold last	Hold digital outputs at their last value in the event of error
	DO substitute value	0	0 ... 65535	Substitute value as a bitmask for the digital outputs if the “Set to defined value” setting is used; The input depends on the “PD layout” parameter. To assign bits 0 to 15 to port and pin, see description of the “PD layout” parameter. Use a binary-to-decimal converter to calculate this value.

Table 30: “DIO” (Digital Input Output) Parameters

Parameter Group	Parameters	Default	Value Range	Description
Force mode setting	Force mode setting	0	0: Enable Force mode	The “Forcing” operating mode is allowed to be used (default)
			1: disable force mode	The “Forcing” operating mode is not allowed to be used
BT interface configuration	BT optical interface	0	0: activation allowed	The Bluetooth interface can be enabled by an optical signal from the WAGO I/O Field app.
			1: activation denied	The Bluetooth interface cannot be enabled by an optical signal.
	Bluetooth timeout [s]	30	5 ... 59	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.
PIN 4 DIO configuration	Port X01 / Power 1L, Port X02 / Power 1L, Port X03 / Power 2L, Port X04 / Power 2L	0	0: DI not inverted (NO normally open)	Pin 4 is a digital input. The input signal is not inverted.
			1: DI (NC normally closed)	Pin 4 is a digital input The input signal is inverted.
			2: DO	Pin 4 is a digital output.
			3: DO static on	Pin 4 is a digital output and switched on (+24 VDC).

Table 30: “DIO” (Digital Input Output) Parameters

Parameter Group	Parameters	Default	Value Range	Description
PIN 4 DI filter configuration	Port X01 / Power 1L, Port X02 / Power 1L, Port X03 / Power 2L, Port X04 / Power 2L	0	0: no filter	No filter active for detecting a signal change of the pin 4 input signal.
			30: 3 ms filter time	Filter time setting for detecting a signal change of the input signal; the filter time is the amount of time the signal must be present in order for a signal change to be detected.
			150: 15 ms filter time	
			200: 20 ms filter time	
PIN 2 DIO configuration	Port X01 / Power 1L, Port X02 / Power 1L, Port X03 / Power 2L, Port X04 / Power 2L	0	0: DI not inverted (NO normally open)	Pin 2 is a digital input. The input signal is not inverted.
			1: DI (NC normally closed)	Pin 2 is a digital input. The input signal is inverted.
			2: DO	Pin 2 is a digital output.
			3: DO static on	Pin 2 is a digital output and switched on (+24 VDC).
PIN 2 DI filter configuration	Port X01 / Power 1L, Port X02 / Power 1L, Port X03 / Power 2L, Port X04 / Power 2L		0: no filter	No filter active for detecting a signal change of the pin 2 digital input signal (default).
			30: 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.
			150: 15 ms filter time	
			200: 20 ms filter time	

6.3.2 Setting the PROFINET Configuration

The PROFINET device has a modular structure. Slot 0 is the PROFINET access point with four submodules. Slot 1 contains the digital input/output module for the process data.

Table 31: PROFINET Modules and Submodules

Slot	Subslot	Submodule	Description
0	1	DAP	Device access point (fixed)
0	32768	PN-IO	PROFINET interface (fixed)
0	32769	Port 1	Port 1 (fixed)
0	32770	Port 2	Port 2 (fixed)
1	1	8 Digital Input Output Module	8 digital inputs/outputs (fixed) 2 input bytes and 2 output bytes

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 ().

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 [▶ 11].
- 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 section Mechanical data [▶ 17].

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 problems.
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.

8.1.9 Shielding Product

Use of shielded cables reduces electromagnetic interference and thus increases signal quality. Measurement errors, data transmission errors and interference due to excessive voltage can be prevented.

Connecting Cable Shield to Ground Potential

Integrated shielding is essential in order to meet the technical specifications regarding measurement accuracy. Connect the cable shielding and ground potential at the inlet to the cabinet or housing. This allows induced interference to dissipate and be kept away from products in the cabinet or housing.

Improving Shielding Performance by Placing the Shield over a Large Area

Greater shielding performance is achieved by a low-impedance connection between shield and ground. For this purpose, connect the shielding over as large a surface area as possible. This is especially recommended for large-scale systems where equalizing currents or high impulse-type currents (e.g., caused by atmospheric discharge) may occur

Keeping Data and Signal Lines Away from Sources of Interference

Lay data and signal lines separate from all high voltage cables and other sources of high electromagnetic emission (e.g., frequency converters or drives).

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 of 0765-xxxx

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 [▶ 37]**.
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.

Power supply 2L is provided to power actuators. It can be used by all products that require a second separate power supply with high power. It can also be passed on to additional devices.

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

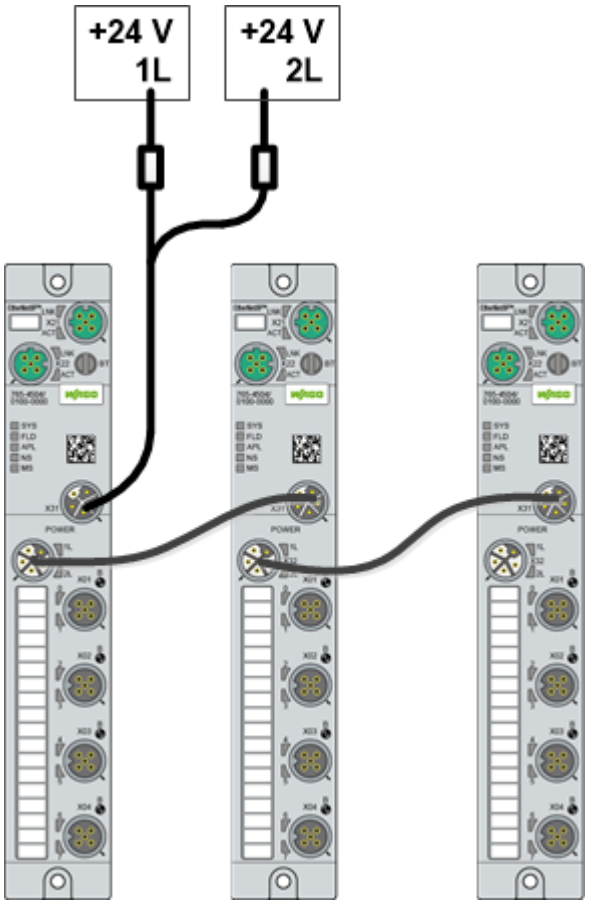


Figure 5: Example of Feeding in and Passing on the Supply Voltages

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 [▶ 33]**.

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 [▶ 21]**.

Example Calculations

You can find example calculations of the maximum permissible current feedthrough in section **Power Supply Examples [▶ 37]**.

The power loss per wire 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	Line resistance

For WAGO 4 × 1.5 mm² supply cables, the cable resistance R_L per wire R_L <= 13.7 Ω/km.

Example of Voltage Drop per Wire 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.

Example of Voltage Drop per Wire with a Current of 16 A on the WAGO 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 4.38 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	Line resistance
l	Cable length
K	Kappa (electrical conductivity of copper)
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 [▶ 18]** apply to the pluggable connectors of the connecting cables.

9.4 Connecting Fieldbus

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 in section **ETHERNET Interfaces [▶ 17]**.

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, proceed as follows to connect it to an RJ45 plug:

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 6: 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 plug 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:

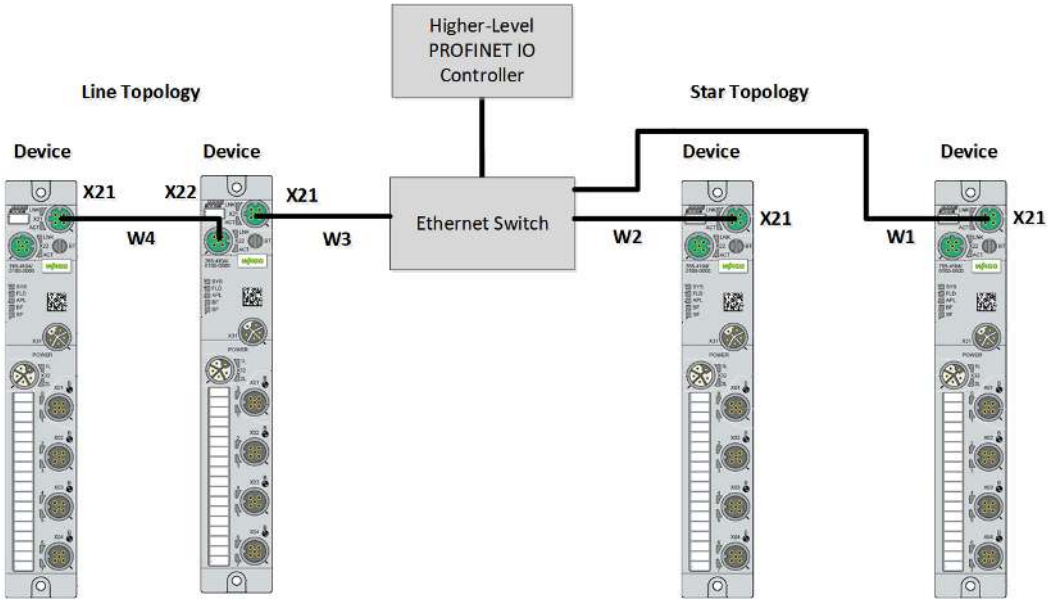


Figure 7: Network Topology (Module Appearance May Differ)

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 section *Rule 3: Ports X01, X02 etc.*

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

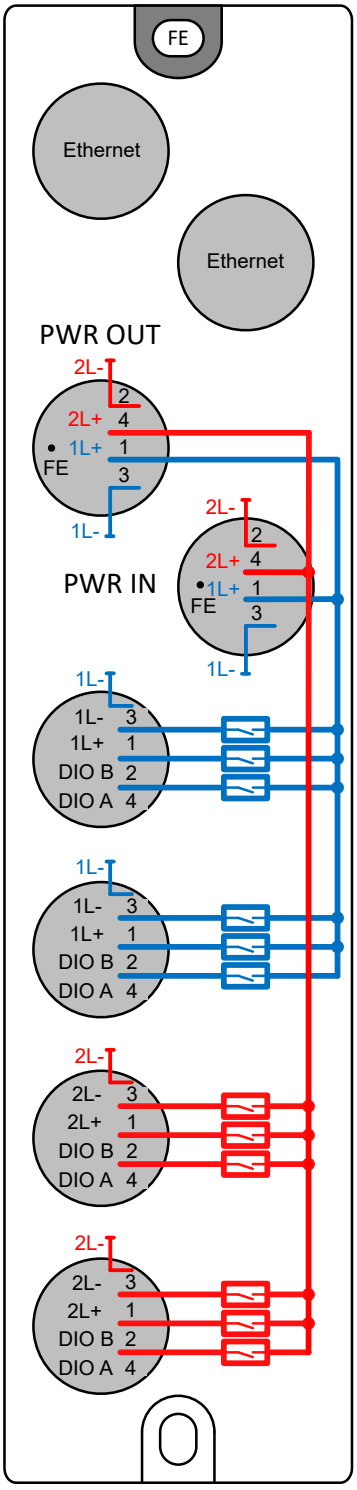


Figure 8: Schematic Circuit Diagram of the Power Supply

The following table shows the connection options for digital inputs and outputs.

Table 32: Connect Digital Inputs/Outputs

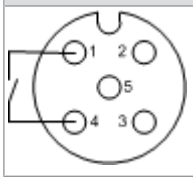
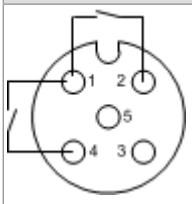
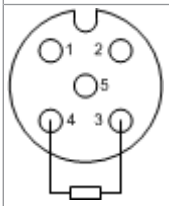
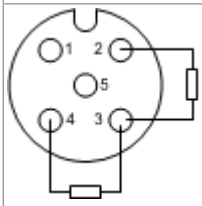
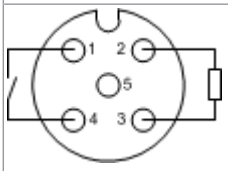
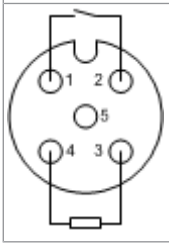
Connection Option	Description
	One digital input on channel A as a 2-conductor termination. Required port configuration: Pin 4 as digital input and pin 2 disabled.

Table 32: Connect Digital Inputs/Outputs

Connection Option	Description
	Two digital inputs on channel A and B as a 3-conductor termination. Required port configuration: pin 4 and pin 2 as a digital input.
	One digital output on channel A as a 2-conductor termination. Required port configuration: Pin 4 as a digital output and pin 2 disabled.
	Two digital outputs on channel A and B as a 3-conductor termination. Required port configuration: pin 4 and pin 2 as a digital output.
	One digital input on channel A and one digital output on channel B as a 3-conductor termination. Required port configuration: Pin 4 as a digital input and pin 2 as a digital output.
	One digital output on channel A and one digital input on channel B as a 3-conductor termination. Required port configuration: Pin 4 as a digital output and pin 2 as a digital input.

Commissioning

10.1 Setting an IP Address

The module requires an IP address so it can be addressed via the ETHERNET network. The module has no IP address when delivered. The module can get the IP address in various ways.

- The PROFINET IO-Controller sets the IP address when PROFINET starts up.
- You can set the IP address permanently or temporarily with the PROFINET engineering tool of the IO controller. Read the documentation of the PROFINET engineering tool.
- You can set the IP address with the “ETHERNET Device Configuration” software as described below. The software is available for download from **https://kb.hilscher.com/display/ETHDEVCFG**.

Setting the IP Address with the “ETHERNET Device Configuration” Software

- Launch the “ETHERNET Device Configuration” software.
- In the menu under **Options** > **Protocols**, verify that the **DCP** option is checked. If the **DCP** option is not checked, check it.
  The software lists all the devices found on the local network. Under **IP Address**, either 0.0.0.0 (i.e., no IP address set) or the IP address set in the product appears.
- Click **Search Devices**.

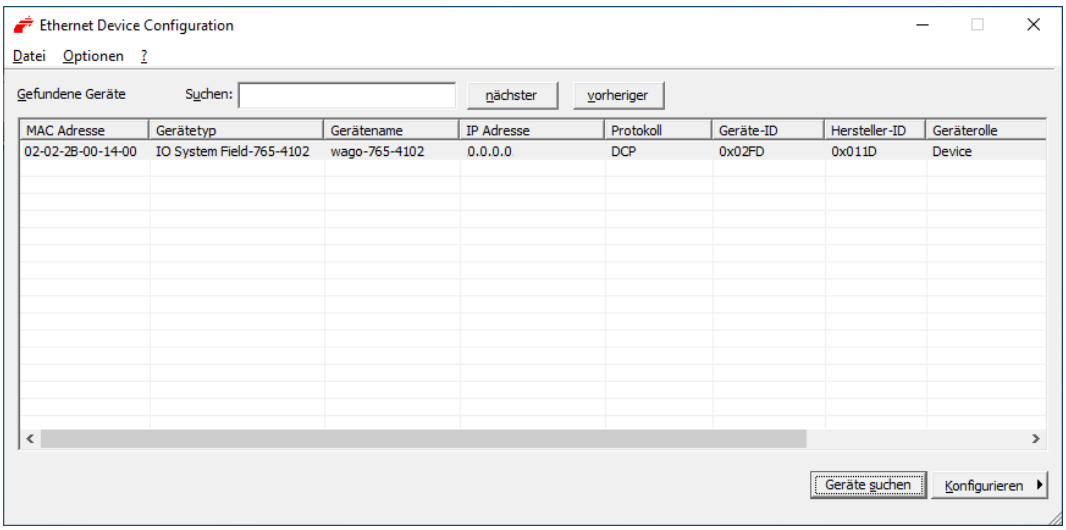


Figure 9: List of the Products Found on the Local Network

- Identify the device, e.g., on the basis of the MAC address or the product type `IO System Field-765-xxxx`.
- Use the mouse cursor to select the corresponding device from the list of devices found.
- Click **Configure** > **Set IP Address**.
  The dialog for setting the IP address appears:

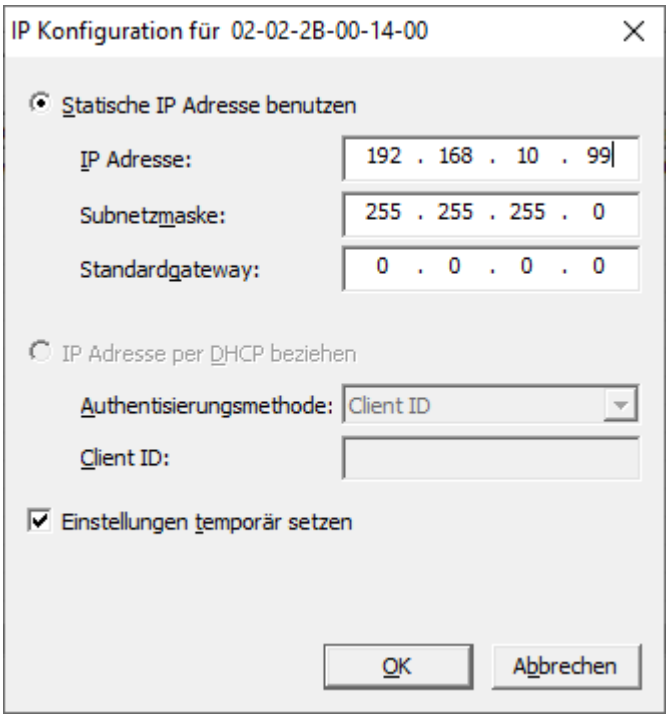


Figure 10: IP Configuration Dialog

- Select the **Use Static IP Address** option.
- Enter the IP address and the subnet mask. Entering the IP address is optional for the standard gateway.
- With **Make Settings Temporarily**, you can specify whether the IP address should be set permanently or temporarily.
- Click **OK**.
  The module is now accessible via the IP address, and you can open WAGO Web-server I/O Field with a browser, for example.

10.2 Parameterization

This section describes the following tools:

- PROFINET
- WAGO Webserver I/O Field
- WAGO IO-Link Configurator
- WAGO I/O Field app
- OPC UA Server

10.2.1 PROFINET

10.2.1.1 Parameterizing the Product via PROFINET

✓ To configure the PROFINET IO-Controller, you need the GSDML file.

1. Import the GSDML file
2. Select the device from the device catalog

3. Configure the ports
4. Set the parameters

⇨ The parameters are imported from the GSDML file.

10.2.1.1.1 Select the Product

Select the product used from the device catalog.

Product: 765-1104

Designation: 8DIO FLD PN DC 24V 2.0A

10.2.1.1.2 Configure the PROFINET Station Name and IP Address

When delivered and after a factory rest, the IO device has no PROFINET product name, and the IP address is 0.0.0.0.

The IO-Device requires a unique PROFINET product name so the IO controller can communicate with the IO device.

Use the engineering software to assign the IO device a PROFINET product name.

The IO controller configures the IP address when PROFINET starts up.

10.2.1.1.3 Parameterizing Ports

Parameterize the ports using the information in section **Setting the PROFINET Configuration [▶ 41]**.

10.2.1.1.4 Parameterizing the Submodule

Parameterize the submodule using the information in section **PROFINET Parameters [▶ 39]**.

10.2.2 WAGO Webserver I/O Field

10.2.2.1 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.

10.2.2.2 WAGO Webserver I/O Field User Interface

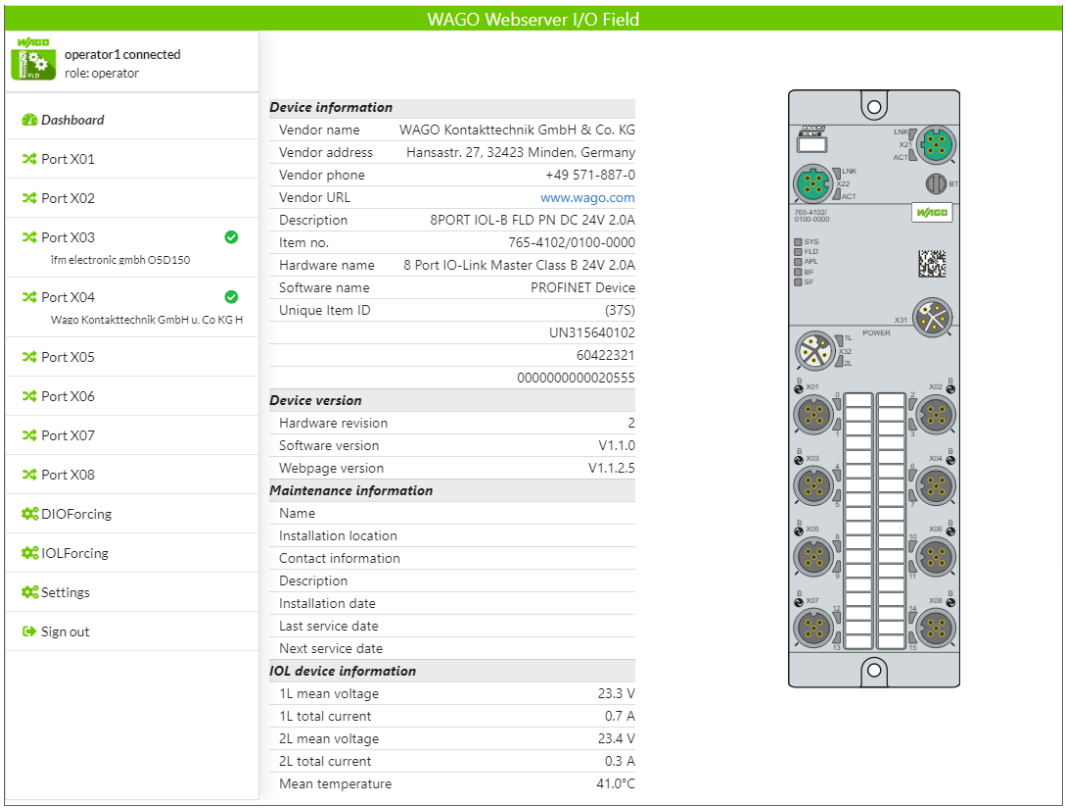


*Figure 11: **Dashboard** Menu Item, Main Page*

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 33: 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)

10.2.2.2.1 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.

10.2.2.2.2 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)

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

10.2.2.3.1 Display Port Information

For each of the digital inputs/outputs of the module (port X01, port X02, etc.), individual port information can be found on the **Information**, **Status**, **Configuration** 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.

The following four tabs are available for each digital input/output:

Table 34: Tab for port information (digital inputs/outputs X01, X02, etc.)

Tab	Description
Information	Displays the current measured values for temperature, voltage and current, as well as the port state, individually for pin 1, pin 2 and pin 4. If an IO-Link device is connected to the digital input/output, its product data is also shown. This tab is pre-configured.
Status	Displays status information for the digital input/output.
Configuration	For displaying and setting port parameters.
Process data	Displays the process data.

10.2.2.3.2 Display Measured Values and Information on Connected IO-Link Devices

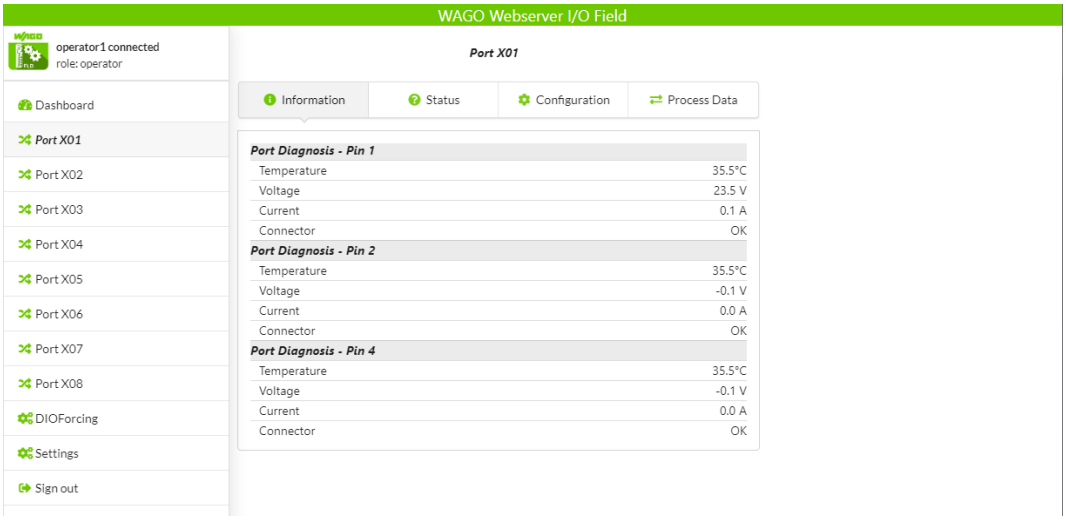


*Figure 12: **Information** Tab, **Port XX** Menu Item*

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

10.2.2.3.3 Display Port Status Information

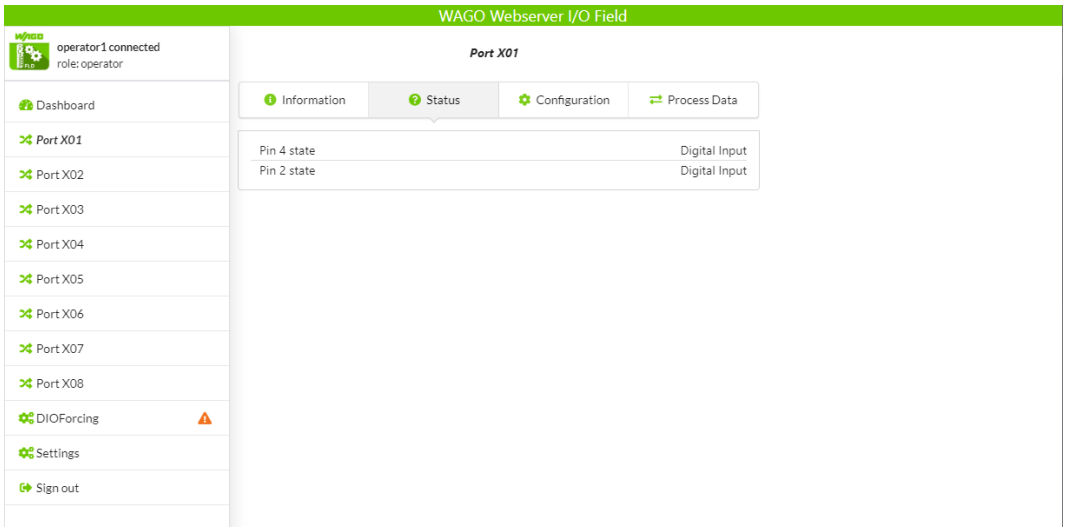


*Figure 13: **Port XX** Menu Item, **Status** Tab*

The **Status** tab shows status information for pins 4 and 2 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 for input/output valid?
- 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?

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.

10.2.2.3.4 State

The current port information of the digital input or output is displayed. Possible values are:

- Digital Input: The port is in digital input mode.
- Digital Output: The port is in digital output mode.

10.2.2.3.5 Display 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.

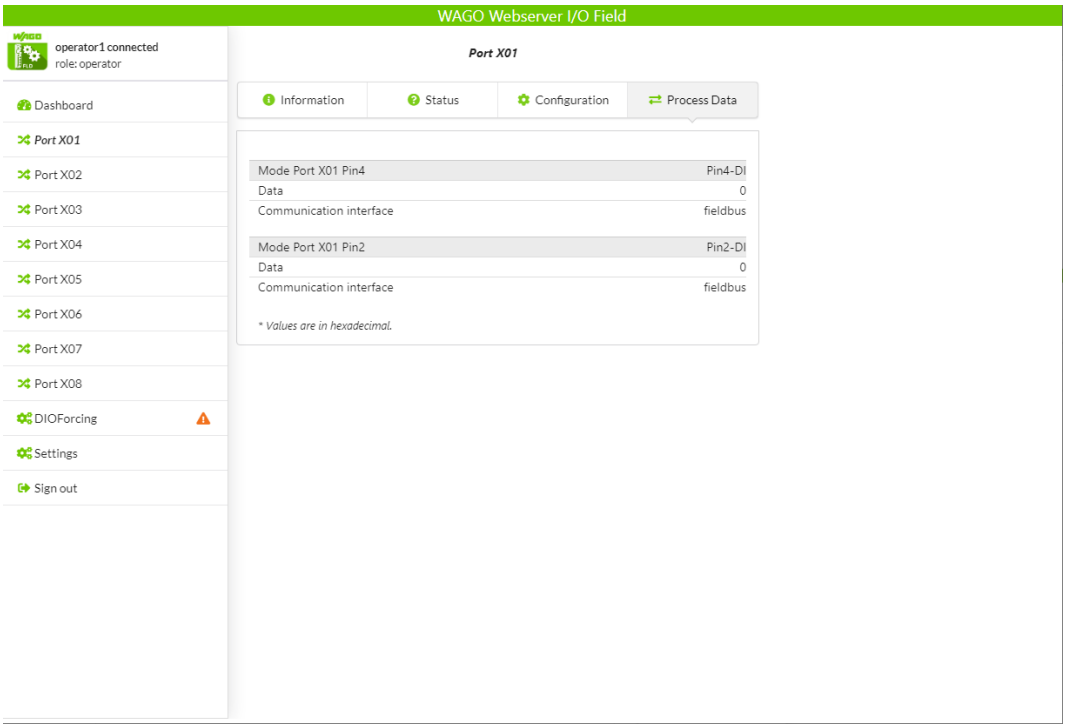


*Figure 14: **Port XX** Menu Item, **Process Data** Tab*

10.2.2.4 Parameterizing the Product via WAGO Webserver I/O Field

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

- Configuring Ports [▶ 62]
- Configuring IP Parameters [▶ 66]
- Storing Maintenance Information [▶ 66]
- Updating Firmware [▶ 68]
- Resetting Module to Factory Settings [▶ 69]
- Configuring Bluetooth [▶ 70]
- Logging Users on and off and Managing Them [▶ 73]
- Forcing Digital Inputs and Outputs [▶ 75]

10.2.2.4.1 Configure Ports

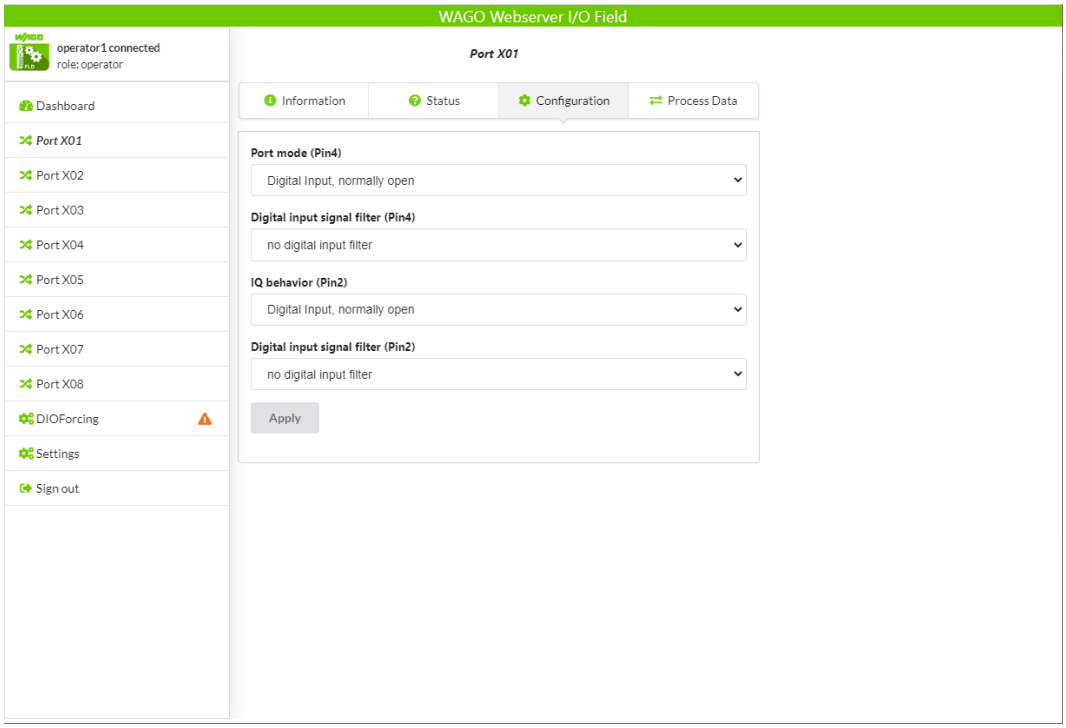


*Figure 15: **Port XX** Menu Item, **Configuration** Tab*

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

Table 35: Port Configuration Settings for IO-Link Devices

Name	Type	Explanation
Port mode	Drop-down list	Port operating mode (configuration of pin 4)
Digital input signal filter (pin 4)	Drop-down list	Filter time for digital input signals to pin 4
IQ behavior (pin 2)	Drop-down list	IQ behavior of the port (configuration of pin 2)
Digital input signal filter (pin 2)	Drop-down list	Filter time for digital input signals to pin 2

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:

1. Select the required 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. Configure the filter time for the digital input signals for pin 4 and pin 2.
5. Configure pin 2 by setting the I/O behavior.
6. Click the **Apply** button.

⇨ Your changes now take effect.

Configure the Operating Mode for Pin 4 of the Port

You can set 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 36: “Port Mode” Drop-Down Menu: Selecting the Operating Mode for Pin 4 of the Selected IO-Link Port

Selection Option	Explanation
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. Vendor ID, Device ID and Revision 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 operates as a digital input (pin 4 serves as a data line). 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 (pin 4 serves a data line). 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 (pin 4 serves a data line). 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 (pin 4 serves a data line). All elements of the port configuration are ignored except for the input and output data length.

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 can be selected from the **IQ behavior** drop-down menu. The following configuration options are available:

Table 37: IQ Behavior Drop-Down Menu – Configuration of Pin 2

Selection Option	Explanation
Not supported	Pin 2 supplies no output voltage.
Power 2	Pin 2 supplies 24 VDC output voltage.

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 38: Possible Values of the Inspection Level Parameter

Inspection Level	Meaning
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. The device check for type compatibility is performed, and the actual serial number is also 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 with respect to continued operation with unmodified device parameters.

This parameter can have three different values:

Table 39: Possible Values of the Backup Level Parameter

Backup Level	Meaning
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.

Table 39: Possible Values of the Backup Level Parameter

Backup Level	Meaning
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 list offers the following options for setting the **Inspection Level** and **Backup Level** parameters:

Table 40: Setting the Inspection Levels and Backup Levels for Device Check during Validation and Backup

Selection Option	Inspection Level	Backup Level	Explanation
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]** 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.

10.2.2.4.2 Configuring IP Parameters

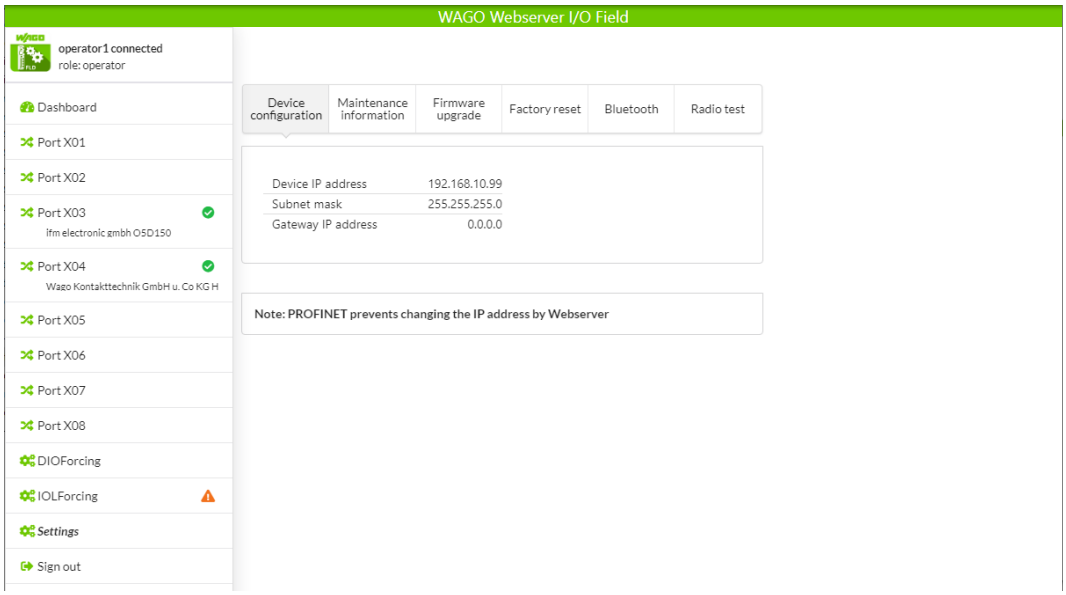


*Figure 16: **Settings** Menu Item, **Device Configuration** Tab*

The **Device configuration** tab shows the following parameters for the IP protocol. The Webserver cannot configure these since they are set via the PROFINET connection:

Table 41: Device Configuration Tab – Parameter Overview

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

10.2.2.4.3 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.

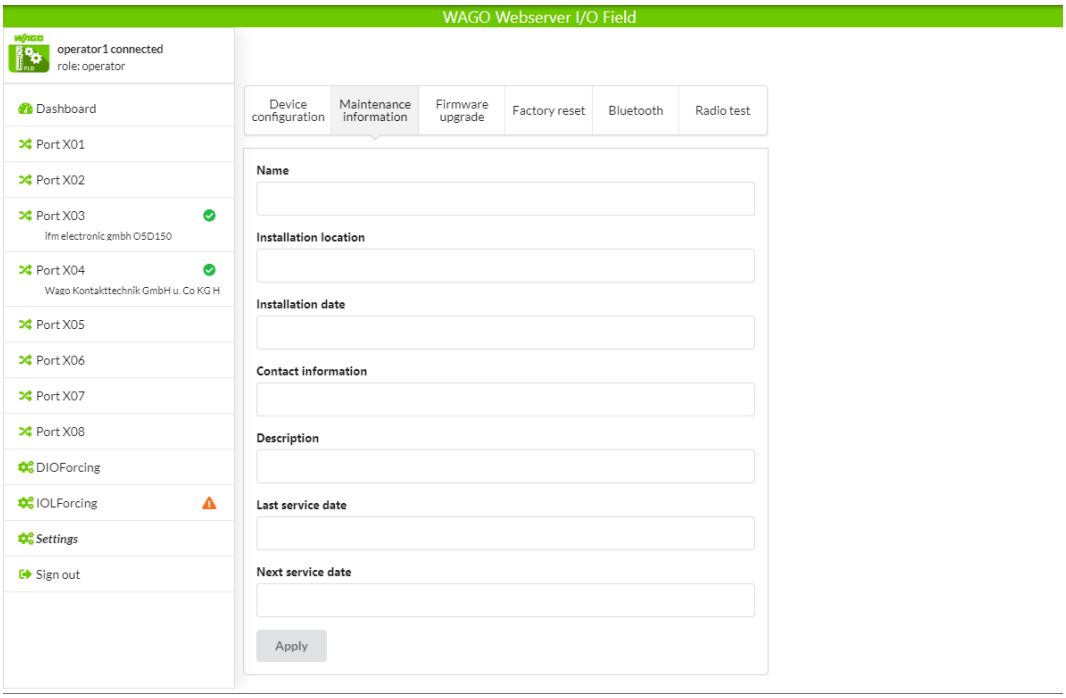


*Figure 17: **Settings** Menu Item, **Maintenance Information** Tab*

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

The maintenance information includes:

Table 42: 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
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

Table 42: Maintenance Information

Name	Data Format and Length	Description	Corresponding I&M Field
Number of changes (Change Count)	ASCII decimal num, 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.

10.2.2.4.4 Update Firmware

With the **Firmware upgrade** tab, WAGO Webserver I/O Field provides the option to update the product firmware.

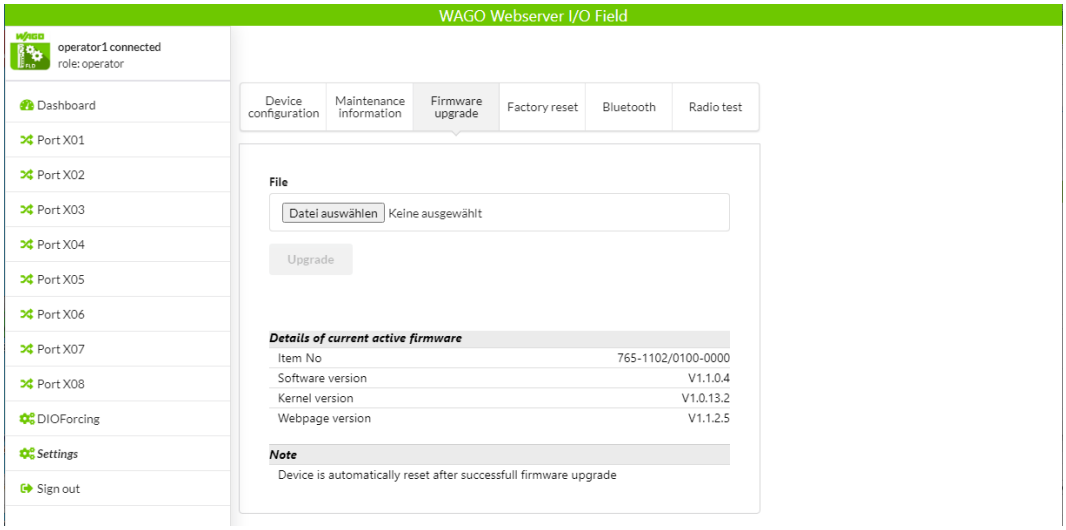


*Figure 18: **Settings** Menu Item, **Firmware Upgrade** Tab*

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 this from the WAGO website: www.wago.com.

Proceed as follows to update the firmware:

1. In the left-hand column of WAGO Webserver I/O Field, 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

10.2.2.4.5 Resetsetting the Module to the Factory Settings

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

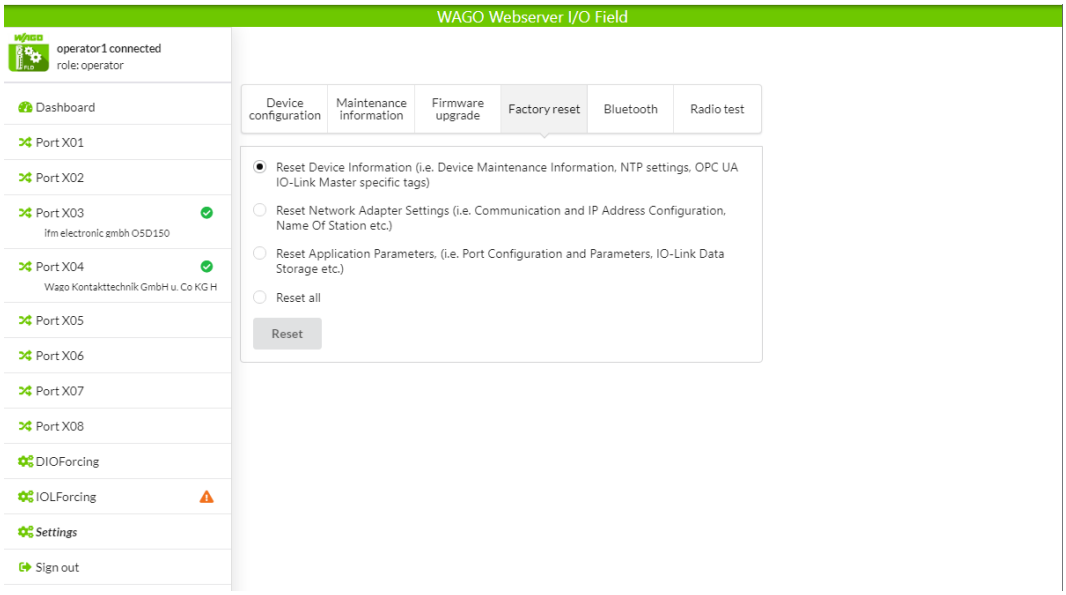


*Figure 19: **Settings** Menu Item, **Factory Reset** Tab*

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 43: Options for Resetting the Product to the Factory Settings

Option	Reset Settings
Reset Device Information	Module settings (e.g., maintenance information, system time settings and IO-Link master settings within OPC UA)
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 rest the module to the factory settings, proceed as follows:

1. In the left-hand column of WAGO Webserver I/O Field, 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.

10.2.2.4.6 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 QR code
- Starting a Bluetooth® firmware update
- Resetting the Bluetooth® firmware

- Switching the Bluetooth® wireless connection on/off
- Switching LED forcing on/off

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

- Open the **Bluetooth®** tab

⇨ The **Bluetooth®** tab appears.

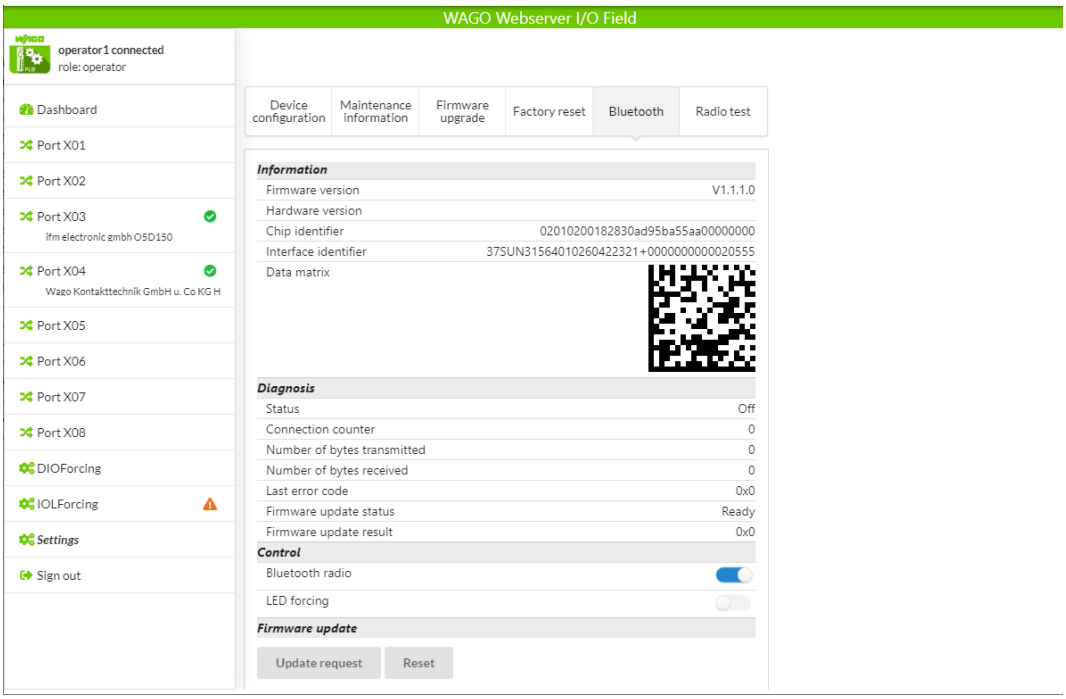


*Figure 20: **Settings** Menu Item, **Bluetooth®** Tab*

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 QR code of the product
  (can be scanned by a smartphone or table to launch an app on it for communication with the product)

Displaying diagnostic information

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

- Connection 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 44: 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 QR 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 QR 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 with 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 revert a Bluetooth® firmware update:

- 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.

10.2.2.4.7 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:

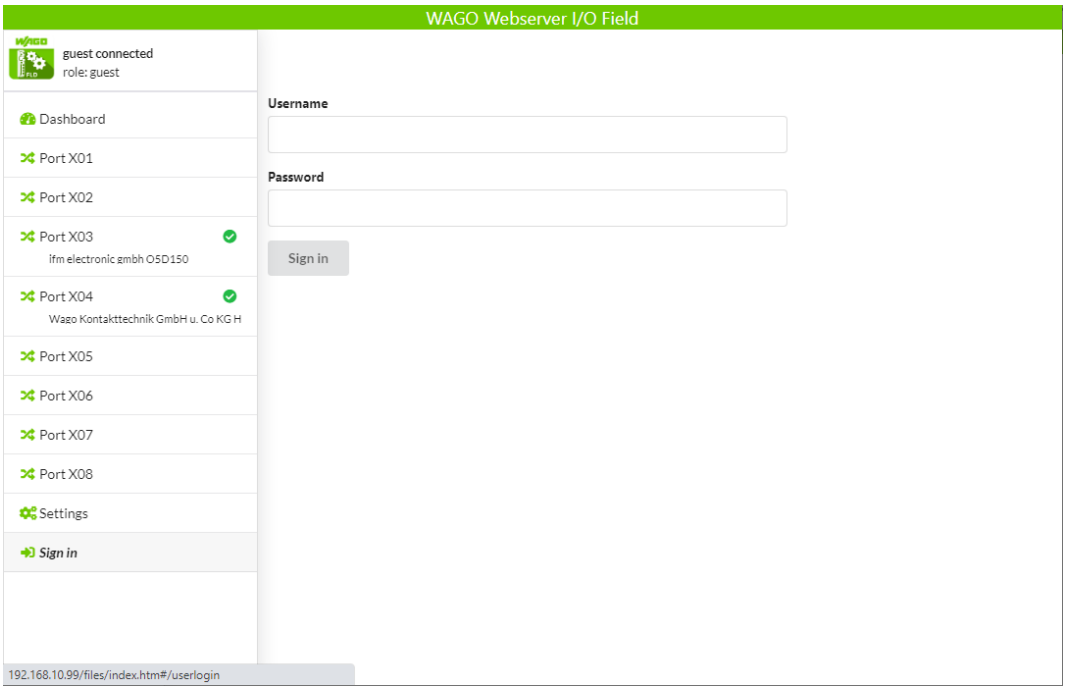


*Figure 21: **Sign in** Menu Item – Input Screen for Username and Password*

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 WAGO Webserver I/O Field 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 WAGO Webserver I/O Field 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 delivered or after a reset to the factory settings, WAGO Webserver I/O Field 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:

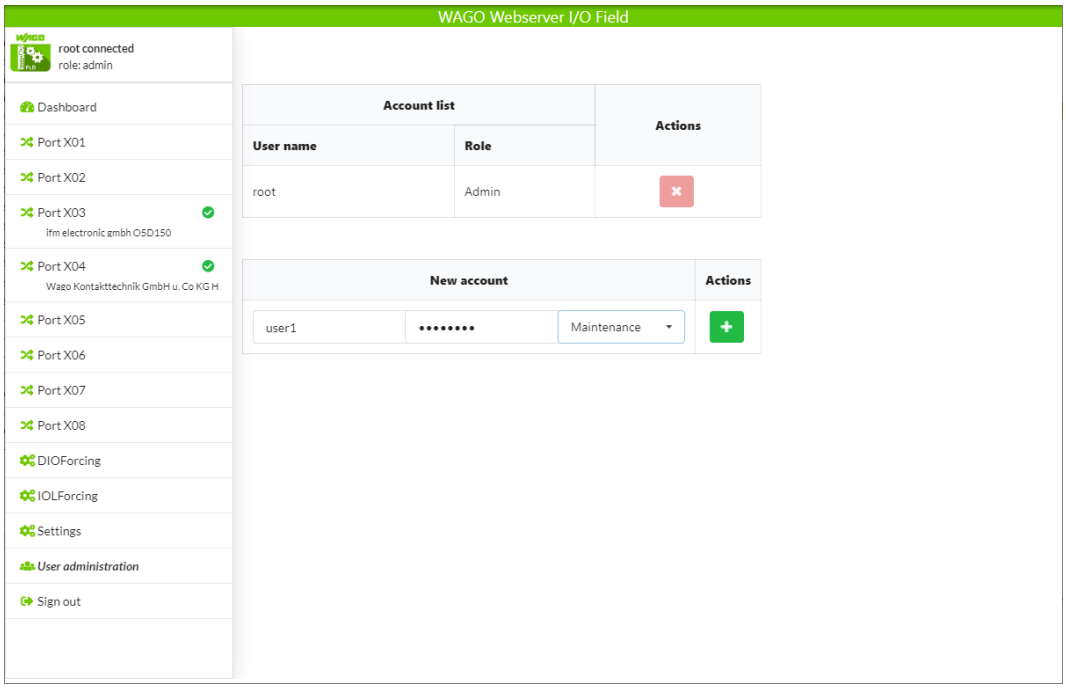


*Figure 22: **User Administration** Menu Item (Initial State)*

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 user 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

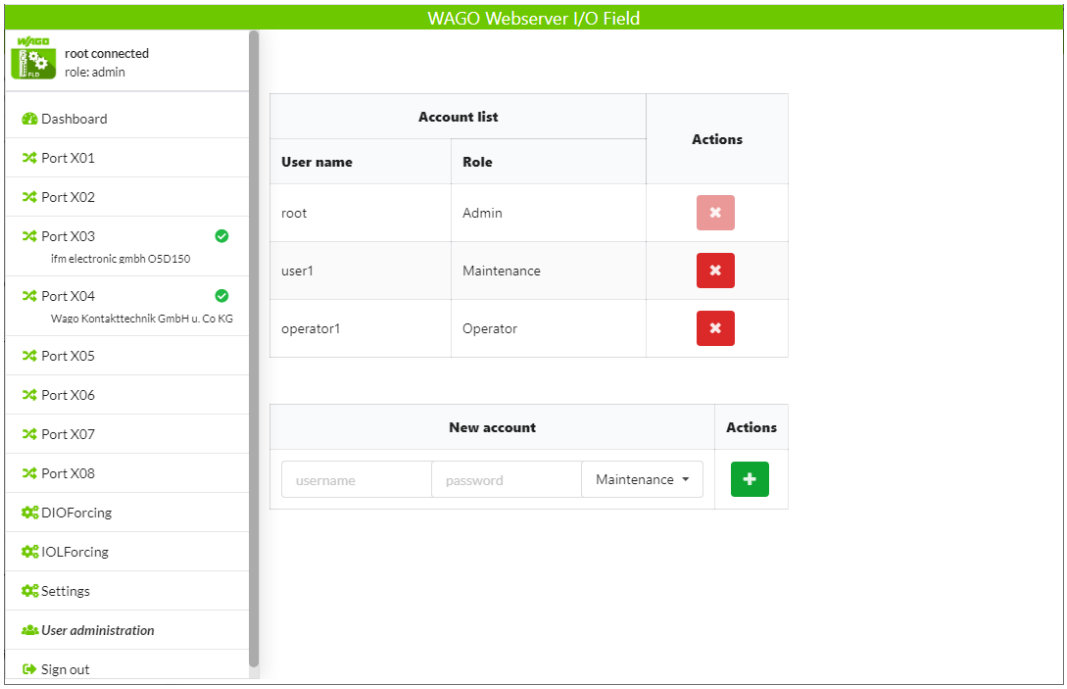


*Figure 23: **User Administration** Menu Item*

⇨ 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.

10.2.2.4.8 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:

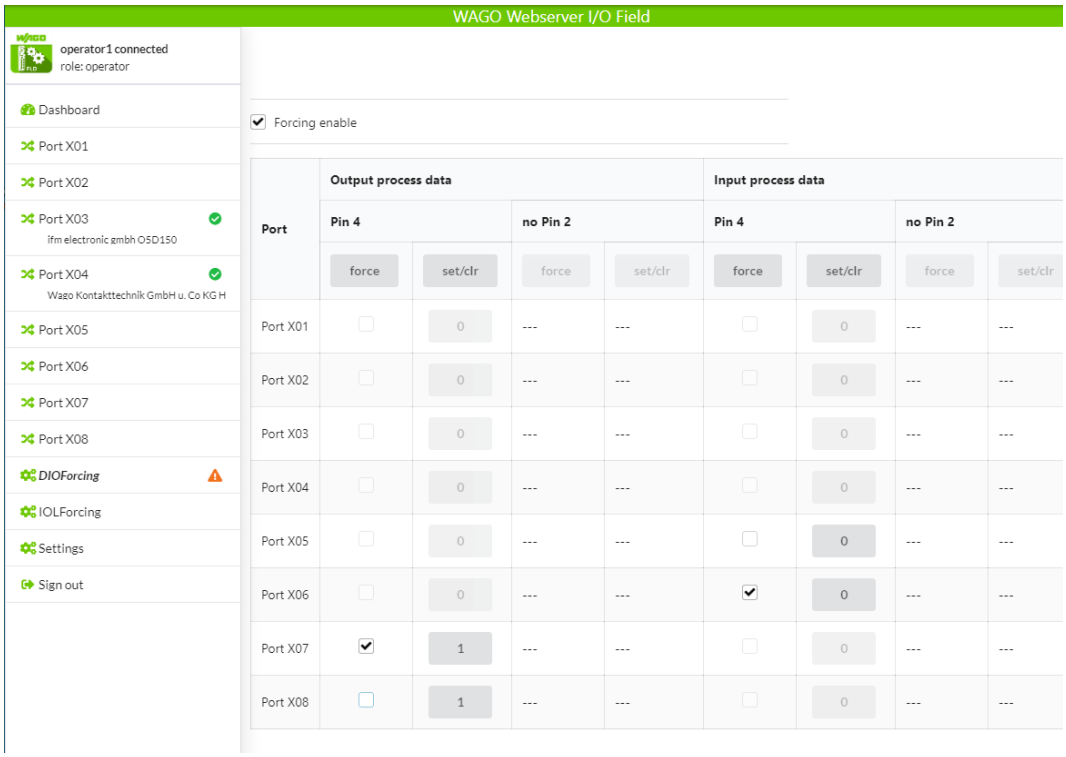


*Figure 24: **DIO Forcing** Menu Item, "DIO Forcing" Screen*

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

Table 45: 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

To enter 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 process:

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, as well as explanations of terms, in section **Forcing [▶ 24]**.

There is a separate table row for each of the 4 ports (X01…X04).

For pin 4, there is always the option of forcing. Whether forcing is also possible for pin 2 depends on the current configuration of pin 2. Pin 2 must be configured as a digital input to force the input process data and as a digital output to force the output process data. Depending on the configuration, the checkboxes for pin 2 can be changed or not and is used as the column title in the **Pin 2** or **No pin 2** screen mask.

Concurrent Access

As long as one user is accessing the forcing functionality through a forcing medium, e.g., WAGO Webserver I/O Field, 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.

10.2.3 WAGO IO-Link Configurator

10.2.3.1 System Requirements

The following system requirements must be met for the WAGO I/O Field configuration software to be installed:

Minimum System Requirements

Table 46: Minimum System Requirements

Components	Requirements
Operating system	Windows 7 (32- and 64-bit)
	Windows 8 (32- and 64-bit)
	Windows 8.1 (32- and 64-bit)
	Windows 10 (32- and 64-bit)
Memory	2 GB
Free hard disk space	150 MB
Processor	1 GHz or higher, 32-bit (x86) or 64-bit (x64)
Screen resolution	800 × 600 pixels

Recommended System Requirements

Table 47: Recommended System Requirements

Components	Requirements
Operating system	Windows 10 (64-bit)
Memory	8 GB
Free hard disk space	250 MB
Processor	1 GHz or higher, 64-bit (x64)
Screen resolution	1920 × 1080 pixels

10.2.3.2 Launching WAGO IO-Link Configurator

10.2.3.2.1 Operation as a Standalone Program

WAGO IO-Link Configurator can be launched as a standalone 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.

WAGO IO-Link Configurator offers the following functions, depending on the WAGO IO-Link master and setting:

- Diagnostics, identification, parameterization and display of process data of WAGO IO-Link devices
- Writing output process data

  This normally the controller's job, and the tool cannot write here concurrently. However, some WAGO IO-Link masters can also be operated on the tool without a PLC. In this case, the tool can also write the process data. In particular, this applies to some ETHERNET-based WAGO IO-Link masters. You can tell this when the WAGO IO-Link master opens or read about it in the corresponding documentation.
- Configuring the WAGO IO-Link master or Field I/O module

  This normally the controller's job, and the tool cannot modify the configuration here concurrently. However, some masters can also be operated on the tool without a PLC. In this case, the tool can configure the master. For ETHERNET-based WAGO IO-Link masters, this functionality is usually available if there is no connection to the PLC. Please refer to the corresponding documentation of the master in this regard.
- Reading the master's configuration

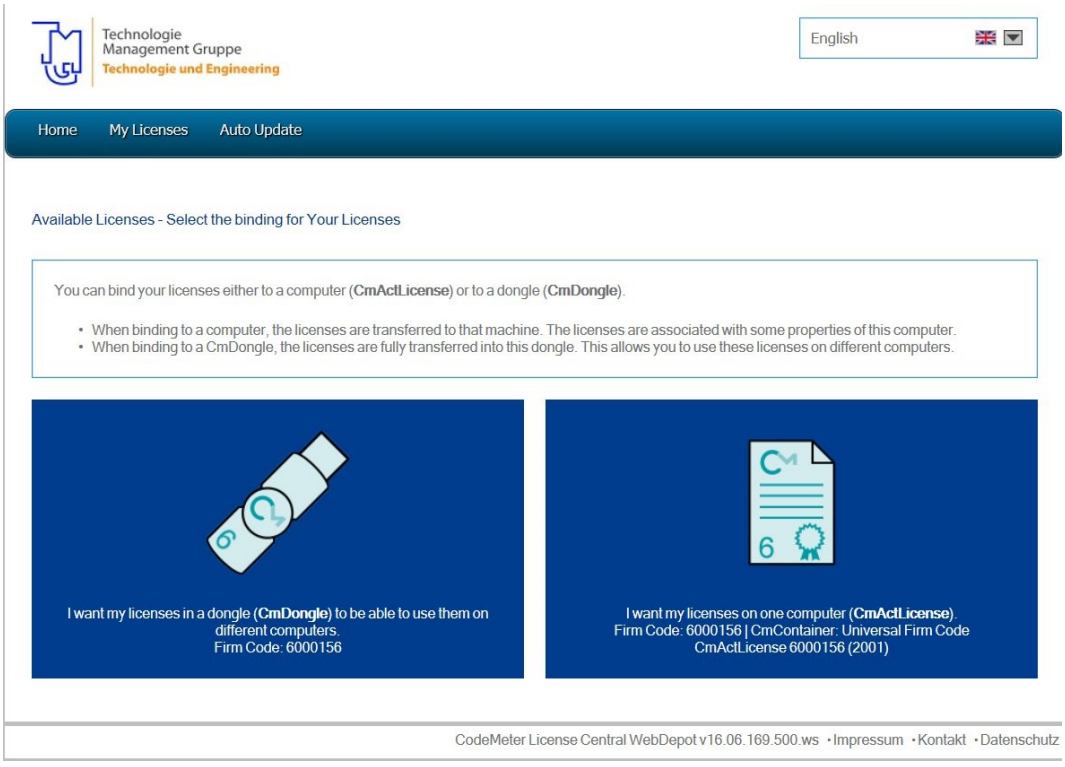
  The configuration is read from the master, compared to the setting in the tool and displayed. This function is always available.

10.2.3.2.2 Activation and Licensing

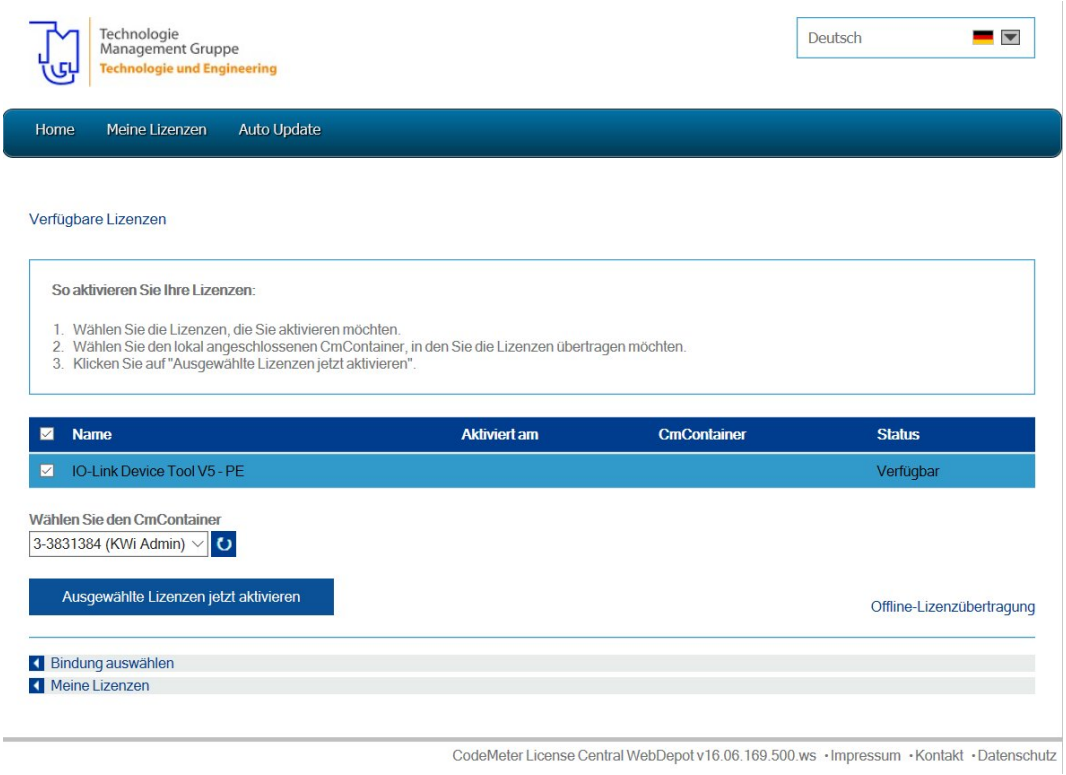
WAGO IO-Link Configurator is protected by Codemeter from WIBU-Systems AG in Karlsruhe. No activation or license key is necessary for the standard edition. The professional edition is initially available for a 30-day trial. After that, a license key is necessary, which is sent by email in a link.

Example: http://lc.codemeter.com/12686/depot/get.php?id=xxxxx-xxxxx-xxxxx-xxxxx-xxxxx

Follow this link or copy it into the address bar of your browser. The TMG TE license portal then opens:



You can now specify whether you want to transfer the license to your computer or a hardware dongle. Please select the corresponding option.



Multiple licenses can be provided through one license key/link. Select the licenses you want to transfer and select “Activate Selected Licenses Now.”

10.2.3.2.3 Install

An executable file “Setup.exe” installs the program. This copies all the required files to the working directory.

“Uninstall” can be invoked from the Windows Control Panel.

The installation is only possible with PC administrator rights.

Windows Firewall

During the installation, WAGO IO-Link Configurator is entered as an exception for incoming and outgoing connections for Windows Firewall. WAGO IO-Link Configurator uses UDP port 1999 for outgoing telegrams and port 2000 for incoming telegrams.

If you use a different firewall, or automatic entry during installation is locked, contact your system administrator. The firewall must be enabled accordingly.

With Windows 7 and higher, UDP “255.255.255.255” broadcasts are now only sent on the network interface with the lowest metric. Therefore, WAGO IO-Link Configurator also searches on all subnets that are entered for the network interfaces.

10.2.3.3 WAGO IO-Link Configurator User Interface

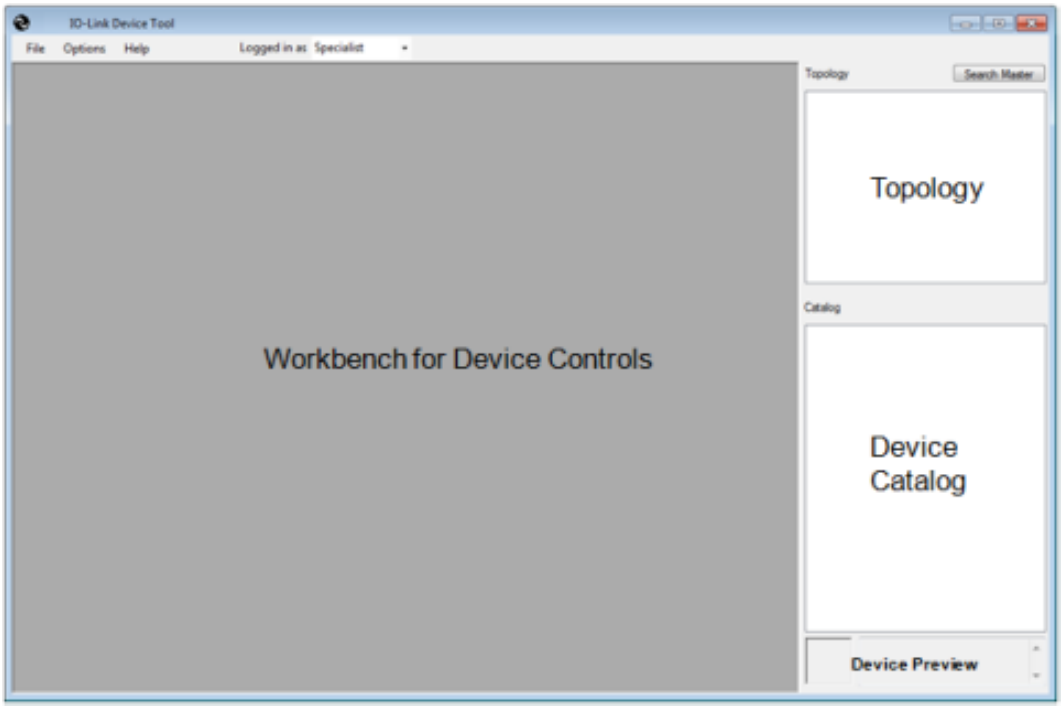
10.2.3.3.1 Start Screen and Login Dialog

The login dialog allows selection of the user role and can be protected with a password for each user role. When invoked via TCI, project data is only passed again during the invocation. To avoid having to constantly enter the login dialog over and over again during the commissioning phase, for example, you can switch it off for a specific “password validity” period. The login then occurs automatically with the last user role, without a password prompt. This setting is also made under “Extras/Manage Users.”

Under “Extras/Manage Users,” you can specify whether or not the start screen should be suppressed upon startup. The start screen can then also be opened via “Help/About” and contains information about the software version.

10.2.3.3.2 Workbench

After login, the workbench appears; it always serves as a frame for the other elements. It consists of the menu bar and toolbar, topology, windows with device controls and the device catalog. Only the functions relevant to the specific operating mode are displayed.



10.2.3.3.3 Device Catalog

In the device catalog, you find the products supported by WAGO IO-Link Configurator. These are the IO-Link masters and IO-Link devices from all manufacturers that have a valid IODD. The device catalog contains the products that can be used according to the operating mode. The user can hide and unhide the device catalog if needed.
The login and user roles are stored in WAGO IO-Link Configurator.

The WAGO IO-Link masters are added when the tool is installed. Additional WAGO IO-Link masters can be installed subsequently at any time. The IO-Link masters are arranged according to their communication connection with the higher-level network and the manufacturer.

The IO-Link masters of the WAGO I/O System Field are integrated into WAGO IO-Link Configurator through a WAGO-specified device description. The IO-Link masters are arranged by fieldbus standard and, if applicable, manufacturer. Entries can be deleted by right-clicking.

IO-Link devices from all manufacturers can be supported. These are described by the associated IODDs, which must then be imported. WAGO IO-Link Configurator supports IODDs per specifications 1.0.1 and 1.1. One IODD can contain multiple variants of an IO-Link device. In the catalog, each variant appears in its own entry, since these are products with different item numbers for the manufacturer as well. However, all variants are always imported or deleted. The IO-Link devices are arranged by manufacturer, product family and product variant. Entries can be deleted by right-clicking.

ⓘ Note

Include files into WAGO IO-Link Configurator only with the import function

WAGO IO-Link Configurator uses a hidden directory as the storage location for the imported IODDs and IOLMs. The IODDs and IOLMs are copied to this directory when imported. This is an internal working directory of WAGO IO-Link Configurator, similar to a database.

Do not copy any files to the IO-Link directory yourself. Always use the import function or right-click to delete. This is necessary in order to ensure data consistency. If you would like to create a collection of IODDs you use independent of WAGO IO-Link Configurator, store them in working directory of your choice. You can then import the IODDs into WAGO IO-Link Configurator from there.

10.2.3.3.3.1 IODDfinder

The IO-Link community provides its members and IO-Link users with a database of IODDs on the Internet. WAGO IO-Link Configurator allows access to this database if the IODD of a connected device is not available on the computer. If “Unknown” appears during the device search, then incorporate it into the project planning. “Import IODD” now appears in the context menu of the corresponding row in the master dialog. You then find the “IODDfinder” button in the import dialog. This searches for the corresponding IODD, which can then be loaded directly into the catalog and enabled.

ⓘ Note

Matching IODD required

WAGO IO-Link Configurator searches for the matching IODD for exactly one device type with the vendor ID and device ID. Therefore, the IODDfinder button is grayed out if this information is not available.

10.2.3.3.4 Topology

The topology, with the accessible IO-Link masters and connected IO-Link devices, is displayed and managed here.

When WAGO IO-Link Configurator is running as a standalone program, it can search for accessible IO-Link masters and then incorporate them into the topology (online). IO-Link masters can also be added to the topology from the device catalog optionally (offline).

The required address information is then assigned later online. The IO-Link masters are arranged in the topology according to the communication connection to the higher-level network.

When it is operated from an engineering tool (TCI), the topology is passed from the engineering tool to the connected IO-Link device. The structure of the topology starts here with the CPU, followed by its communication threads with the connected IO-Link masters. In this case, only IO-Link devices can be added or deleted in WAGO IO-Link Configurator. The definition of the higher-level topology is fixed by the engineering tool and cannot be modified here. For changes to the topology made in the engineering tool to also take effect in WAGO IO-Link Configurator, it is necessary to close and restart it.

ⓘ Note

Drag-and-drop function not available for assigned connections

Since the IO-Link devices are assigned to fixed connections of the IO-Link master, they cannot be dragged and dropped into the topology, but must rather be dragged onto the corresponding port of the IO-Link master.

10.2.3.3.5 Device Controls Window

This section shows the master controls, the device control or the project properties control. Only one control is visible and active at a time. The master controls/device control can be viewed by selecting the corresponding product in the topology, and the project properties control by opening it from the menu bar or toolbar.

10.2.3.3.6 Menu Bar and Toolbar

10.2.3.3.6.1 Project Administration

A project consists of a topology with the IO masters and IO devices of the WAGO I/O System Field. For the IO masters, information on their identity and network addressing, as well as the configuration, is saved. For the IO devices, instance data and state information on the parameters and the state of the menu – whether expanded or collapsed – is saved. The data is stored in a project file (XML). In addition, all device descriptions with all associated files are saved, so all required data can be passed on when a project is shared. Therefore, the IODDs do not need to be present on the destination computer; they come with the project automatically. All data is stored together in a project directory.

If WAGO IO-Link Configurator is executed as a standalone program, the user can freely select the storage location for the projects. If it is invoked via TCI, the project information is generally stored in a project folder of the engineering tool.

Execution as standalone program:

Table 48: Execution of WAGO IO-Link Configurator as a Standalone Program

Menu	Description
File/New Project	Open empty project
Open File/Project	Open existing project
Save File/Project	Save project; if the project has already been saved, it is automatically saved at the last storage location; otherwise, the “Save As” dialog opens.

Table 48: Execution of WAGO IO-Link Configurator as a Standalone Program

Menu	Description
Save File/Project As	Save project at a new storage location; the last storage location with project directories is offered as the default setting.
List of Last Projects Opened	Open one of the last projects opened

Execution via TCI:

Table 49: Execution of WAGO IO-Link Configurator via TCI

Menu	Description
File/New Project	Delete all project content that was added in addition to the information from the engineering tool
Save File/Project	Save project

10.2.3.3.6.2 Language Selection

Except for the standard dialogs, you can switch between English and German for all text in WAGO IO-Link Configurator. If the corresponding IODD also contains the selected language, this text is also displayed accordingly. If the IODD does not contain the selected language, English is used as the default setting.

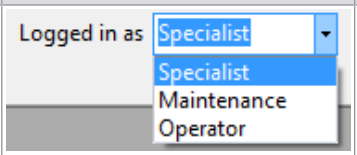
Table 50: Language Selection

Menu	Description
Extras/Language Selection	Switches the language setting. The language setting has no effect on standard dialogs. The standard dialog language is determined by the operating system settings.

10.2.3.3.6.3 Managing Login and User Roles

When WAGO IO-Link Configurator starts, login occurs with the desired user role. The IO-Link device descriptions each determine which user can view and modify which parameter. Each user role can be protected with a password. Only as a “Specialist” can you modify the settings for the user roles.

Table 51: Managing Login and User Roles

Menu	Symbol	Explanation
Extras/Switch User Role		Switches the user role; if a password is set for the user role, it must be entered.
Extras/Manage User Roles		Opens the “Manage User Roles” dialog; only possible as “Specialist”

User Roles

Table 52: WAGO IO-Link Configurator – User Roles

User Role	Description
Operator (Observer)	The user sees the “Operator” selection of parameters. Write access is usually not allowed. This is specified in the device description by the device manufacturer and may differ for different devices. The operator cannot change passwords or their validity periods. No password is preset in WAGO IO-Link Configurator for the user role “Operator.”
Maintenance	The user sees the “Maintenance” selection of parameters. Write access is usually restricted. This is specified in the device description by the device manufacturer and may differ for different devices. The user role “Maintenance” cannot change passwords or their validity periods. The pre-set password is “maintain.”
Specialist	The user sees the “Specialist” selection of parameters. Write access is usually unrestricted. This is specified in the device description by the device manufacturer and may differ for different devices. The specialist can change passwords and their validity periods for all user roles. The pre-set password is “special.”

“Manage User Roles” Dialog

This dialog is only available for the “Specialist” user role. Here you can assign passwords for the user roles and set the behavior when the tool is invoked.

A password validity period can be entered to avoid having to constantly reenter the password during commissioning, for example. For the duration of the password validity period, you are no longer prompted to enter the password after the first successful login. This is especially helpful for operation via TCI. The start screen can also be suppressed.

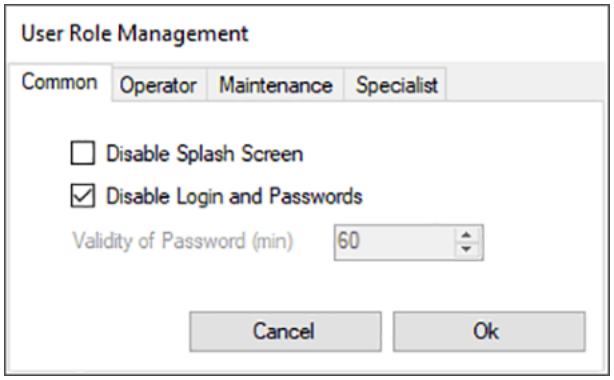


Figure 25: “Permissions” Dialog

Suppressing the start screen:

- The start screen no longer appears upon startup. However, it can be accessed via “Help/About.”

Suppressing the login and password prompt:

- This function switches the login and passwords off for all user roles.

Password validity (min):

- This function is only available if “Login and Password Prompt” is not suppressed. After successful login to a user role, the product starts the selected time without a login dialog. If the user wants to switch roles, this can be done with the toolbar or menu. This requires entering the corresponding password.

10.2.3.3.6.4 Importing an IODD Device Description

Device descriptions can be imported into WAGO IO-Link Configurator from any storage location. The device descriptions must be checked by a valid checker and tagged. When imported, the validity of the IODD XML files is checked on the basis of the “stamp” tag. All referenced graphics files must also be present. The files are only imported if they are complete and correct.

WAGO IO-Link Configurator supports:

- IODD V1.0.1 for IO-Link devices per V1.0 and
- IODD V1.1 for IO-Link devices per IO-Link V1.1
- Use of IODD V1.0 is no longer allowed, so it is no longer supported

Table 53: Importing an IODD Device Description

Menu	Description
Extras/Import IODD	Opens the “Import IODD” dialog

ⓘ Note

Include files into WAGO IO-Link Configurator only with the import function

WAGO IO-Link Configurator uses a hidden directory as the storage location for the imported IODDs and IOLMs. The IODDs and IOLMs are copied to this directory when imported. This is an internal working directory of WAGO IO-Link Configurator, similar to a database.

Do not copy any files to the IO-Link directory yourself. Always use the import function or right-click to delete. This is necessary in order to ensure data consistency. If you would like to create a collection of IODDs you use independent of WAGO IO-Link Configurator, store them in working directory of your choice. You can then import the IODDs into WAGO IO-Link Configurator from there.

Importing IODDs with Different Versions

If updated IODDs are imported with a new date in the file name, the previous versions are retained. When new WAGO IO-Link devices are added to the project (topology), the most current IODD is always used. Older versions cannot be loaded except by loading projects.

To compare an old IODD with a current IODD, e.g., in order to compare old functions with new functions, delete the current IODD from the device catalog and then import the old IODD.

For devices that have already been added, the version current at this time applies. When projects are saved, all associated IODDs are also saved. When they are opened, the latter are installed if they are not in the database.

Importing a Newer IODD with the Same Date in the File Name

Except during the development phase for WAGO IO-Link devices, this should generally **not** occur. The device developer must ensure that different IODDs (for one device) with the same date are not circulated.

However, in order to still allow this in the development phase, the imported IODD replaces the previous one. Since, in this case, the consistency of saved data is no longer ensured, the tool rejects it. A corresponding error message appears.

For additional information, see section IODDfinder [▶ 81].

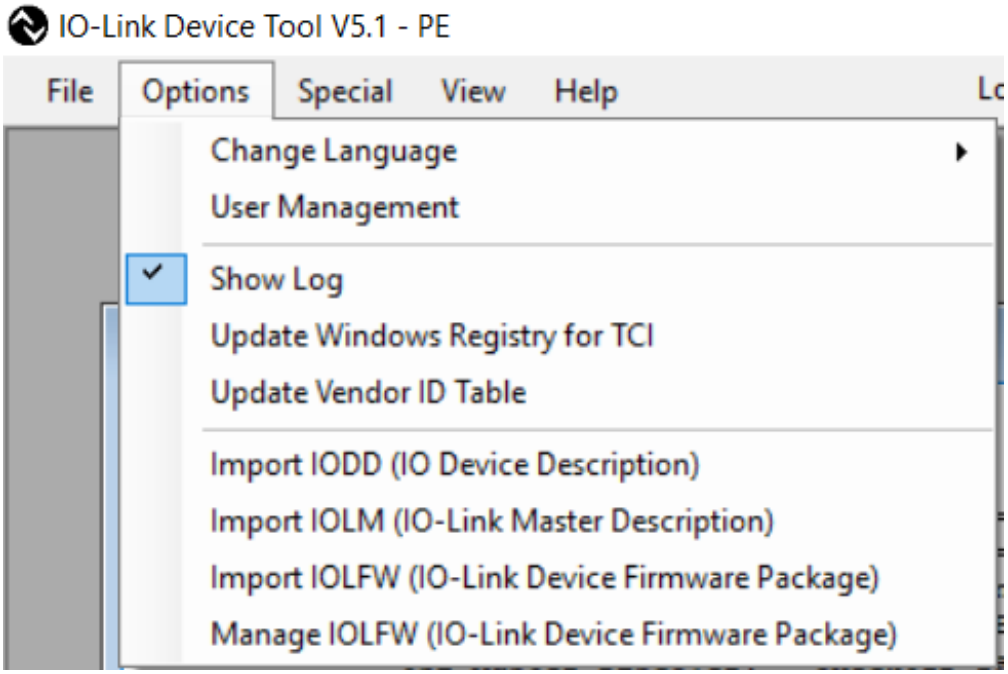
Note

Matching IODD required

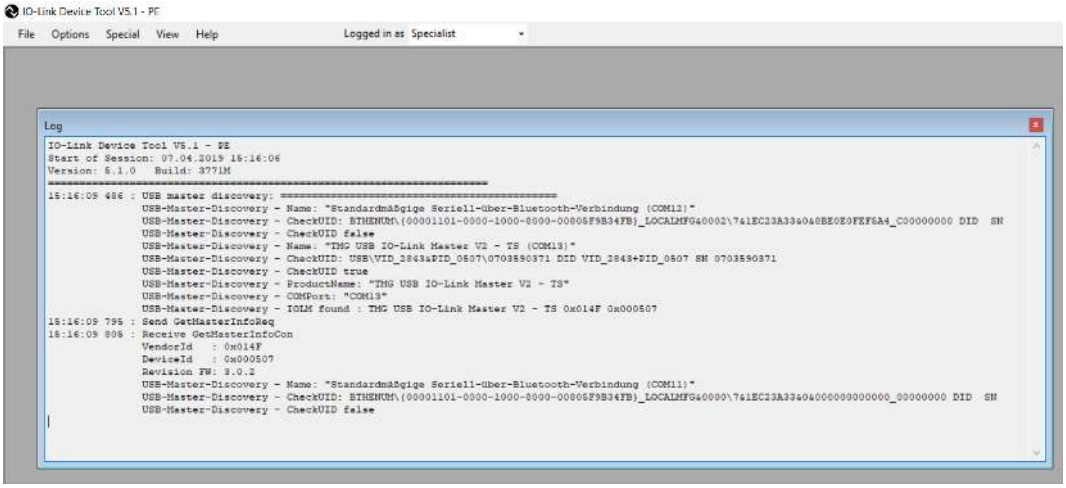
WAGO IO-Link Configurator searches for the matching IODD for exactly one device type with the vendor ID and device ID. Therefore, the IODDfinder button is grayed out if this information is not available.

Showing the Log and Logfile

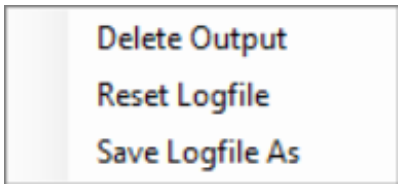
A series of diagnostic outputs are written to a log file to aid in support requests. The content can be viewed in the log window.



The display can be switched on and off under Extras. Double-clicking in the Log window enlarges the window to the size of the workbench.



Right-clicking opens the context menu.



- Delete Output

  Deletes the content of the output window; However, data continues to be written to the log file.
- Reset Logfile

  Deletes the content of the output window and log file
- Save Logfile As

  Saves the log file under a path of your choosing; send this file to WAGO Support along with support requests.

TCI Invocation

Here you can specify whether only the IO-Link master selected in the engineering tool, the network line with the selected IO-Link masters or all network lines are displayed. The default setting is that only the selected IO-Link master is displayed. This corresponds to the basic operating philosophy of the engineering tool. Here the user can launch the tool associated with this IO-Link master. However, for experts, it may be easier to get access to all IO-Link masters with one call.

This is purely a display setting. The project always contains all passed IO-Link masters of the WAGO I/O System Field. Although the display is reduced, no data is lost.

Table 54: TCI Invocation

Menu	Symbol	Explanation
Extras/TCI Invocation/ Only Selected Device		After the call from the engineering tool, only the WAGO IO-Link master from which the call was made from the engineering tool is displayed.

Table 54: TCI Invocation

Menu	Symbol	Explanation
Extras/TCI Invocation/ Only Selected Subsystem		After the call from the engineering tool, only the subsystem (network line) and the accessible WAGO IO-Link masters connected to it from which the call was made from the engineering tool are displayed. The WAGO IO-Link master selected in the engineering tool is also selected in the topology of WAGO IO-Link Configurator.
Extras/TCI Invocation/ All Subsystems		After the call from the engineering tool, all subsystems (network lines) are displayed with the accessible WAGO IO-Link masters connected to them. The WAGO IO-Link master selected in the engineering tool is also selected in the topology of WAGO IO-Link Device Configurator.

10.2.3.3.7 IO-Link Master Control

The control described here is only used for existing IO-Link masters. Master Control 2 is used for new IO-Link masters, especially for module IO-Link masters.

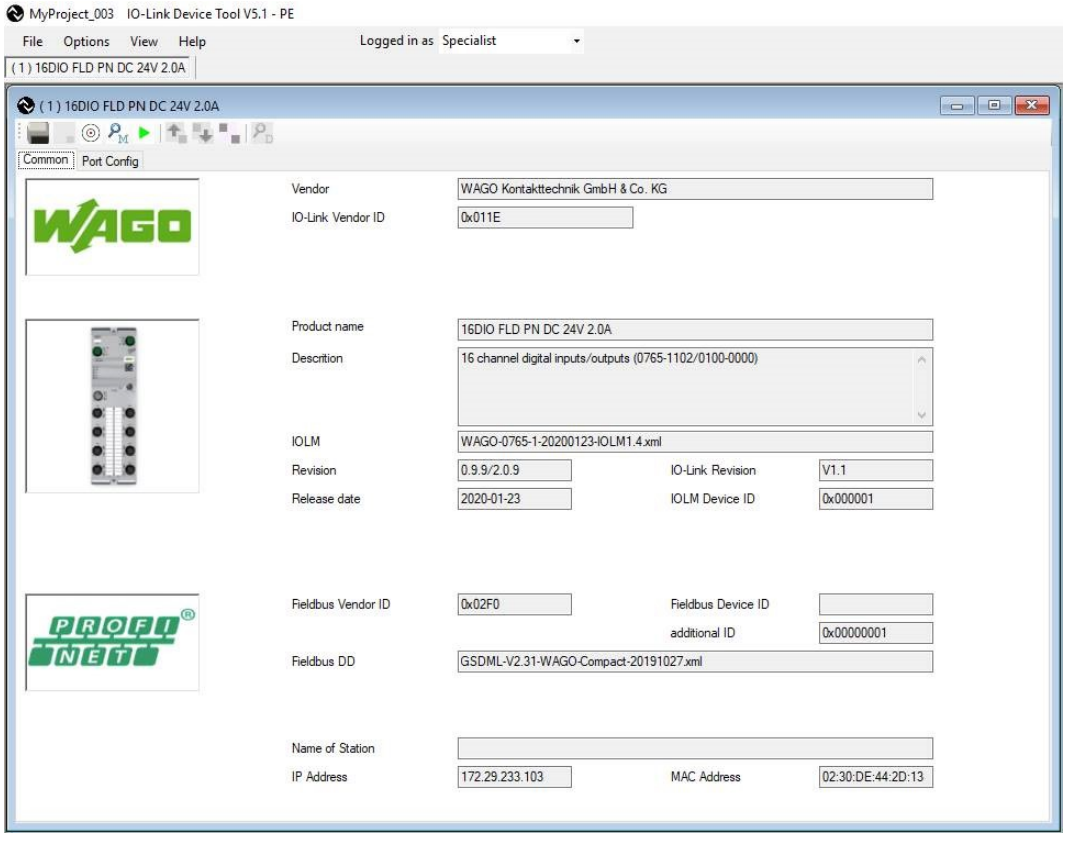


Figure 26: IO-Link Master Control General Settings

The top third of the IO-Link master control contains information on the WAGO IO-Link master (identification section). The table in the middle shows all the available IO-Link ports and their configuration. Below that there are buttons for searching for connected IO-Link devices and transferring the WAGO IO-Link master's data storage data.

The lower section shows detailed information on the port selected in the table.

10.2.3.3.7.1 Searching for IO-Link Masters

There are several options for searching for IO-Link masters and incorporating them into the project. With integrated execution via TCI, these functions are disabled, since the configuration is performed with the PLC engineering software.

In the topology:

- Right-click in an empty area

⇨ A search is performed for all IO-Link masters.

- Right-click on fieldbus or ETHERNET icon

⇨ A search is performed for only IO-Link masters with the corresponding communication interface.

[Search Masters] button:

If the master was selected from the device catalog and added to the topology, you can search for the exact configured IO-Link master with this button.

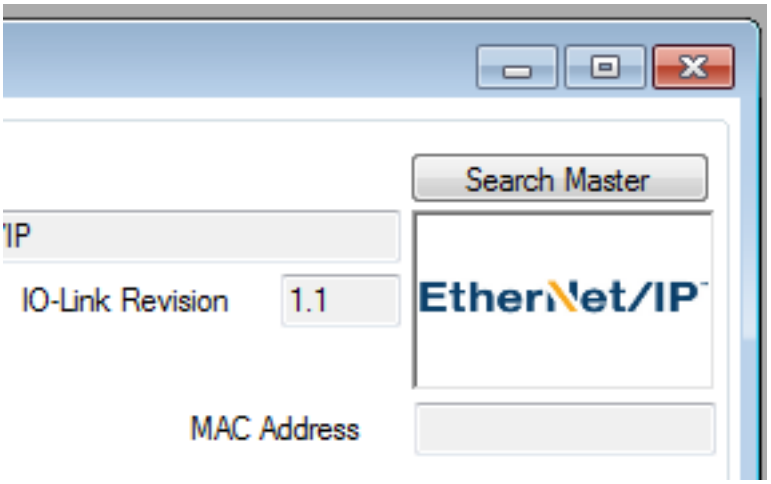


Figure 27: ***[Search Masters]*** *Button*

A list appears of the IO-Link masters of the WAGO I/O System Field that were found. Double-clicking the IO-Link master you want to add adds it. Right-clicking makes additional functions available, such as modifying network settings and flashing.

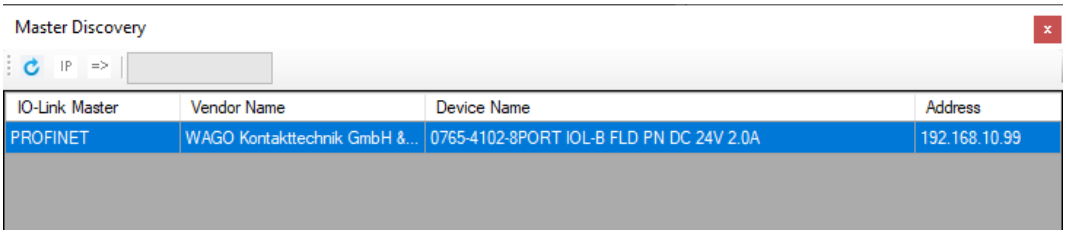


Figure 28: Results List

Once the IO-Link master has been added, the “Flash” function can be used to identify the IO-Link master.

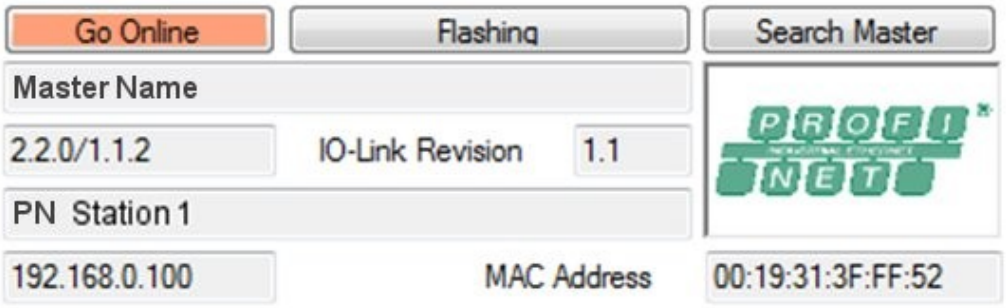


Figure 29: **[Flash]** *Button*

10.2.3.3.7.2 Online/Offline, Set Port Mode

Online establishes the link to the IO-Link master. When the connection is established, the software checks whether the configuration can be modified by WAGO IO-Link Configurator and whether the configuration in the project planning (WAGO IO-Link Configurator) matches that in the IO-Link master.

The configuration can only be modified offline and then transferred to the IO-Link master.

The parameters in the IO-Link devices can be modified both online and offline. This makes it possible to prepare the parameterization of entire application without the products (offline).

10.2.3.3.7.3 Searching for IO-Link Devices

This can only be performed online. If connections are configured as IO-Link, a search can be performed for connected products. If the IODD for these products is found in the WAGO IO-Link Configurator database, the corresponding IODD opens. Otherwise, only data that can be displayed even without the IODD is displayed.

“IL” Column = Inspection Level, Validation

n = none, deactivated

c = compatible

I = identical

Engineering and Rev Columns = Port Configuration

IO-Link Master Column= Device Currently Connected

Green = identical to the device according to the project planning

Yellow = can be added into the project planning:
- If the validation is disabled
- If the port configuration shows “unknown device” and the IODD has since been imported

Red = incorrect device

10.2.3.3.7.4 Transferring Data Storage Data

For replacement of defective IO-Link devices, the parameters are saved in the IO-Link master. The data storage data can be saved in the product so IO-Link masters can also be replaced without re-parameterization. This function allows IO-Link masters to be copied (cloned) as well.

“Master to Project” transfers all available data storage data to the project database. “Project to Master” transfers all available data storage data from the project database to the master.

These functions are for data exchange between WAGO IO-Link Configurator and the IO-Link master. The commands under “Port Configuration Details” are for data exchange between the IO-Link master and IO-Link device.

10.2.3.3.7.5 Port Configuration Details

Here you can view the details of the ports selected in the list or adjust them. In online mode, some commands are available for controlling the data storage function manually. With operation via TCI, the configuration can only be viewed, not modified.

Validation/Inspection Level

You can select which IO-Link device to accept for the port:

Inspection Level = None

All IO-Link devices are accepted. This setting is used especially during commissioning.

Inspection Level = Compatible

The Vendor ID and Device ID are checked.

Inspection Level = Identical

The serial number is also checked. This ensures that IO-Link devices can only be replaced by authorized personnel. To allow this, it is necessary to revert the inspection level to at least “compatible,” enter the new serial number and then reset the inspection level to “identical.”

Data Storage / Data Storage Mode

This function is only available for IO-Link devices of IO-Link versions V1.1 and higher. You can select from the following operating modes:

- **Disabled**
  No parameter server function
- **Auto**
  Changes to the parameterization in the device are automatically applied to the parameter server
- **Download**
  The data in the parameter server (master) takes precedence. If a device is replaced, its parameters are set from the parameter server.
  This setting is selected if an application is “withdrawn” and modification needs to be prohibited. In this mode, no changes can be made with the tool. They are overwritten immediately by the data storage mechanism.
- **Upload**

The data in the device takes precedence and is applied to the parameter server. This setting can be used if the devices are pre-parameterized and the data is to be applied to the master. Furthermore, this also allows a master to be replaced if all devices have already been parameterized and their data is to be applied to the master.

Data Storage Commands

The parameterization can also be exchanged manually between the data storage and IO-Link device. The following commands are available: **Clear**, **Upload** and **Download**.

Process Data Configuration

Here you can view/modify the process data width setting for the PLC. “Configured Length” indicates the process data width for the PLC. “Device Length” indicates the number of input or output bytes of the IO-Link device. A color change indicates that too little of the process image is configured for the PLC.

10.2.3.3.8 IO-Link Master Control 2

This control is used for all newly integrated IO-Link masters, especially if they are modular or require special settings beyond the normal port configuration.

For the new control, the information is divided into three tabs:

- Common
  Identification data from the master device description (IOLM)
  Identification data of the specific master

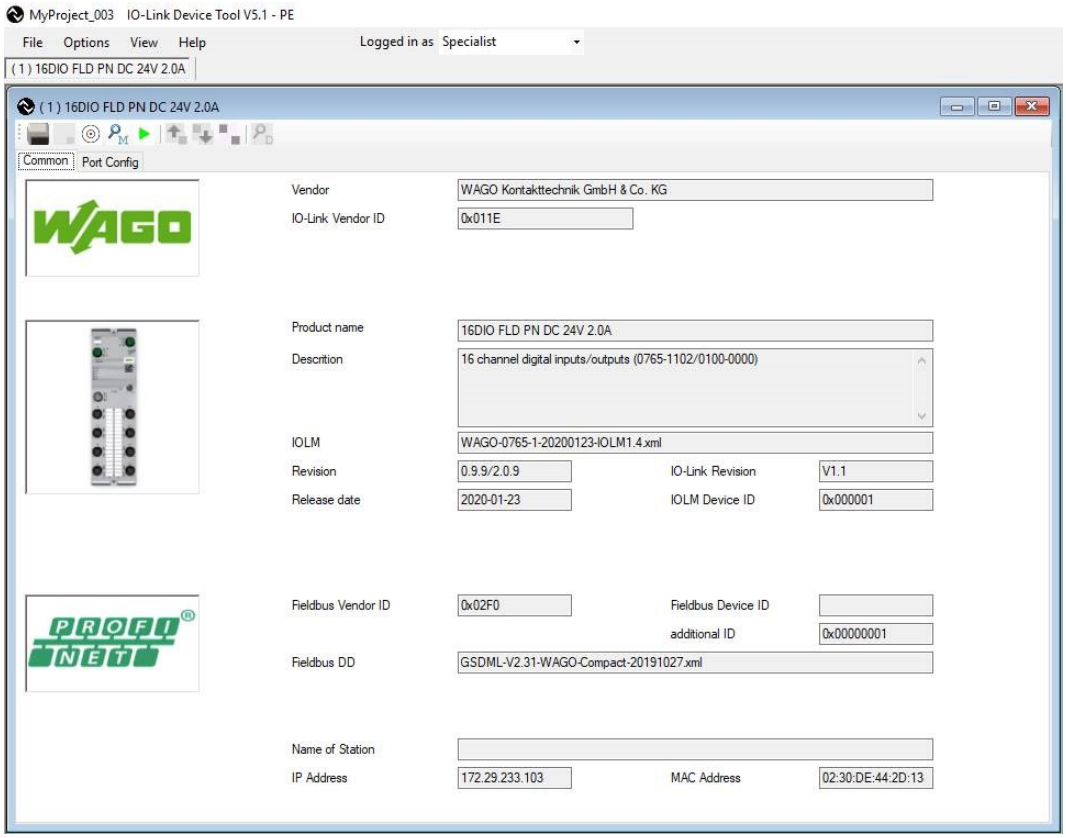
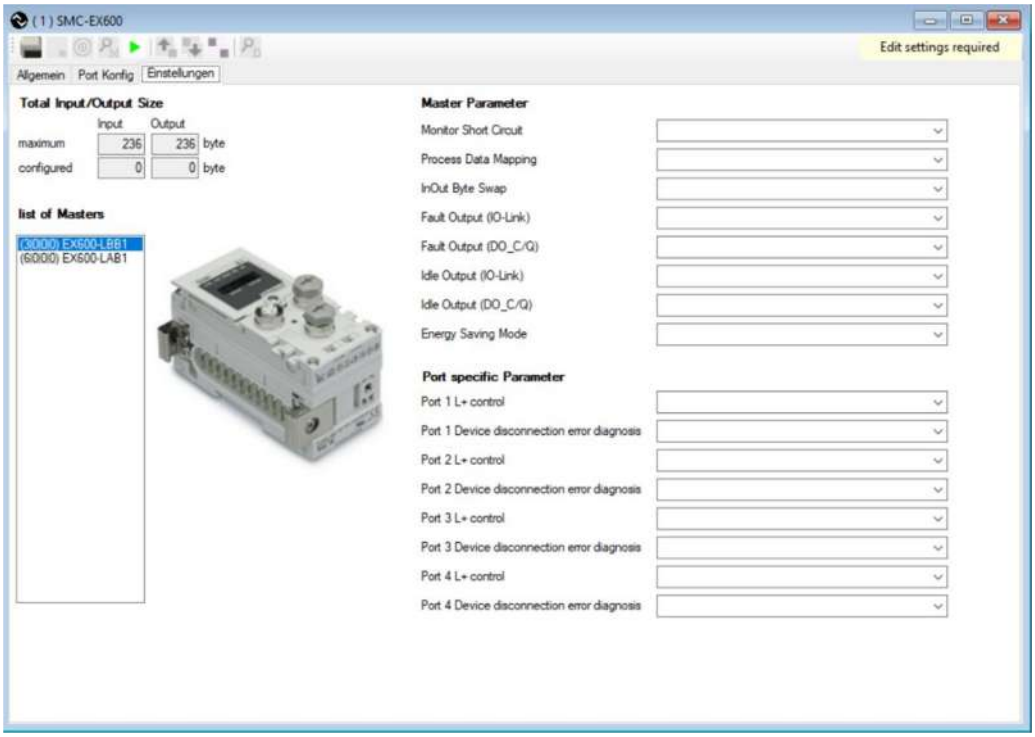


Figure 30: “Common” Tab

- Port Config

  List of the connections with IO-Link standard port configuration; the implementation follows the standard master interface (SMI, IO-Link interface-specification V1.1.3).
- Settings

  This tab only appears if the IO-Link requires additional parameterization or parameterization differing from the standard. There is a plug-in interface for manufacturer-specific dialogs for this purpose. For IO-Link masters that need this, or even need a special communication driver, the device description is imported in a package (ZIP) consisting of the IOLM device description, master GUI and communication drivers.



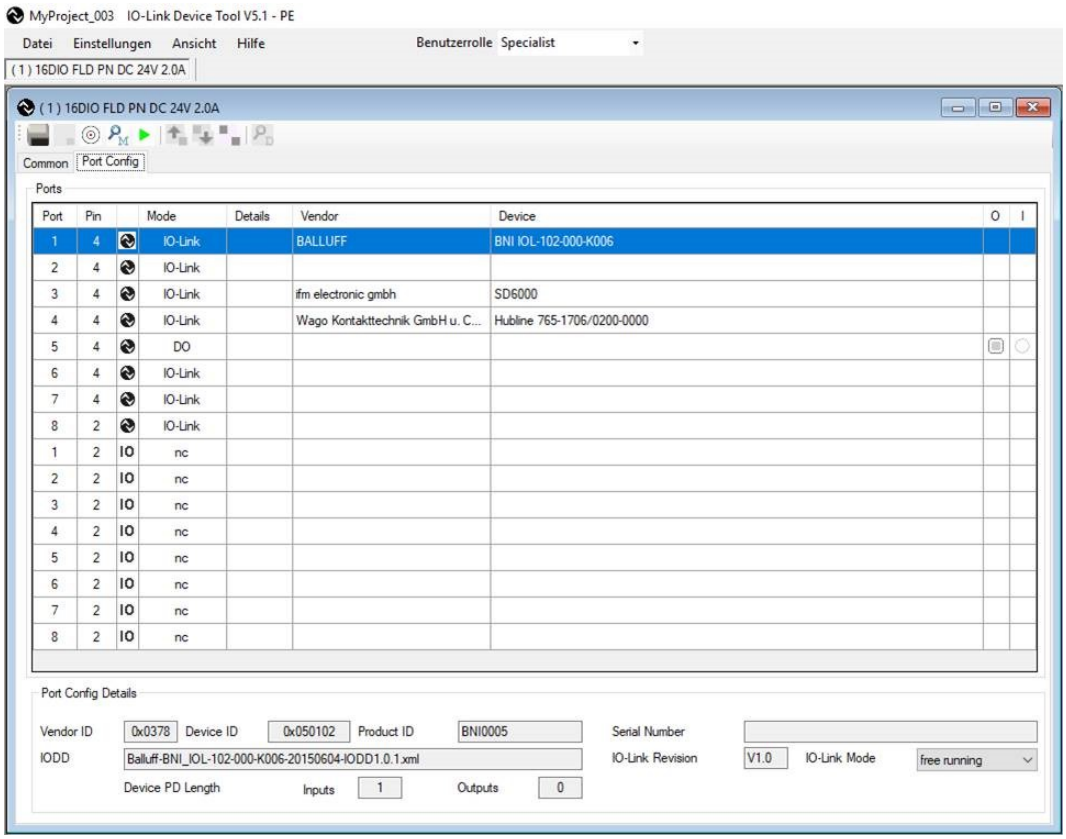


Figure 31: “Port Config” Tab

There is a toolbar for quick access:

- **Connected Status**

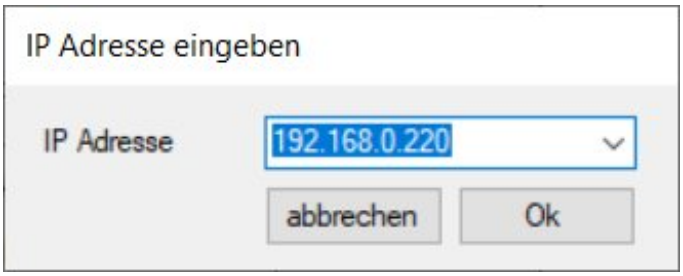
  A connection exists between WAGO IO-Link Configurator and the WAGO IO-Link master
- **PLC Connection Status**

  Indicates whether or not a PLC is connected to the master; if a PLC is connected, it has access rights for configuration and for writing process output data; otherwise, the tool has full access.
- **Flashing**

  Requests flashing for finding the master; this is not available for all masters.
- **Search Masters**

  Searches for masters of the type being configured

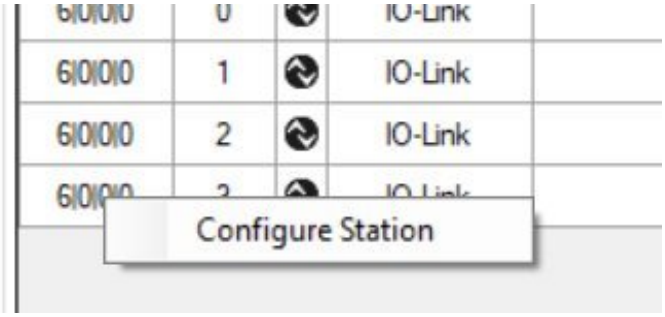
  The IP address can also optionally be entered manually. Right-clicking on the IP address field or clicking on the button next to it opens a dialog for entering the IP address. Recently used addresses are offered.



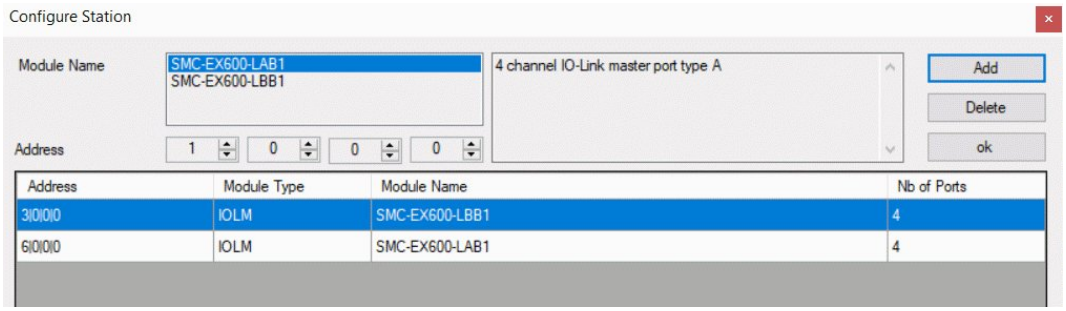
- **Online/Offline**
  Establishes or terminates the connection
- **Upload of Data Storage Data from Master**
  Loads the content of the data storage from the master into the project
- **Download of Data Storage Data into Master**
  Loads the data storage data that was saved previously from the project into the master
- **Status of Data Storage Data in Project**
  The tooltip indicates whether data storage data is stored in the project
- **Search Devices**
  Searches for connected devices; if devices are specified as unknown here, the associated IODD device description is missing. Please load it into the project nonetheless. Right-clicking on the corresponding device offers the IODD import. Here you can import the IODD from the local environment or IODDfinder.

With modular IO-link masters, the configuration can be read in online.

Right-clicking in the “Module” column or, if no modules have been configured yet, in an empty space opens the “Configure Station” selection.



A module can be selected from the list of available modules and added. Selected modules can be deleted. Under “Address,” the address within the station can be selected.



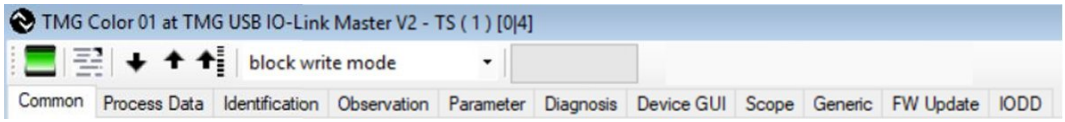
In principle, the interface is designed for a hierarchical topology with up to four levels. However, only one level (n|0|0|0) is currently supported.

10.2.3.3.9 IO-Link Device Control

The IO-Link devices are described by XML device descriptions. These IODDs (IO Device Descriptions) are imported into the WAGO IO-Link Configurator device catalog. The configuration and parameterization can be performed both offline and online. The settings are saved in a project file, so they are available for documentation or product replacement, for example. The project file is saved in the project directory with the device descriptions used.

If TCI is used, the project directory is saved in such a way that the data is also included when then engineering project is archived and unarchived.

If the IO-Link device is selected in the topology or opened by double-clicking in the master control, the device control, which essential implements an IODD interpreter, appears.



There are tabs for general product properties (“Common”), process data, identification, monitoring, parameterization and diagnostics. Their content comes from the IODD. If there are no entries in the IODD for the corresponding tab, it is grayed out.

There is also a “Generic” tab, which allows access to the IO-Link device via index and subindex and shows the corresponding data in the raw format. This is also available if there is no IODD at hand for the IO-Link device.

Toolbar, from left to right:

- **Connected Status**
- **Device default settings**

  Opens the “Device Default Settings” dialog
- **Load onto device**

  All read/write variables that are accessible in the present user role are transferred. However, this does not take into account whether menus are expanded or hidden, e.g., due to the operating mode selection.
- **Load from device**

  All variables that are accessible in the present user role are transferred. However, this does not take into account whether menus are expanded or hidden, e.g., due to the operating mode selection.
- **Enable loading of dynamic parameters**

  Cyclic variable loading is enabled for variables that are marked as “Dynamic.”
- **Operating mode for writing parameters**

  “block write mode“: Variables can first be edited without being transferred. Edited variables are marked with “c.” A yellow download arrow appears, which then initiates transfer of the modified variables.

  “direct mode“: Variables are transferred directly after modification.

  Commands (write only) are always transferred immediately, independent of this setting.
- **Loading modified parameters (yellow down arrow)**
- **Progress bar**
- **Conditions**

With IO-Link, table sections (menus) can be hidden and unhidden with conditions. If a variable that is used as a condition is edited, the menu display changes that depend on it do not take effect until they are transferred into the device or the tool's database. In "block write mode," you should always first write/transfer this variable and then edit it further.

10.2.3.3.9.1 Device Default Settings

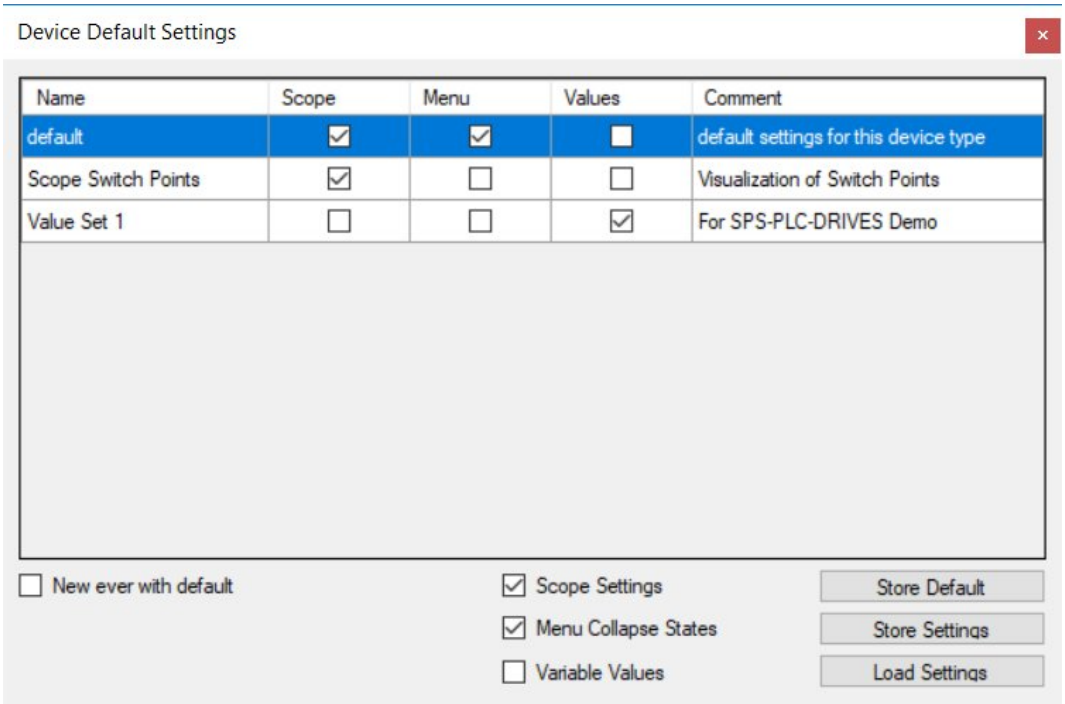
Settings for the specific device type are saved here in and apply across projects.

- **Scope**
  Settings for the Scope tab
- **Menu**
  State indicating whether the IODD table headers are expanded or collapsed
- **Values**
  Value of variables with "Read/Write" access rights

For "Scope" and "Menu", there are usually sensible default settings that can always be used for this product type. Saving and loading values (parameter sets) is a convenient way to keep pre-settings available for different application cases for the product type. They can also easily be transferred between projects.

Any number of settings can be saved; in each case, you can specify whether Scope, Menu and Values are saved. The first row always contains the settings with the name "default.' A setting for "Scope" and "Menu" should be prepared here that makes the most sense initially for the specific device. The "New ever with default" checkbox can be used to specify whether these settings are then always loaded automatically when new project planning is performed for this device type.

- **Store Default**
  Stores the settings selected in the "Scope Settings," "Menu Collapse States" and "Variable Values" checkboxes in the "default" settings.
- **Store Settings**
  Stores the settings selected with the "Scope Settings," "Menu Collapse States" and "Variable Values" checkboxes; an input window appears for selecting the name and comments on the settings.
- **Load Settings**
  Loads the settings selected with the "Scope Settings," "Menu Collapse States" and "Variable Values" checkboxes
- **New ever with default**
  When the device type is newly created, the "default" settings are loaded automatically
- **Deleting settings:**
  Pressing the <Delete> key deletes the selected setting. The row with the "default" settings cannot be deleted. However, the content is deleted.



10.2.3.3.9.2 “Common” Tab

The “Common” tab shows general information from the IODD about the IO-Link device.

10.2.3.3.9.3 “Process Data” Tab

This tab’s behavior depends on the IO-Link master and operating mode:

- **Offline:**
  - Only the process data structure is shown. No values are shown, and no values can be set either.
- **Online:**
  - Depending on the product, it may be possible to selectively write/force the data. The higher-level controller is then removed from the communication for this process data area and, depending on the fieldbus, may be notified of this.

10.2.3.3.9.4 Identification, Monitoring, Parameters and Diagnostics Tabs

- **Offline**
  - The variables’ structure and value settings are shown. For R/W variables, the variable values can be changed and are stored in the project.
- **Online**
  - When switching to online, no data is transferred automatically. You can use the **[Check]** button to compare the data on the device and in the project configuration. You can use the **[Upload]** and **[Download]** buttons to synchronize the data between WAGO IO-Link Configurator and the module. Only the module parameters that are defined for the currently active user role are transferred.

If the **Value** field of a variable is selected, the value is retrieved from the module, and the display is updated.

The operating mode can be set for the input with the context menu (right-click). This allows you to specify whether the value of an unchanged variable should be transferred to the module immediately after it is entered, or whether the inputs should be collected until they are transferred via command (also in the context menu).

10.2.3.3.9.5 “Device GUI” Tab

If a plug-in for a graphical user interface for the device was also imported with the IODD, this tab is displayed. The tool provides an interface for such plug-ins. The settings on the **Device GUI** tabs are available online and offline and are all synchronized with the tool’s internal database. A change on the **Identification, Monitoring, Parameters and Diagnostics** tabs can be seen in the device GUI and vice versa.

10.2.3.3.9.6 “Scope” Tab

The process data is visualized graphically in trend curves. All process data elements are recorded. Up to eight elements can be selected for visualization in the Configuration window. You can go to the Configuration window by right-clicking in the **Scope** tab. Data can be recorded for up to one day.

The recording starts anew whenever the **Scope** tab is activated. The sampling rate is set according to the IO-Link master.

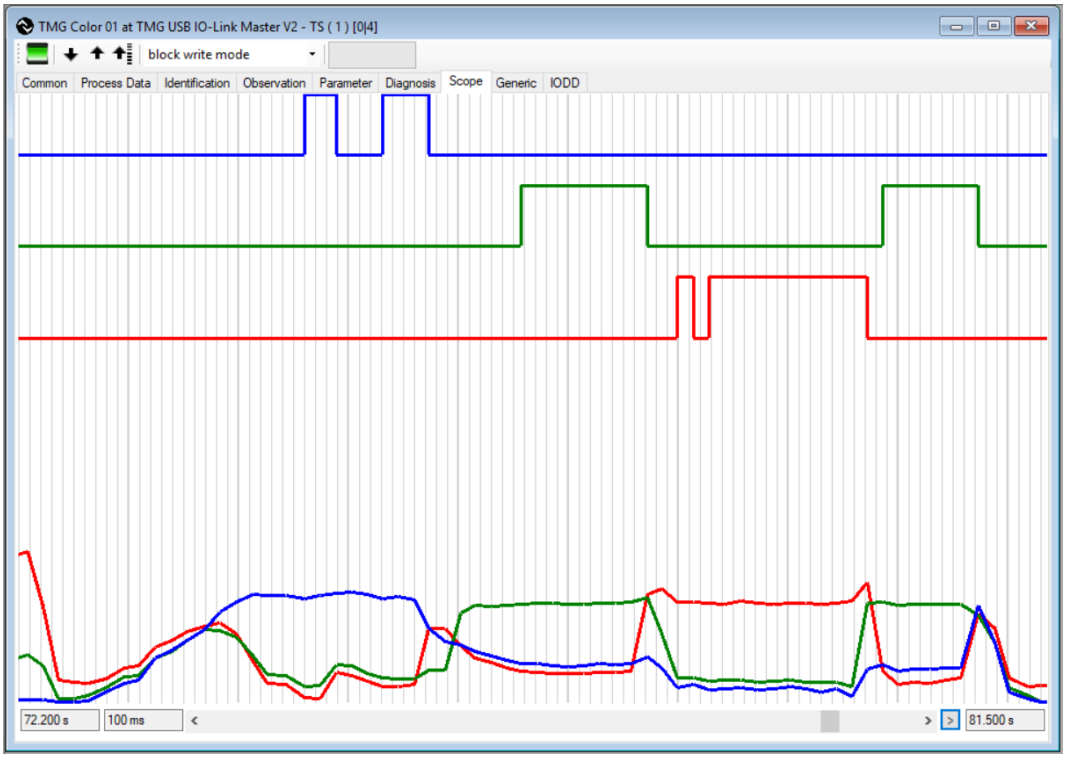


*Figure 32: **Scope** Tab*

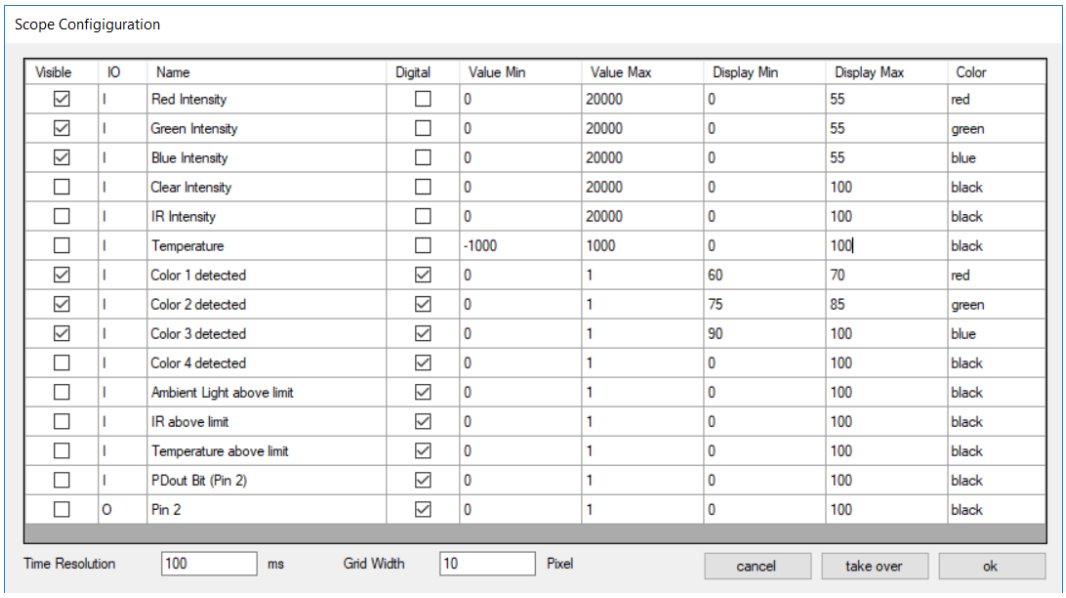


*Figure 33: **Scope Configuration** Window Section*

Configuration of the Scope function

- **Visible**

  Indicates whether the process data element is displayed; up to eight curves can be displayed simultaneously
- **IO (read only)**

  Indicates whether the process data element represents input or output data
- **Name (read only)**

  The name of the process data element
- **Digital**

  Indicates whether the values are discrete values; the default setting for all booleans or integers with enumeration is “Digital”
- **Value Min, Value Max**

  Value range of the process data element; the default setting is taken from the IODD. The possible values are limited to these. Since the IODD usually does not indicate a value range for the process data, the user must configure this. The curves are restricted to the value range according to the setting.
- **Display Min, Display Max**

  Determines where the curve is displayed and in what size; the value range is *0 ... 100*, measured from below
- **Color**

  Eight easily distinguishable colors are available. Multiple assignment is also possible if needed.
- **Time Resolution**

  Indicates the time unit of the grid
- **Grid Width**

  Sets the grid width

10.2.3.3.9.7 “Generic” Tab

This tab is for operating the IO-Link device even without an IODD. In this process, the data is displayed as raw data, and the addressing is performed via index and subindex. To make the default variables easily accessible, they are stored as a pulldown table by index.

If no IODD is available, only this tab appears. Otherwise, it is available as a supplement. It is useful in particular for PLC programming, since this usually involves addressing via index and subindex and the necessity of working with raw data.

The output window shows both the events of the IO-Link port and the results of the read and write requests that were executed manually.

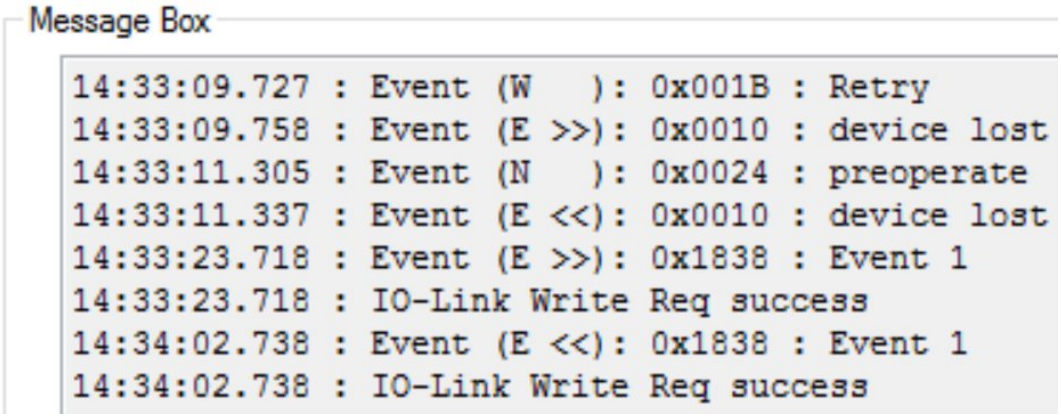


*Figure 34: **Message Box**, Detailed View*

Event display:

Event (<Type> <Mode>): <Code> : <Name> : <Description>

Type: E Error

W Warning

N Notification

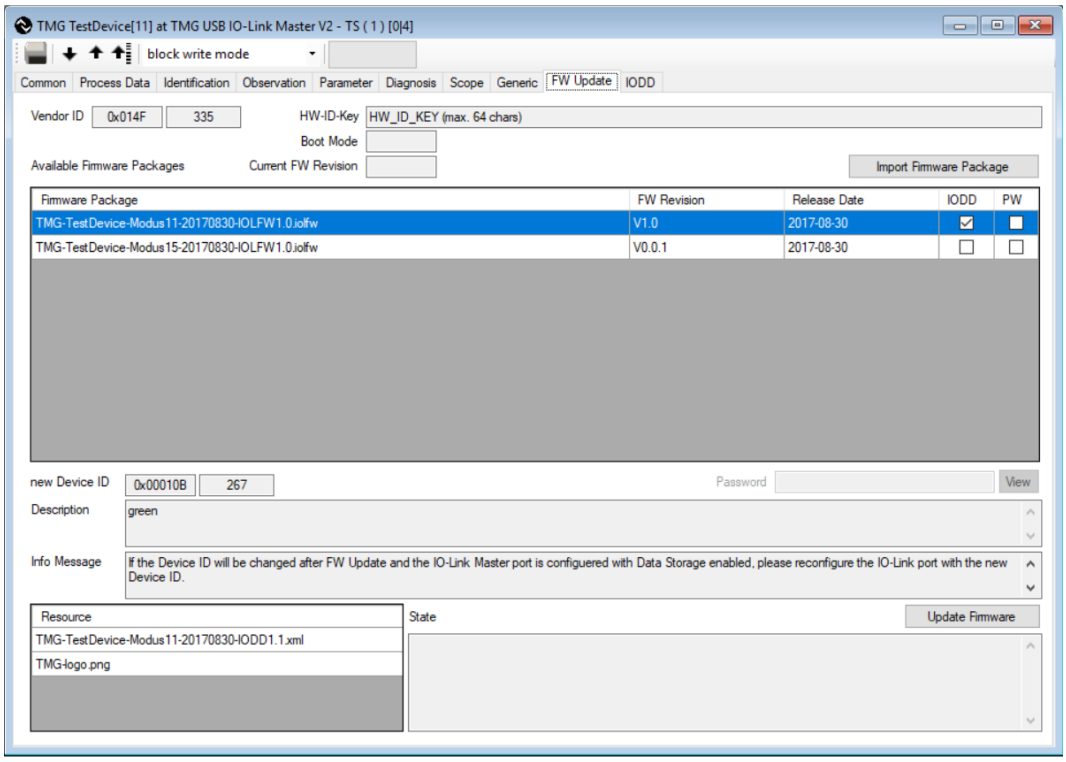
Mode: >> appears

<< disappears

single shot

10.2.3.3.9.8 “FW Update” Tab

This tab appears if the firmware update profile is provided in the IODD. New firmware versions are supplied as a *-YYYYMMDD-IOLFW1.0.iolfw package. Firmware packages can be read in for any IO-Link devices in the “Settings/Import IOLFW” menu in the workbench. The firmware packages matching the IO-Link device’s hardware are listed on the **FW Update** tab and can be selected and transferred.



10.2.3.3.9.9 “IODD” Tab

The information from the IODD for application programmers is displayed here in pre-processed form. It is organized into the following divisions:

- **Datasheet**
  Comprehensive datasheet derived from the IODD
- **Process Data**
  Structure of the process data with data type, value ranges and position within the byte sequence
- **Variables**
  Each with data type, value ranges and default setting
  For structured variables like records and arrays: with position within the byte sequence
- **XML**
  Displays the XML source text
  With navigation to the main elements of the IODD
  With text search within the IODD

10.2.3.4 Parameterizing the Product with 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. Unfortunately, there is often no integration option in this case, or no consistent one. Therefore, we have endeavored to find easy-to-use solutions for the relevant cases. For this reason, various options are implemented for the IO-Link device tool.

WAGO IO-Link Configurator can be operated as a standalone program or via TCI.

10.2.3.4.1 Operate via TCI (Tool Calling Interface)

TCI is a very simple software interface for integrating device software into engineering tools. TCI is specified by PNO (PROFIBUS Nutzerorganisation e.V.) and is now available as an open interface for PROFIBUS and PROFINET. Unfortunately, only a few manufacturers support this interface. They include Siemens, with STEP 7 and the TIA Portal, and Phoenix Contact with PC Worx.

TCI is launched from the network configurator of the engineering tool. With Siemens STEP7, this is “Hardware Config.” Right-clicking on the desired device and selecting the “Launch Device Tool” function launches the IO-Link device tool. In the process, the engineering tool passes all the devices supported by the tool. They then appear in the topology. Under “Extras,” you can choose whether only the device selected in STEP 7, the network line with the selected device or all network lines are shown in the topology.

The topology cannot be changed by the tool. Although the supported masters appear in the device catalog, they can only be added, configured and deleted by the higher-level engineering tool.

When called via TCI, the tool handles the following functions:

- Diagnostics, identification, parameterization and display of process data of WAGO IO-Link devices
- The output process data can sometimes be written if the PLC has a connection to the WAGO IO-Link master. With some masters, write access to the process data is also possible if the PLC does not have a connection. This can be helpful in the installation phase in order to test functions at this stage already, even without a PLC. You can find information on the exact function with the corresponding WAGO IO-Link master in the latter’s documentation.
- The master is configured by the calling engineering tool.
  The data is passed regardless of whether or not a communication connection exists.
- Reading the master’s configuration
  The configuration is read from the master and, if applicable, the information from the TCI is supplemented. However, the data from the TCI call takes precedence. In the event of inconsistency, an error message appears, and the PLC must write the configuration anew with the current data.

The communication with the WAGO IO-Link master is performed over the communication channels provided by the engineering tool (TCI class 3) or its own communication channels (TCI class 2), depending on the case.

The process data is stored in the engineering tool’s project repository, so it is included when the project is archived and unarchived with the engineering tool.

10.2.3.4.2 Performing an IO-Link Device Firmware Update

The IO-Link community has defined a profile for updating WAGO IO-Link device firmware. This makes it possible to perform this with every WAGO IO-Link master. However, this requires support by a tool or function blocks.

The device manufacturer packages the firmware in a firmware package. This contains the firmware itself and an XML file with information on the firmware.

WAGO IO-Link Configurator provides an import function for the firmware packages, which are then available in the internal database for use. The device user interface then contains an additional tab for conveniently performing the firmware update. If the firmware

package contains a new IODD, it is imported automatically and assigned to the device after the update. WAGO IO-Link Configurator makes the firmware update available for all WAGO IO-Link masters.

10.2.3.4.3 Quick Start Guide: Using an ETHERNET IO-Link Master

- Install WAGO IO-Link Configurator.
- Connect the computer to the network to which the ETHERNET IO-Link masters are also connected. Note the information on Windows Firewall in section Install [▶ 79].
- Right-click **[Search Devices]** in the topology section menu.
- The ETHERNET IO-Link master should now appear. Try switching Windows Firewall off if the WAGO IO-Link master is not detected.
- You can add an entry by double-clicking it.
- Connect at least one WAGO IO-Link device to the WAGO IO-Link master.
- Click the **[Online]** button in the toolbar. If the IO-Link master configuration does not match the one shown in WAGO IO-Link Configurator, you can choose which configuration to use.
- Click the **[Search Devices]** button.
- The connected WAGO IO-Link devices now appear, as long as the ports are configured as IO-Link. Add the found devices into the project configuration.
- Double-clicking within the user interface of the master or making a selection in the topology brings you to the IODD interpreter.

10.2.3.4.4 Quick Start Guide: Using TCI, e.g., in STEP 7 or the TIA Portal

- Install the PLC engineering tool that supports TCI. TCI V1.2 or higher must be supported.
- Import the GSD file for the PROFIBUS and PROFINET IO-Link masters that are supported by WAGO IO-Link Configurator. You can find them in the WAGO IO-Link Configurator program directory under \Devices\Master\GSD.
- Install WAGO IO-Link Configurator.
- In the fieldbus configuration of the PLC tool (e.g., Hardware Config in Step 7), you can now launch WAGO IO-Link Configurator by right-clicking “Launch Device Tool.” The corresponding WAGO IO-Link master automatically appears in the interface of the configurator.
- During operation via TCI, you cannot modify the WAGO IO-Link master configuration in WAGO IO-Link Configurator. This is done in the “Hardware Config” of the PLC engineering tool. For information on this, please read the documentation of the PLC engineering tool and the WAGO IO-Link master.
- The communication between WAGO IO-Link Configurator and the WAGO IO-Link masters is realized by the PLC engineering tool. For information on this, please refer to the documentation of the PLC engineering tool.
- Connect at least one WAGO IO-Link device to the WAGO IO-Link master.
- Click the **[Online]** button in the toolbar. If the IO-Link master configuration does not match the one shown in the tool, you can choose which configuration to use.
- Click the **[Search Devices]** button.
- The connected WAGO IO-Link devices now appear, as long as the ports are configured as IO-Link. Add the found devices into the project configuration.
- Double-clicking within the user interface of the WAGO IO-Link master or making a selection in the topology brings you to the IODD interpreter.

10.2.3.4.5 IO-Link Implementation

This section provides some notes on IO-Link implementation with WAGO IO-Link Configurator. The implementation corresponds to the IO-Link interface and IODD specification.

10.2.3.4.5.1 Data Types

WAGO IO-Link Configurator supports all the data types of the specification without restriction.

- Display and Input Formats
  For number formats with decimal places, both decimal commas and decimal points are accepted as decimal separators. Thousands separators are not supported.
  - TimeT
    Corresponds to the RFC 1305 specification and calculates from 1900-01-01 0.00,00(UTC) to 2036-02-07 6.28,15(UTC). Format: yyyy-mm-dd[Thh:mm:ss[.fff]]
  - TimeSpanT
    Regular expression: [+-]?PT\d+(\.\d{1,3})?S
    Example: -PT7765.001S

10.2.3.4.5.2 Block Parameterization

For transferring variables, besides on the “Generic” tab, the tool generally uses block parameterization if the device supports it. Each transfer to the device concludes with BlockEndStore, even if the device does not support block parameterization, but data storage. This ensures that the user’s changes are always backed up. This also applies to the transfer of individual variables.

10.2.3.4.5.3 Block Write Mode / Direct Write Mode

In Block Write mode, at first variables are only edited and marked “changed,” but not yet transferred. The yellow download arrow indicates that there are modified variables. The variables are not transferred until you click the download arrow.

- Yellow download arrow: only modified variables
- Black download arrow: all read/write variables

In Direct Write mode, the modified variable is transferred directly. If the IO-Link device supports this, it is always transferred with block parameterization in order to ensure data consistency and to back up its value in the data storage.

ⓘ Note

Note difference between “Block Write Mode” and “Direct Write Mode”

Do not confuse “Block Write Mode” and “Direct Write Mode” with the use of block parameterization

10.2.3.4.5.4 Upload and Download

The upload and download function always uses block parameterization if the IO-Link device supports it.

The read/write variables that are visible in the respective user role are transferred. If the device is to be backed up so it can be replaced, or so a new application can be initialized with the saved data, the “Specialist” role is required for this.

When the connection to the WAGO IO-Link master is established or the device control is activated, the data is not automatically synchronized with the device. This was a deliberate choice, since there are IO-Link devices with a great number of variables and low performance for transferring them. Therefore, it is possible to load individual variables by clicking on the device's Status column with the mouse and only transferring modified variables in "Block Write Mode."

10.2.4 WAGO I/O Field app

10.2.4.1 Parameterizing the Product with the WAGO I/O Field App

Note

Read the online help!

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

10.2.5 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 username/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.

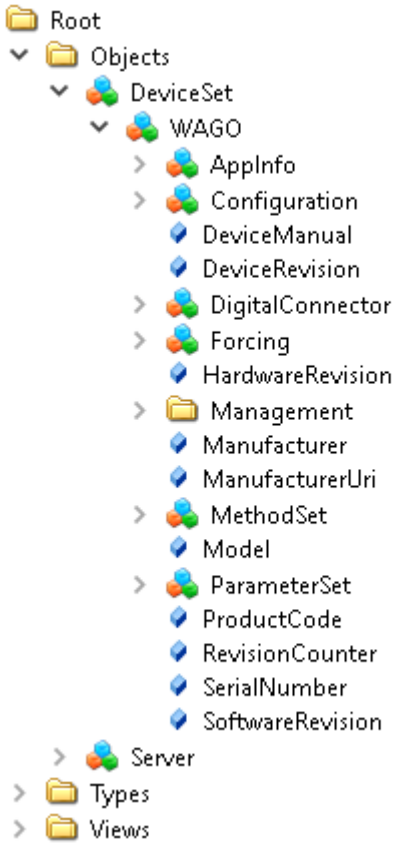


Figure 35: Figure 48: OPC UA: Device Information Model

10.2.5.1 Parameterizing the Product via OPC UA

10.2.5.1.1 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 55: Identify Devices

Node Name	Node Class	Access	Description
Manufacturer	Variable	Read	Device manufacturer
ManufacturerUri	Variable	Read	URL of the device manufacturer
Model	Variable	Read	Model name of the device: “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

10.2.5.1.2 Configure 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] > DigitalConnector > Diagnostics > Configuration`

The following table lists device-specific configuration parameters.

Table 56: Device-Specific Configuration Parameters

Node Name	Node Class	Access	Description
CurrentHysteresis	Variable	Read	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	Upper limiting value for the temperature of a port; unit: 0.1 °C
OverVoltageL	Variable	Read	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	Upper limiting value for the voltage in supply cable 2; unit: mV
TemperatureHysteresis	Variable	Read	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	Lower limiting value for the temperature of a port; unit: 0.1 °C
UnderVoltageL	Variable	Read	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	Lower limiting value for the voltage in supply cable 2; unit: mV

Table 56: Device-Specific Configuration Parameters

Node Name	Node Class	Access	Description
VoltageHysteresis	Variable	Read	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] > DigitalConnector > Diagnostics > PortXX > Configuration`

The following table lists port-specific configuration parameters.

Table 57: Port-Specific Configuration Parameters

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

10.2.5.1.3 Read 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] > DigitalConnector > PortXX > ProcessData`

Note

OPC UA client can only read process output data

The process output data is written by the PROFINET IO-Controller. The OPC UA client can only read process output data.

The following table lists port-specific process data.

Table 58: 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

10.2.5.1.4 Read 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] > DigitalConnector > Diagnostics > Current
```

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

Table 59: 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
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] > DigitalConnector > Diagnostics > PortXX > Current
```

The following table lists port-specific measured values.

Table 60: 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

10.2.5.1.5 Read 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] > DigitalConnector > PortXX > Diagnostics > Flags
```

The following table lists port-specific diagnostic information.

Table 61: 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

10.2.5.1.6 Read 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] > DigitalConnector > PortXX > Statistics > Current / Temperature / Voltage`

The following table lists port-specific statistical information:

Table 62: 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
MaxTemperaturePin1, MaxTemperaturePin2, MaxTemperaturePin4	Variable	Read	Maximum temperature on pin 1, pin 2 or pin 4 since the value was reset; unit: °C
MinTemperaturePin1, MinTemperaturePin2, 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

Table 62: Port Specific Statistical Information

Node Name	Node Class	Access	Description
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 63: 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
	Red	On	2L undervoltage (voltage between 11 V and 18 V)
	Red	Flashing	2L overvoltage (voltage above 30 V)
	Off	Off	No 2L supply voltage

System Status

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

Table 64: 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 65: 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 66: APL LED

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

PROFINET IO-Device Status

The BF and SF LEDs indicate the status of the PROFINET IO-Device. The LNK and ACT LEDs indicate the ETHERNET status.

PROFINET IO-Device Status

The following table describes the LED states of the PROFINET IO-Device.

Table 67: PROFINET IO-Device Status

LED	Color	State	Description
BF (bus error)	Red LED		
	Off	Off	No error
	Red	Flashing (2 Hz)	No data exchange
	Red	On	No configuration, slow physical connection or no physical connection
SF (system error)	Red LED		
	Off	Off	No error
	Red	Flashing (1 Hz, 3 s)	DCP signal service is triggered via the bus
	Red	On	Watchdog timeout; channel, generic or extended diagnostics present; system error; forcing active

Table 68: LED states – PROFINET IO-Device

LED State	Description
Flashing (1 Hz, 3 s)	The indicator switches on and off for 3 second in phases at a frequency of 1 Hz: on for 500 ms and then off for 500 ms
Flashing (2 Hz)	The indicator switches on and off in phases at a frequency of 2 Hz: on for 250 ms and then off for 250 ms

ETHERNET Status

The following table describes the LED states of the link and activity LEDs.

Table 69: ETHERNET Status

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

Table 70: LED States – ETHERNET Status

LED State	Description
Flickering (load-dependent)	The indicator switches on and off at a frequency of 10 Hz, indicating high ETHERNET activity: on for 50 ms and then off for 50 ms. The indicator switches on and off at irregularity intervals to indicate low ETHERNET activity.

Bluetooth® Status

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

Table 71: Bluetooth® LED States

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

Port Status

LEDs 0 (port X01), 2 (port X02), 4 (port X03), 6 (port X04) indicate the status of the digital input/output channel A.

LEDs 1 (port X01), 3 (port X02), 5 (port X03), 7 (port X04) indicate the status of the digital input/output channel B.

Table 72: Port Status

LED	Color	State	Description
0, 2, 4, ... Port status channel A (pin 4)	Duo LED, yellow/red (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
	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, ... Port status channel B (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 PROFINET

General Alarms

Table 73: General Alarms

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

Service

12.1 Resetting to Factory Settings

The product can be reset to the factory settings. Use WAGO Webserver I/O Field for this purpose. Section Parameterizing the Product via WAGO Webserver I/O Field describes this process.

12.2 Updating Firmware

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

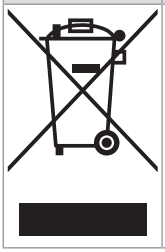
You need the firmware file corresponding to the module type. The name of the firmware file is always `FWUPDATE.zip`; you can store it in a folder with the name of the module, e.g., in a folder named `765-4101`.

Section Parameterizing the Product via WAGO Webserver I/O Field describes the process of updating the firmware.

Decommissioning

13.1 Disposal and Recycling

Table 74: 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 0765-1104/0100-0000 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 /0765-1104/0100-0000.

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

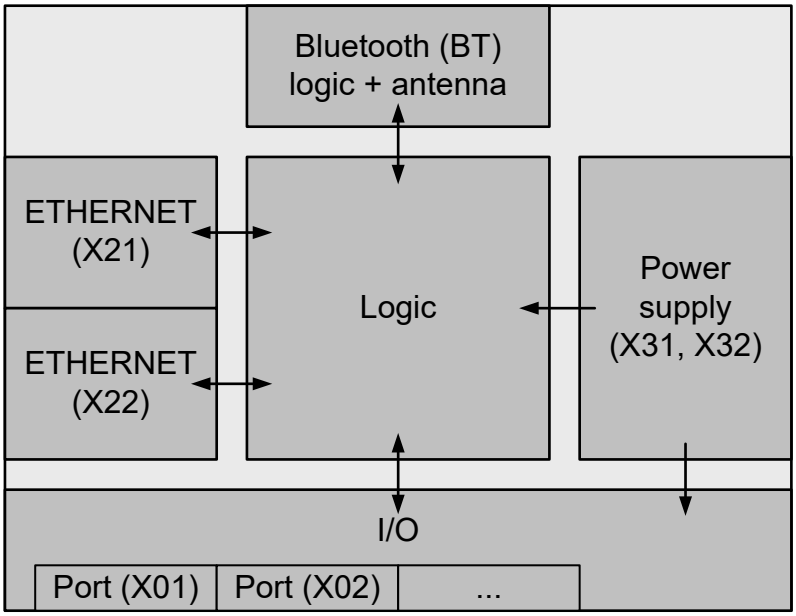
The product is for the acquisition and output via IO-Link to sensors, actuators and hubs of field signals that are sent to a higherlevel controller or received.

The product serves as a decentralized input/output unit in PROFINET I/O networks.

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

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

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

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)

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